

Search for Sources of Systematic Error in Astrometric Measurements of the Cosmological Constant

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Abstract

Among the theoretical problems with the prevailing theory of cosmology, Lambda Cold Dark Matter (Λ CDM), the most serious appears to be the twofold problem with the cosmological constant λ : Dark Energy and Hubble Tension. Despite a two-decade search for systematic errors in astrometry the problems have not been resolved. This paper posits a potential source of error that may have affected astrometry related to the current and past measurements of λ .

Keywords: Λ CDM, Dark Energy, Cosmological Constant, Hubble Tension

1 Introduction

The results of the 1998 study published by Dr. Saul Perlmutter et al [1], and the 2004 study from Dr. Adam Reis et al [2] presented a view of Big Bang cosmology that was, and remains, unsatisfying. Though both papers presented theoretically rigorous and well reasoned arguments for a “dark energy” acceleration of the universe, their conclusions published in their respective papers rest upon data from fewer than 80 type 1a Supernova (SNe 1a).

In statistical analysis, a result is only considered reliable if the sample data is representative of the population under study. Considering the literally universal size of the stellar population, 80 is a miniscule number of samples upon which to base such an important conclusion. To do so must rest on at least two simplifying assumptions:

1. The expansion of the universe is isotropic. Thus, a sample of any size must be representative of the full population spanning the same distance and age.
2. The peculiar velocity of the local reference frame is known and effectively constant throughout the span of history covered by the observations, or any change would be too small to affect the results and may be ignored.

The recently measured [3], roughly 4+ kilometer per second [4] [5] [6] discrepancy between two rigorous measurements of λ known as “The Hubble Tension” is similarly unsatisfying.

2 Methods

These widely acknowledged theoretical problems motivated a deeper look into astrometry concerning dark energy. To address the small dataset problem, we used as many of the stars listed in the SAI Supernova Catalog [7] and the Extragalactic Distance Database (EDD) [8] as possible.

To challenge the simplifying assumptions, we segregated the SNe 1a from the SAI Supernova Catalog and observations from the EDD into directional cohorts by right ascension (RA) and compared the uncorrected redshift (RS)-magnitude relations. To obtain sufficient samples of SNe 1a in each cohort required a cone spanning 60 degrees of right ascension and ± 90 degrees of declination. The larger EDD allowed narrower samples of 15 degrees of right ascension and 60 degrees of declination.

Measurements of SNe 1a magnitude are acknowledged to be affected by multiple independent random variables. [9] The comparison of cohort samples assumes that the various random variables that affect the measurements of SNe 1a

magnitude apply to the entire population of observations in SAI Catalog. The population is sufficiently large that the magnitudes of cohort SNe 1a samples are candidates for a comparative statistical analysis. Applying the Central Limit Theorem [10], we posit that the sampling distribution of the cohort magnitudes may be compared with function-fit mean trend lines of magnitude-redshift plots. This allowed direct comparison of supernova magnitude-redshift values at regular intervals by applying the mean functions to a scale of redshift values.

The local Earth, solar system, Milky Way [11] reference frame is known to be moving roughly toward the Shapley Galactic Supercluster [12], and the more distant Great Attractor [13] with a velocity of approximately 630km/s [14]. We selected only confirmed SNe 1a from the catalog, then chose the RAs toward the Great Attractor (RAs 14-17), and those diametrically opposed (RAs 2-5) for the test comparison. For the control comparison we used two cohorts at right angle RAs 8-11 and 20-23. The data used to create the plots are found in the [Data](#) section.

The EDD analysis made use of distance, heliocentric radial velocity, and peculiar motion measurements to obtain a function-fit mean of distance-velocity plots of the RA2, RA14, RA8 and RA20 cohorts. This allowed direct comparison of the narrower cohort's distance-velocity and distance-redshift values at regular intervals by applying the mean functions to a scale of velocities and corresponding redshifts.

3 Research

3.1 Type 1A Supernova Data Analysis

The **Perlmutter** et al and **Reiss** et al papers used Type 1A supernova astrometry to propose a dark energy induced acceleration of the expansion of spacetime. While the astrometry is exceptionally well grounded in theory and the analysis is thorough, the work may have been misled by observational bias and limited data. A broader statistical analysis of a larger, more recent SNe 1a data set is presented here.

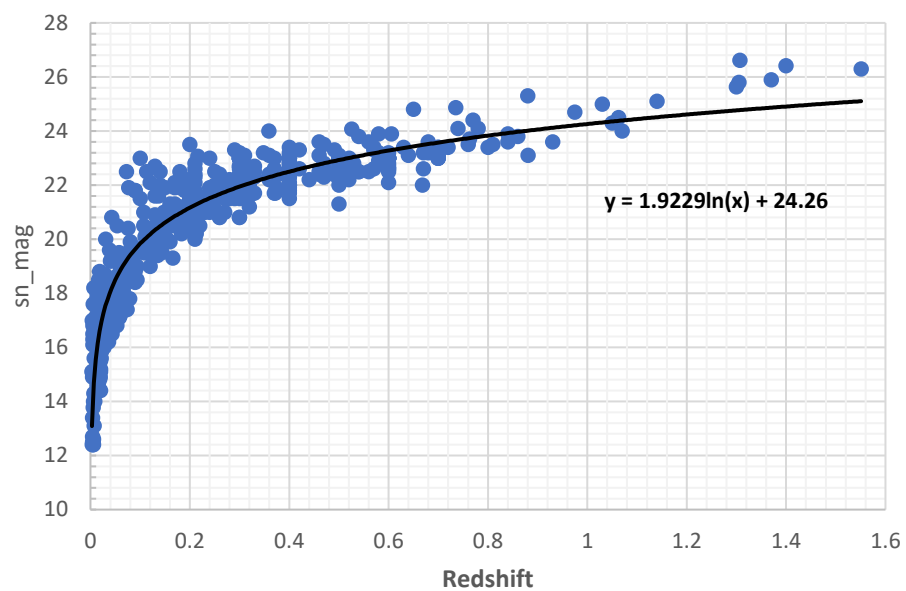
We plotted the SNe 1a redshift-magnitude relation for the RA 2.0000 through 5.9999 (RA 2-5) and RA 14.0000 through RA 17.9999 (RA14-17) cohorts of the test group. The current positive velocity of the Milky Way of 630kps is additive to the distance from the low-RA cohort and subtractive to the distance from the high-RA stars. If the expansion of the universe is isotropic, and if the velocity of the Milky Way has been constant through the period under study, that would introduce a fixed offset to the redshift-magnitude (RSM) plots when compared. The plots should not converge.

However, if the Milky Way has positively accelerated on its current heading it would produce a plot with a larger difference in the RSM plots in the recent past that converges in the distant past. Conversely, a negative acceleration would produce a smaller difference in the RSM plots in the recent past.

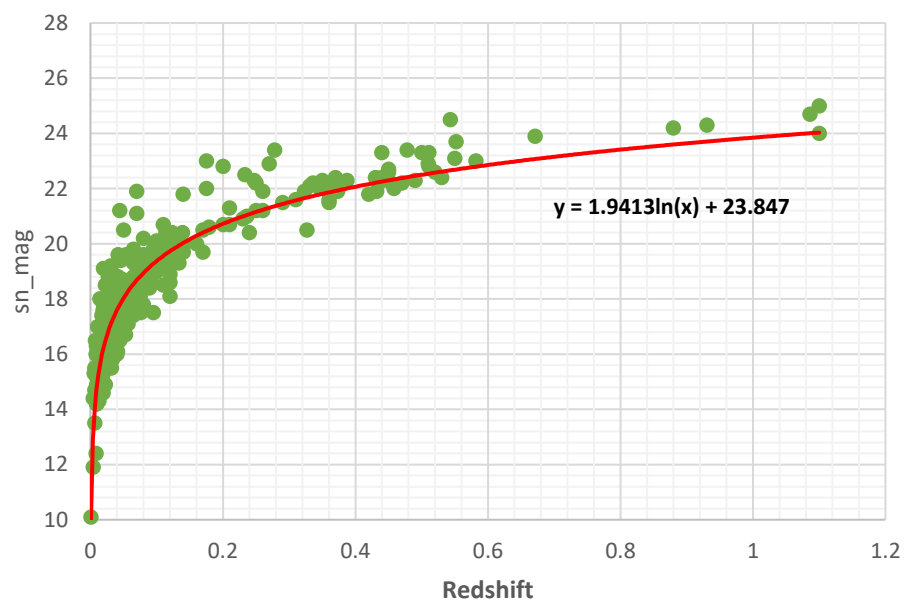
Plots 1 through 6 Illustrating Cohort sn_mag Redshift Relations

The first pass through the data yielded similar plots from data found [here](#) and [here](#) :

Plot 1: 2 <= RA <= 5 sn_mag vs Redshift



Plot 2: 14 <= RA <= 17 sn_mag vs Redshift



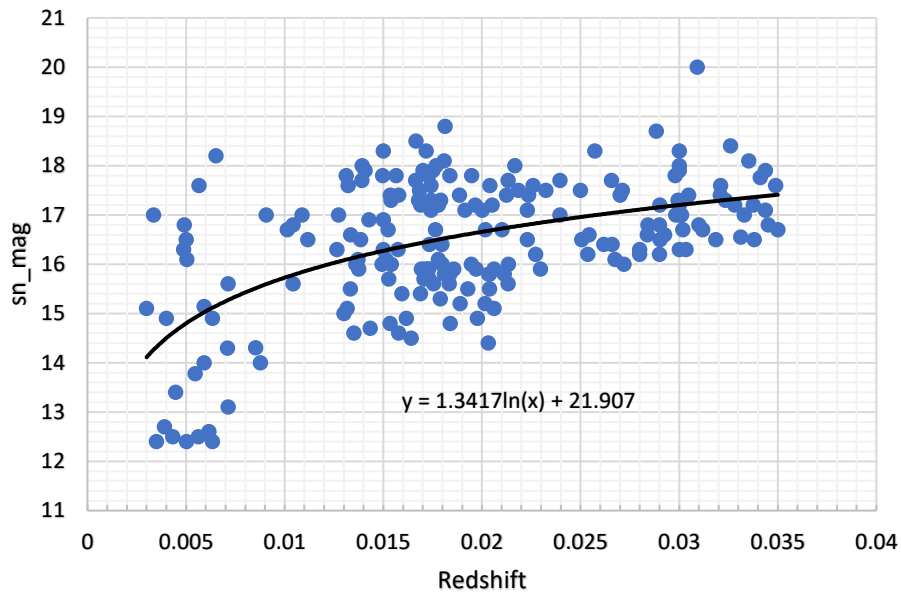
In plots 1 and 2 note that the low-RA plot trends 2 magnitudes higher (lower luminosity) than the high-RA plot at redshift (RS) near 0, but the two plots converge, possibly intersecting beyond redshift=1.6 as shown in Table 1. This pair of plots hypothetically illustrates a potentially consequential acceleration of our galaxy during the last 480 million years or more.

Index	14..17 sn_mag	2..5 sn_mag	diff
0.05	18.03138494	18.4995064	0.468121
0.1	19.37699156	19.8323591	0.455368
0.15	20.16412097	20.612028	0.447907
0.2	20.72259818	21.1652118	0.442614
0.25	21.15578676	21.5942946	0.438508
0.3	21.50972759	21.9448807	0.435153
0.35	21.80898031	22.241297	0.432317
0.4	22.0682048	22.4980646	0.42986
0.45	22.29685701	22.7245496	0.427693
0.5	22.50139338	22.9271473	0.425754
0.55	22.68641903	23.1104192	0.424
0.6	22.85533422	23.2777334	0.422399
0.65	23.01072112	23.4316475	0.420926
0.7	23.15458693	23.5741498	0.419563
0.75	23.28852279	23.7068161	0.418293
0.8	23.41381142	23.8309173	0.417106
0.85	23.531502	23.9474924	0.41599
0.9	23.64246363	24.0574023	0.414939
0.95	23.74742433	24.1613681	0.413944
1	23.847	24.26	0.413
1.1	24.03202565	24.4432719	0.411246
1.2	24.20094084	24.6105861	0.409645
1.3	24.35632775	24.7645002	0.408172
1.4	24.50019355	24.9070025	0.406809
1.5	24.63412941	25.0396689	0.405539
1.6	24.75941805	25.16377	0.404352

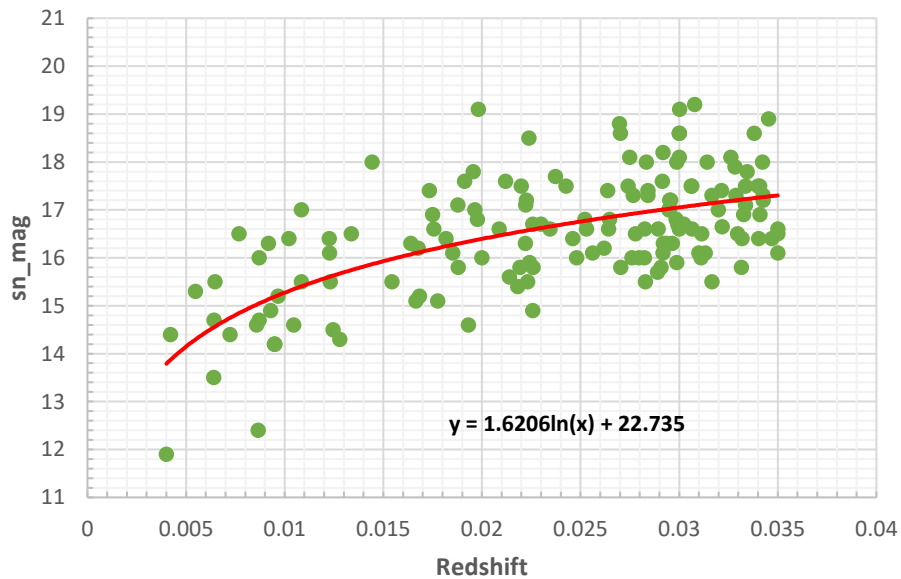
Table 1: Unfiltered Test Cohort Trendline Magnitudes calculated from SAI Supernova Catalog SNe 1a Measurements

A sharper focus on low-redshift supernovae yielded these plots from data [here](#) and [here](#):

Plot 3: 2 <=RA<= 5 sn_mag vs Redshift <= 0.035

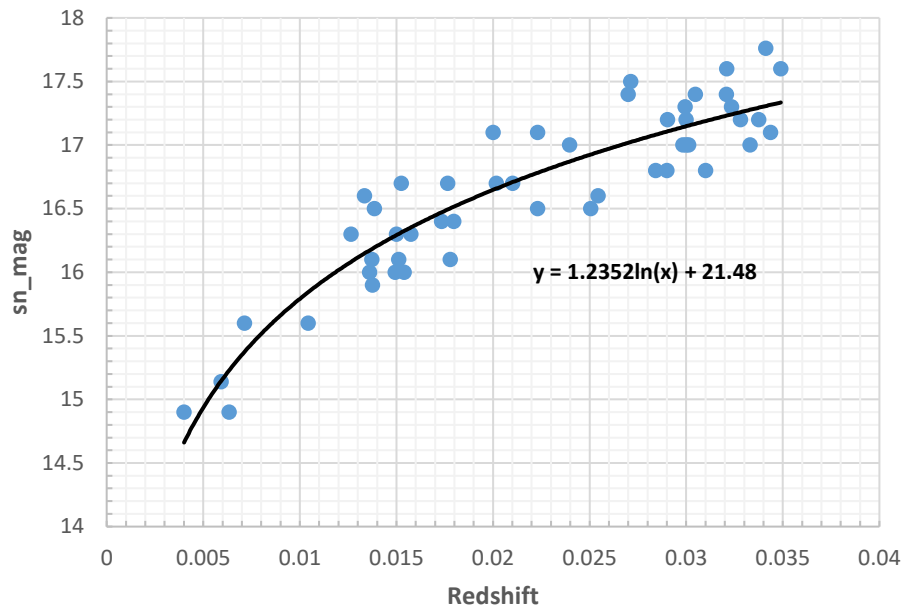


Plot 4: 14<= RA<=17 sn_mag vs Redshift <= 0.035

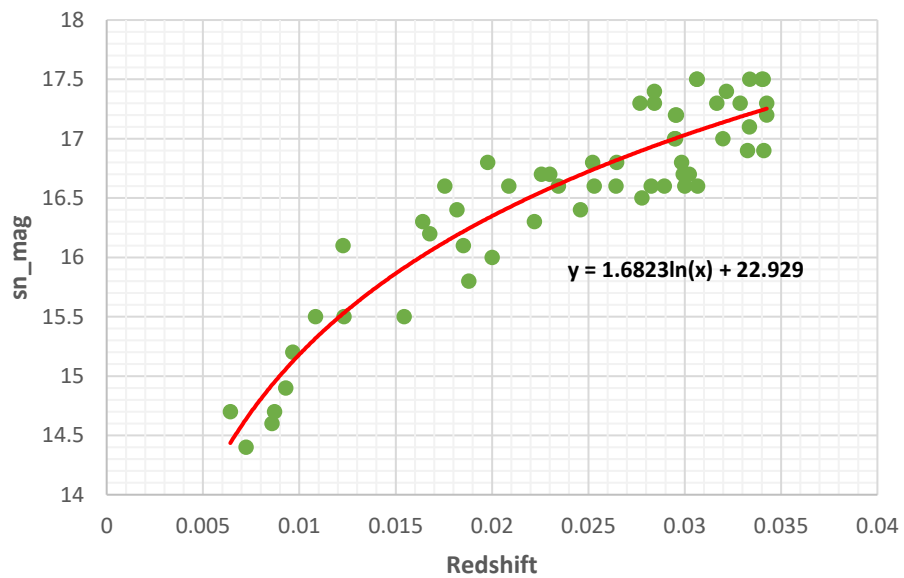


Since lambda is common mode in these two plots, any difference must be due to motion of the populations relative to the local reference frame. We know that the Milky Way is moving away from the low-RA stars toward the high-RA stars which exaggerates the change over time by a factor of two. Since there is much more data in the low RA set, and it is difficult to compare individual stars, we used the mean trend lines to filter the data in both sets to the exemplars of each trend from data found [here](#) and [here](#):

Plot 5: $2 \leq \text{RA} \leq 5$ sn_mag vs Redshift ≤ 0.035



Plot 6: $14 \leq \text{RA} \leq 17$ sn_mag vs Redshift ≤ 0.035



Note that though the trends appear to be quite similar, the high-RA trend begins 0.002 to the right on the X or redshift axis, yet the traces nearly converge at RS = 0.035 as shown in Table 2.

Index	RA 2-5 sn_mag	RA 14-1sn_mag	diff
0.005	14.93022007	14.01564069	0.914579
0.01	15.78708862	15.1817222	0.605366
0.015	16.28832458	15.86383615	0.424488
0.02	16.64395716	16.3478037	0.296153
0.025	16.91980722	16.72319809	0.196609
0.03	17.14519313	17.02991765	0.115275
0.035	17.3357542	17.28924534	0.046509

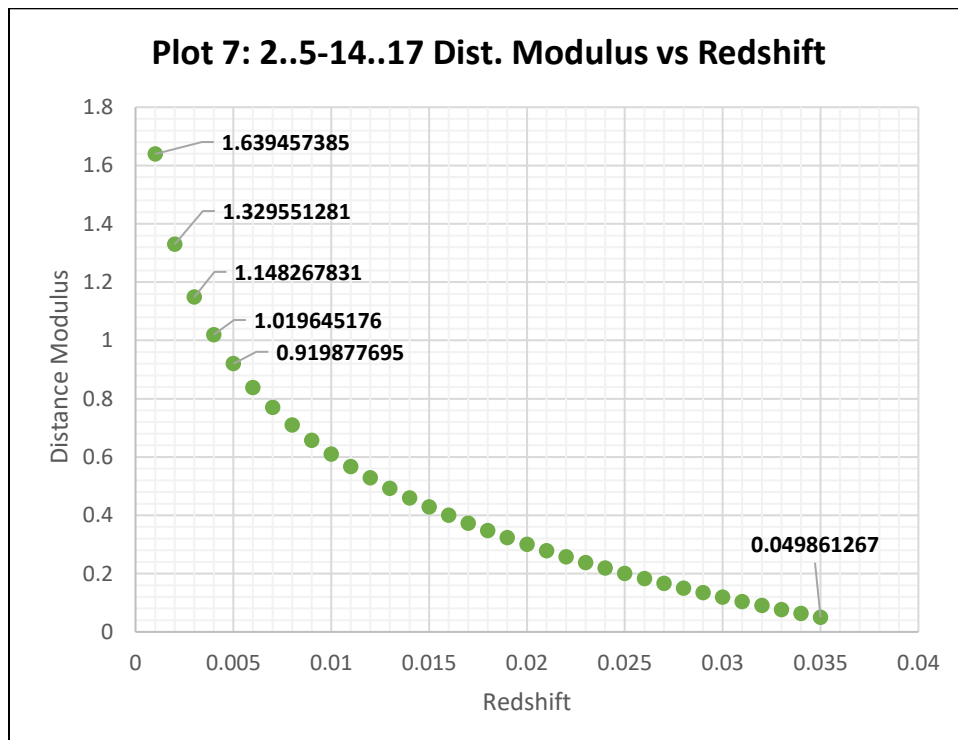
Table 2 Exemplar Trendline sn_mag vs redshift <= 0.035 calculated from SAI Supernova Catalog SNe 1a Measurements

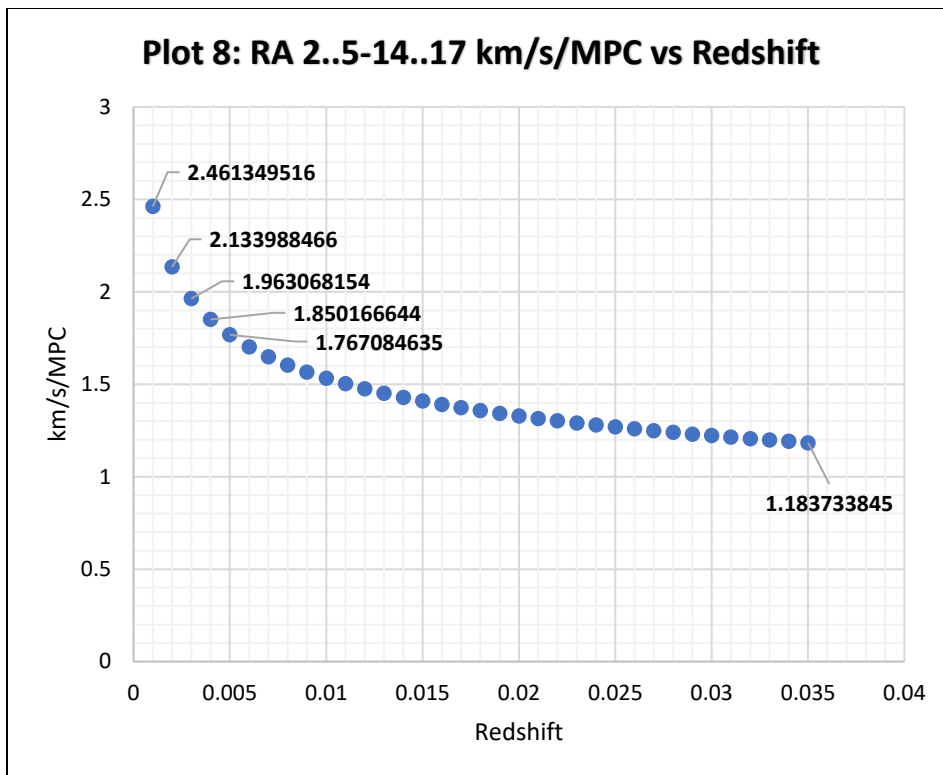
Individual stars still cannot be compared directly, but we can use the mean trend line equations to make straightforward comparisons at each redshift in the interval of interest. Each 0.001 of RS is equivalent to approximately 13.8 million years. By using the high-RA magnitude as the absolute magnitude, and the low-RA magnitude as the apparent magnitude at each 0.001 interval in the trendline equations we can obtain regular changes in distance measurements in approximately 13.8-million-year intervals over the last 480 million years with this formula:

$$d = 10^{\frac{m - M + 1}{5}}$$

Plots 7 and 8 Illustrating the Distance Modulus and ΔV vs Redshift

Here are the plots of the distance modulus and computed acceleration from [this](#) data:



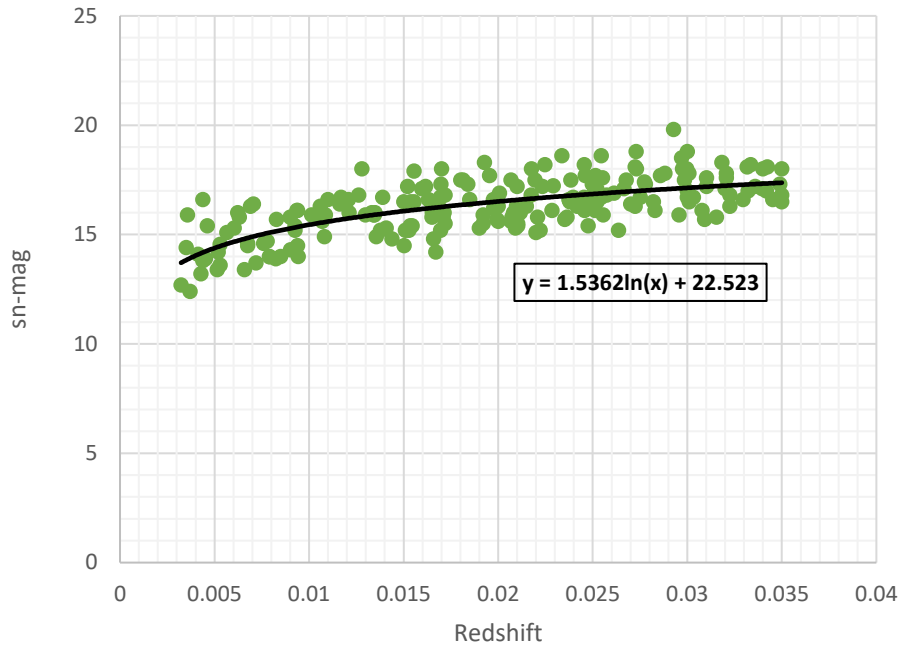


Plot 8 shows the computed change in velocity of the Milky Way on the RA 2-5 ->14-17 vector during the last 480 million years. After correction for doubling of the separation distance, this plot shows that during the most recent 3.26-million-year period that we can measure the velocity of the Milky Way in the direction of RA2..5 increased by an average of 2.46 km/s every 3.26 million years, and increasingly less in the past.

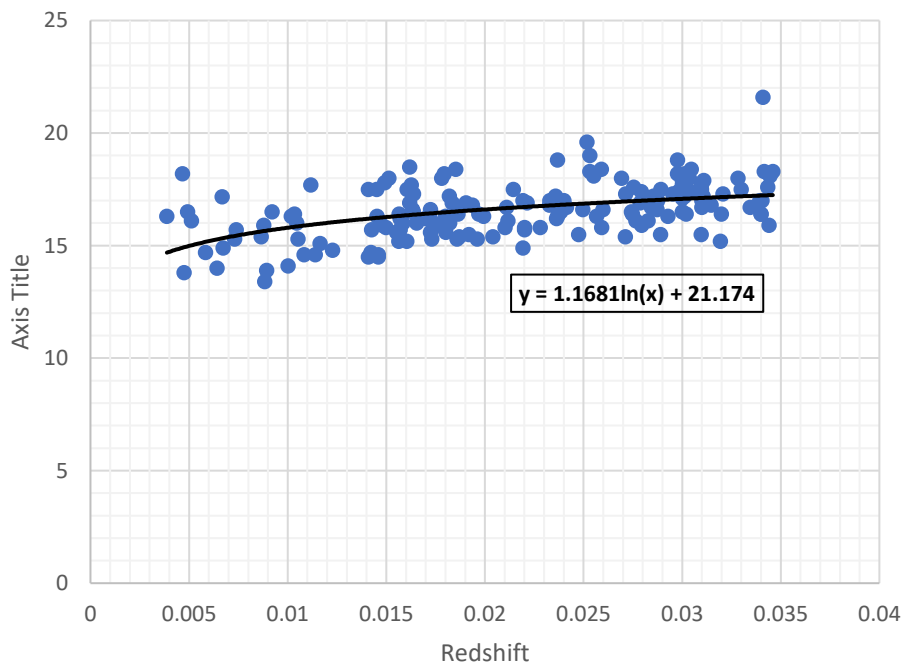
Plots 8 and 9 Displaying RA8..11 and RA20..23 sn_mag Redshift Relations

Plots of the control cohorts RA 8..11 and RA 20..23 are distinctly different in appearance than test plots 1 and 2 which illustrates potential recent anisotropic changes in velocity. Data for plots 8 and 9 is found [here](#) and [here](#):

Plot 9: RA 8..11, rs <= .035 sn_mag vs Redshift



Plot10: RA 20..23 rs <= .035 sn_mag vs Redshift



The 20..23 cohort contains no observations below redshift = 0.003, so to achieve representative plots for comparison we removed extreme outliers 2014J, 1999by, and 2011by from cohort ra8..11 cohort for the control comparison. The plots converge near redshift 0.025 as shown in Tables 3 and 4, and plot 11.

Index	20..23 sn_mag	8..11 sn_mag	diff
0.005	14.98503548	14.35469885	0.630337
0.01	15.79470071	15.43351312	0.361188
0.015	16.2683245	16.06457902	0.203745
0.02	16.60436593	16.51232739	0.092039
0.025	16.86501991	16.85962802	0.005392
0.03	17.07798972	17.14339329	-0.0654
0.035	17.25805313	17.38331341	-0.12526

Table 3: Unfiltered Control Cohort $RA \leq 0.035$ Trendline Magnitudes calculated from SAI Supernova Catalog SNe 1a Measurements

Plot 11 Displaying Magnitude-Redshift Variations in Directional Cohorts

Plot 11 clearly displays the changes in the relative velocity of the means of the cohort samples. Note that the changes in slope of the mean trend lines differ, with the greatest differences from redshift 0.001 to 0.005. This is crucial to disambiguating apparent change in velocity due to an increase in the rate of expansion of spacetime from changes in velocity due to gravitational acceleration.

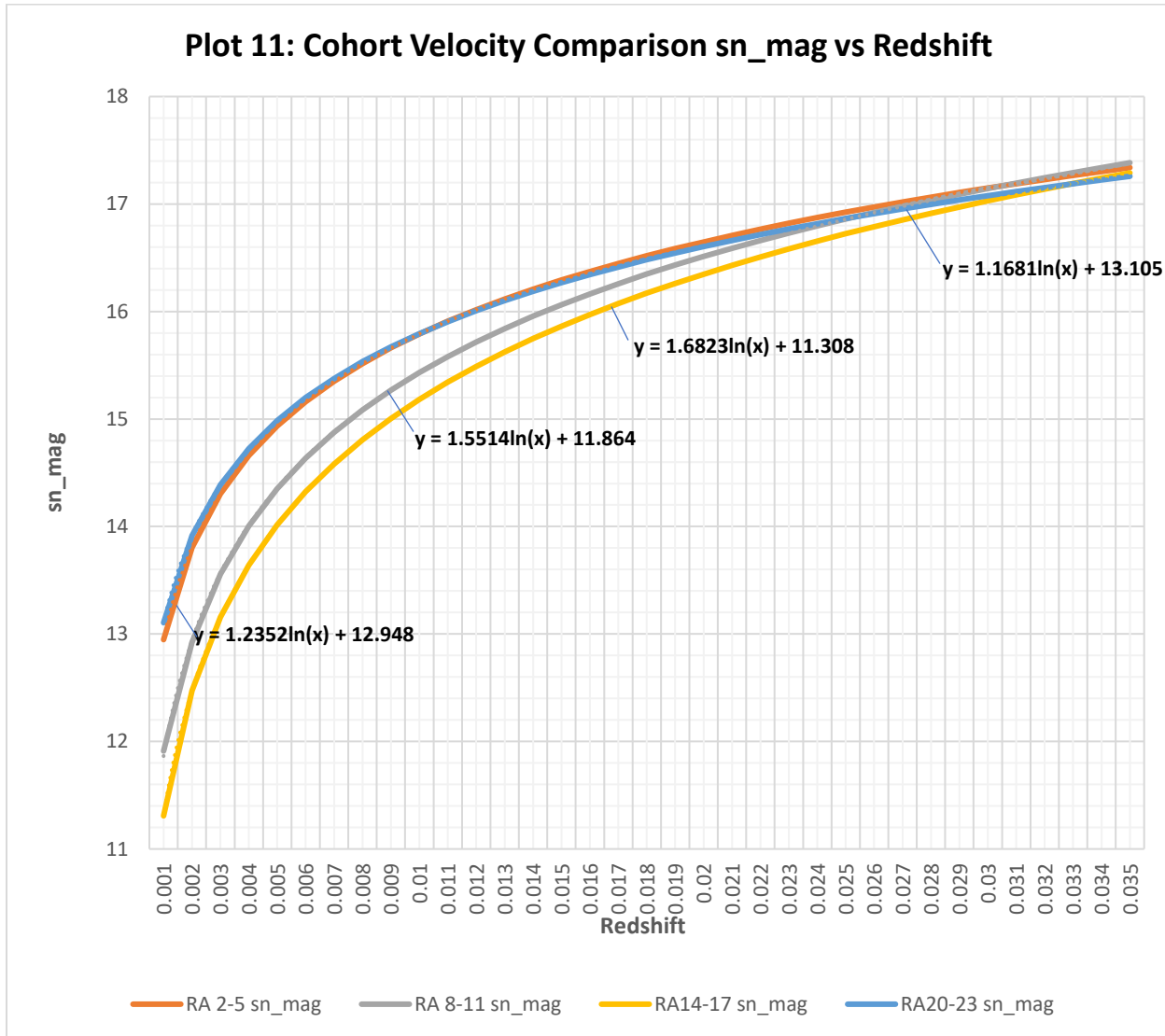


Table 4 displays the values of the changes in velocity displayed in plot 11. Note the differences in the rows of the Δv columns. Plot 11 and Table 4 were derived from the samples of SAI Supernova Catalog data found [here](#):

Redshi ft	RA 2-5 Δ distmod	RA 8-11 Δ dstmod	RA 14-17 Δ distmod	RA 20-23 Δ distmod	RA 2-5 Δv kps	RA 8-11 Δv kps	RA 14-17 Δv kps	RA 20-23 Δv kps
0.001	0	0	0	0	0	0	0	0
0.002	0.8561753 97	1.0122269 38	1.1660815 02	0.8096652 22	3.4319968 99	3.6877136 85	3.9584768 34	3.3592695 37
0.003	0.5008305 02	0.6319173 71	0.6821139 51	0.4736237 93	2.9139219 01	3.0952467 87	3.1676310 95	2.8776406 9
0.004	0.3553448 96	0.4483525 1	0.4839675 5	0.3360414 29	2.7250896 01	2.8443452 43	2.8913809 64	2.7009720 69

0.005	0.2756269 15	0.3477692 25	0.3753943 96	0.2606539 82	2.6268615 9	2.7155990 76	2.7503672 41	2.6088109 21
0.006	0.2252035 87	0.2841481 46	0.3067195 55	0.2129698 1	2.5665665 2	2.6371900 99	2.6647453 82	2.5521474 93
0.007	0.1904069 2	0.2402438 35	0.2593276 89	0.1800634 09	2.5257664 56	2.5844050 1	2.6072179 95	2.5137639 24
0.008	0.1649379 76	0.2081086 75	0.2246398 62	0.1559780 2	2.4963150 93	2.5464405 55	2.5659003 13	2.4860359 88
0.009	0.1454856 06	0.1835648 61	0.1981464 01	0.1375823 64	2.4740525 98	2.5178205 83	2.5347847 61	2.4650644 59
0.01	0.1301413 09	0.1642043 64	0.1772479 95	0.1230716 18	2.4566317 99	2.4954718 78	2.5105068 25	2.4486467 17
0.011	0.1177271 34	0.1485409 15	0.1603403 15	0.1113318 21	2.4426274 54	2.4775360 95	2.4910352 34	2.4354441 32
0.012	0.1074764 53	0.1356072 31	0.1463792 4	0.1016379 89	2.4311239 28	2.4628232 99	2.4750709 63	2.4245961 16
0.013	0.0988687 53	0.1247465 6	0.1346558 47	0.0934978 87	2.4215060 46	2.4505361 82	2.4617445 02	2.4155241 55
0.014	0.0915381 67	0.1154972 75	0.1246718 42	0.0865655 22	2.4133451 66	2.4401204 36	2.4504518 63	2.4078249 58
0.015	0.0852199 95	0.1075253 9	0.1160667 08	0.0805905 73	2.4063334 4	2.4311787 18	2.4407604 02	2.4012087 76
0.016	0.0797179 81	0.1005832 85	0.1085731 54	0.0753874 47	2.4002440 6	2.4234187 54	2.4323520 77	2.3954620 59
0.017	0.0748835 33	0.0944834 73	0.1019888 01	0.0708156 21	2.3949062 31	2.4166207 6	2.4249878 53	2.3904239 5
0.018	0.0706020 73	0.0890813 88	0.0961576	0.0667667 43	2.3901888 82	2.4106162 78	2.4184846 05	2.3859709 73
0.019	0.0667838 32	0.0842637 64	0.0909572 86	0.0631559 21	2.3859897 5	2.4052740 19	2.4126996 69	2.3820067 7
0.02	0.0633574 77	0.0799405 99	0.0862907 09	0.0599156 97	2.3822278 78	2.4004901 44	2.4075202 52	2.3784550 42
0.021	0.0602656 11	0.0760394 71	0.0820796 93	0.0569917 91	2.3788383 4	2.3961814 48	2.4028560 06	2.3752545 87
0.022	0.0574615 23	0.0725014 44	0.0782606 22	0.0543400 3	2.3757684 57	2.3922804 78	2.3986337 04	2.3723557 42
0.023	0.0549068 17	0.0692780 72	0.0747812	0.0519241 04	2.3729750 43	2.3887319 68	2.3947933 71	2.3697177 86
0.024	0.0525696 36	0.0663291 59	0.0715980 39	0.0497138 86	2.3704223 56	2.3854902 13	2.3912854 16	2.3673070 12
0.025	0.0504233 28	0.0636210 78	0.0686748 41	0.0476841 72	2.3680805 61	2.3825170 81	2.3880684 75	2.3650952 82
0.026	0.0484454 25	0.0611254 81	0.0659810 06	0.0458137 15	2.3659245 58	2.3797805 11	2.3851077 77	2.3630589 2
0.027	0.0466168 53	0.0588183 01	0.0634905 54	0.0440844 77	2.3639330 79	2.3772533 47	2.3823738 75	2.3611778 62
0.028	0.0449213 14	0.0566789 73	0.0611812 88	0.0424810 45	2.3620879 83	2.3749124 38	2.3798416 72	2.3594349 94
0.029	0.0433447 98	0.0546898 22	0.0590341 27	0.0409901 71	2.3603737	2.3727379 24	2.3774896 38	2.3578156 25
0.03	0.0418751 97	0.0528355 68	0.0570325 8	0.0396004 03	2.3587767 95	2.3707126 71	2.3752992 05	2.3563070 78

0.031	0.0405019 89	0.0511029 39	0.0551623 19	0.0383017 92	2.3572856 1	2.3688218 21	2.3732542 71	2.3548983 52
0.032	0.0392159 92	0.0494803 46	0.0534108 35	0.0370856 55	2.3558899 84	2.3670524 24	2.3713408 04	2.3535798 55
0.033	0.0380091 53	0.0479576 3	0.0517671 61	0.0359443 74	2.3545810 14	2.3653931 42	2.3695465 21	2.3523431 89
0.034	0.0368743 8	0.0465258 43	0.0502216 4	0.0348712 46	2.3533508 74	2.3638340 05	2.3678606 23	2.3511809 62
0.035	0.0358054 06	0.0451770 76	0.0487657 33	0.0338603 42	2.3521926 49	2.3623662 13	2.3662735 76	2.3500866 51

Table 4: Cohort Mean Trendline Distance Modulus and Velocity Changes from Redshift 0.001 to 0.035

3.2 Extragalactic Distance Database Analysis

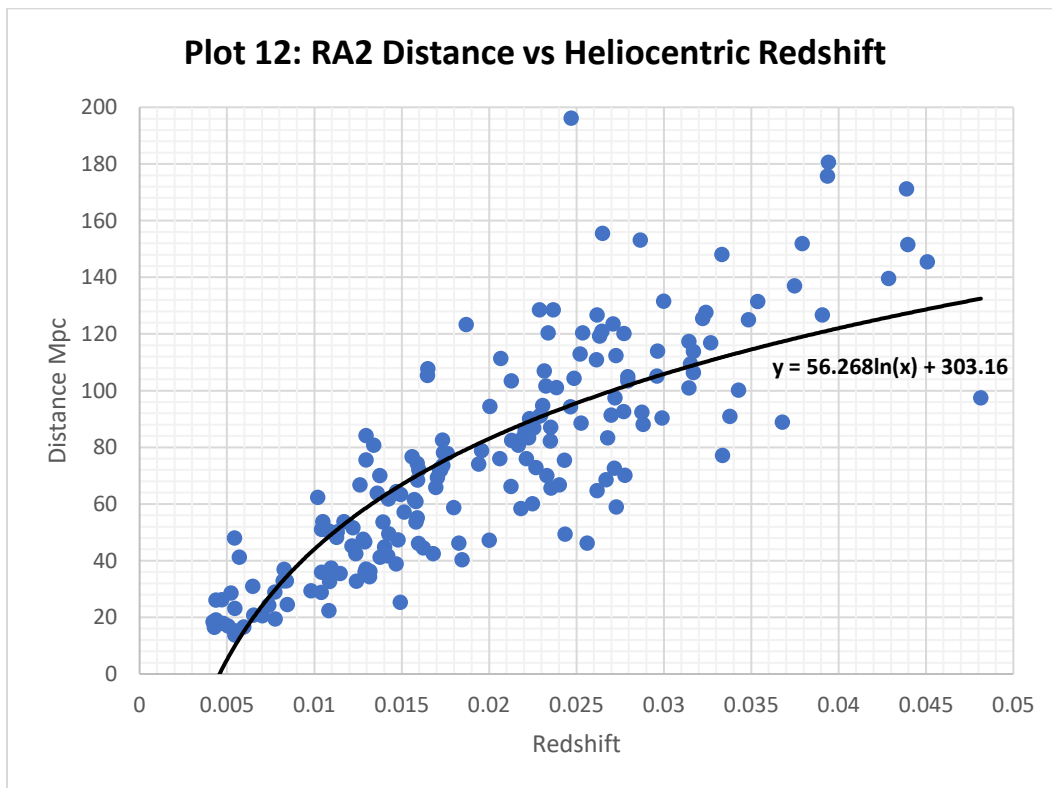
The EDD provides numerous measurements including distance, heliocentric velocity, and peculiar motion of over 50 thousand objects. This provided sufficient data of cohort samples of 15 degrees of right ascension and ± 30 degrees of declination. An analysis of right ascension 2.0000 to 2.9999 (RA2), 14.0000 to 14.9999 (RA14), 8.0000 to 8.9999 (RA8) and 20.0000 to 20.9999 (RA20) is presented here. All observations are identified by their Principal Galaxies Catalog (PGC) [15] entries.

We plotted the distance- peculiar velocity-corrected heliocentric velocity relation for the EDD data for the RA 2 and RA 14 cohorts of the test group. The current positive velocity of the Milky Way of 630kps is incorporated into the velocity measurement. If the expansion of the universe is isotropic, and if the velocity of the Milky Way has been constant through the period under study, that would introduce a fixed offset to the distance-velocity (DV) plots when compared. The plots should not converge.

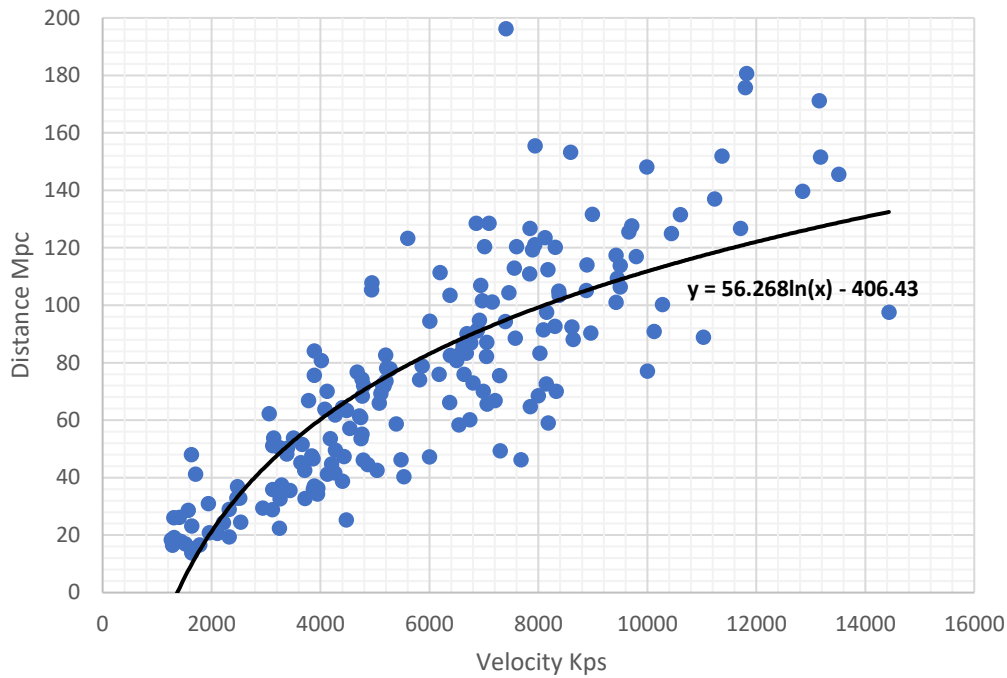
However, if the Milky Way has positively accelerated on its current heading it would produce a plot with a larger difference in the DV plots at low distance (recent past) that converge at high distance (distant past). Conversely, a negative acceleration would produce an increasing difference in the DV plots over increasing time and distance.

Plots 12 and 13 Displaying RA2 Observations by Redshift and Velocity

The plots 12 and 13 from EDD data displaying the RA2 distance-velocity relation on redshift and velocity scales respectively, are found [here](#):



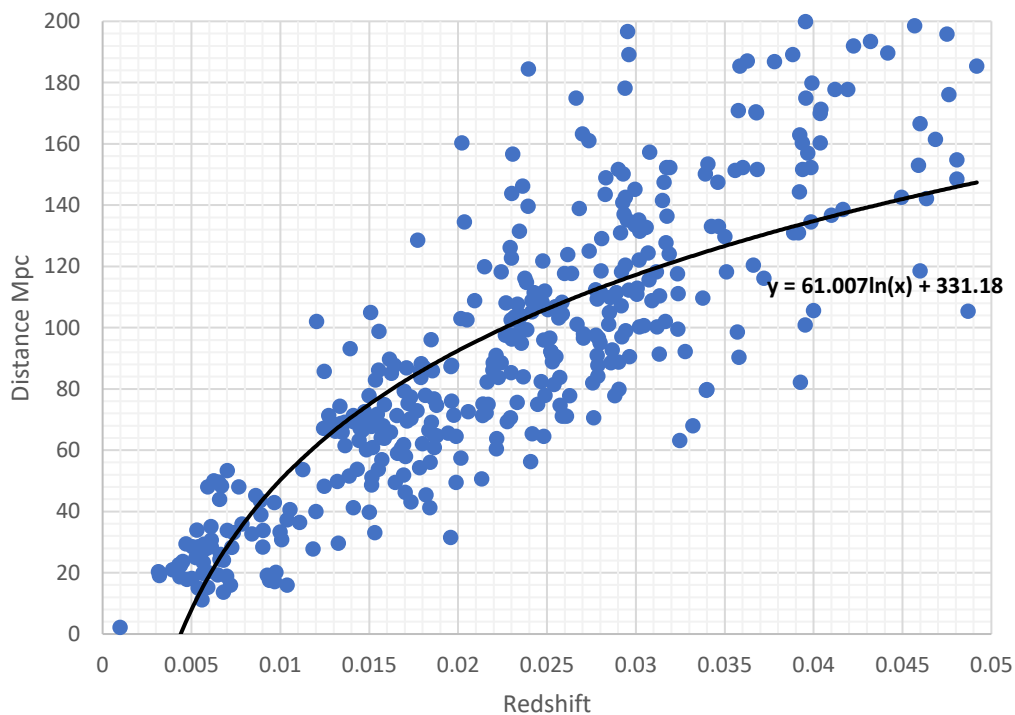
Plot 13: RA-2 Distance vs Heliocentric Velocity



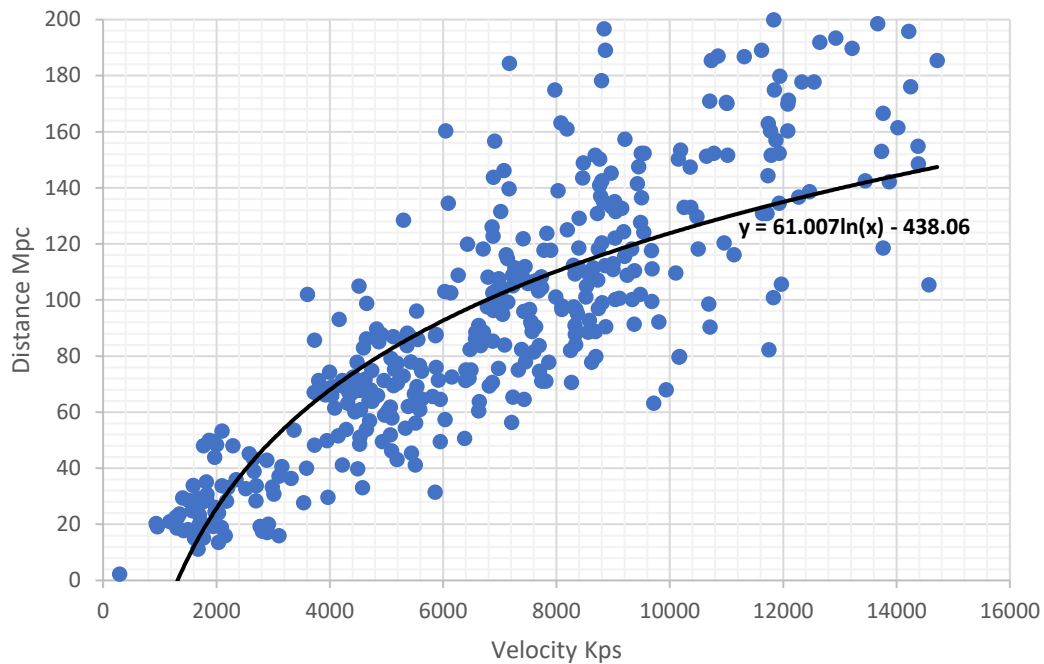
Plots 14 and 15 Displaying RA14 Observations by Redshift and Velocity

The plots 14 and 15 from EDD data displaying the distance-velocity relation on redshift and velocity scales respectively, are found [here](#):

Plot 14: RA14 Distance vs Heliocentric Redshift



Plot 15: RA14 Distance vs Heliocentric Velocity

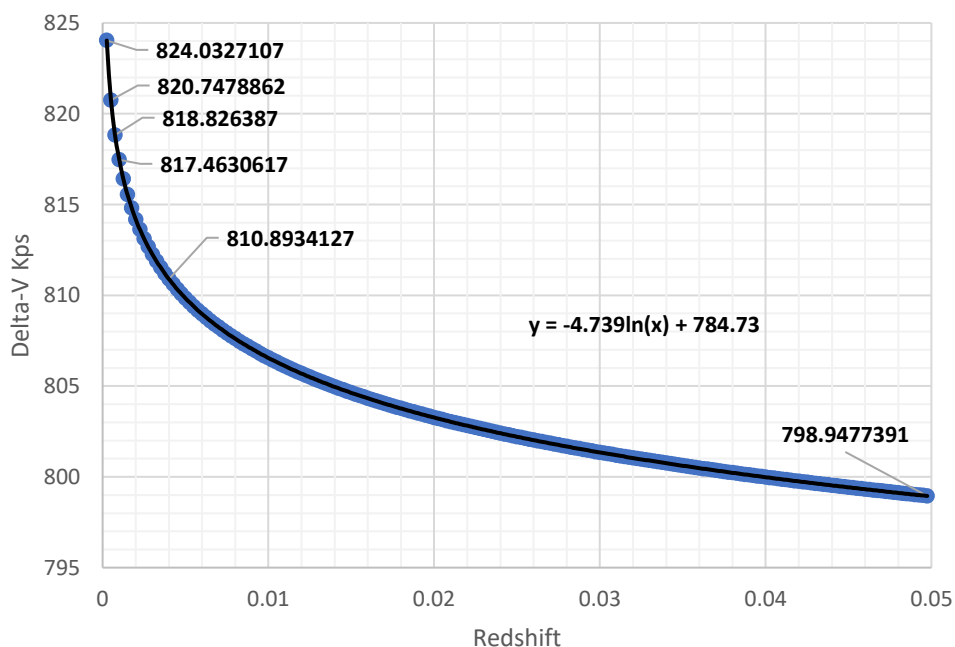


The curve in the RA2 and RA14 mean trendlines indicate a change in velocity over time in both cohorts, however, the plots do not clearly display any difference between them.

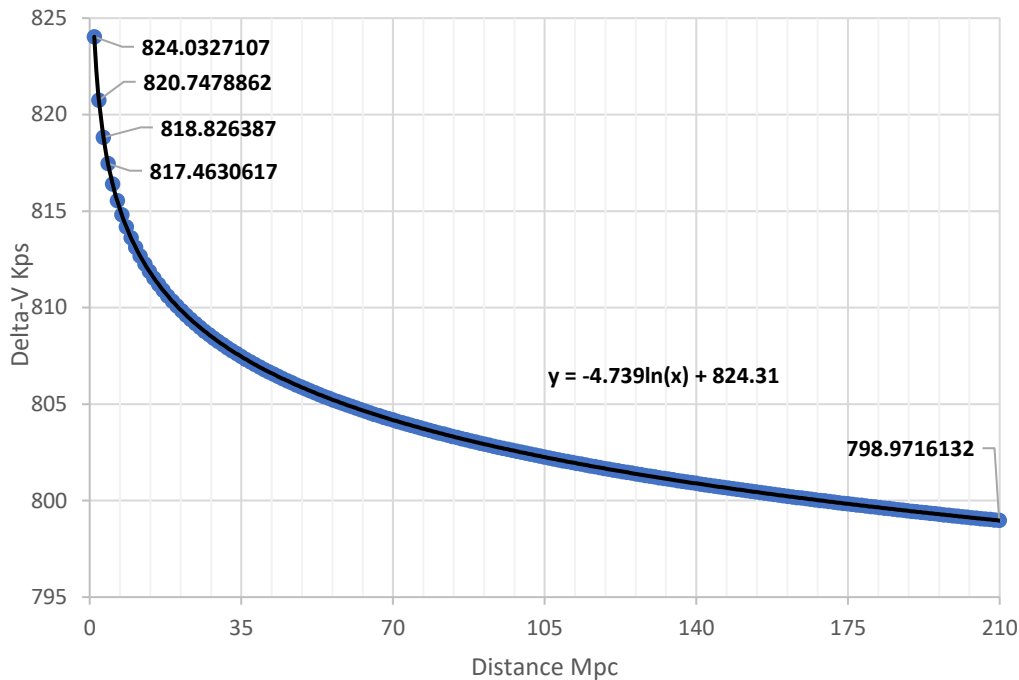
Plots 16 through 18 Illustrating Heliocentric ΔV Changes by Redshift and Velocity

Plots 14, 15 and 16 display the RA2-RA15 differences in the distance-redshift and distance-velocity relations change from data found [here](#):

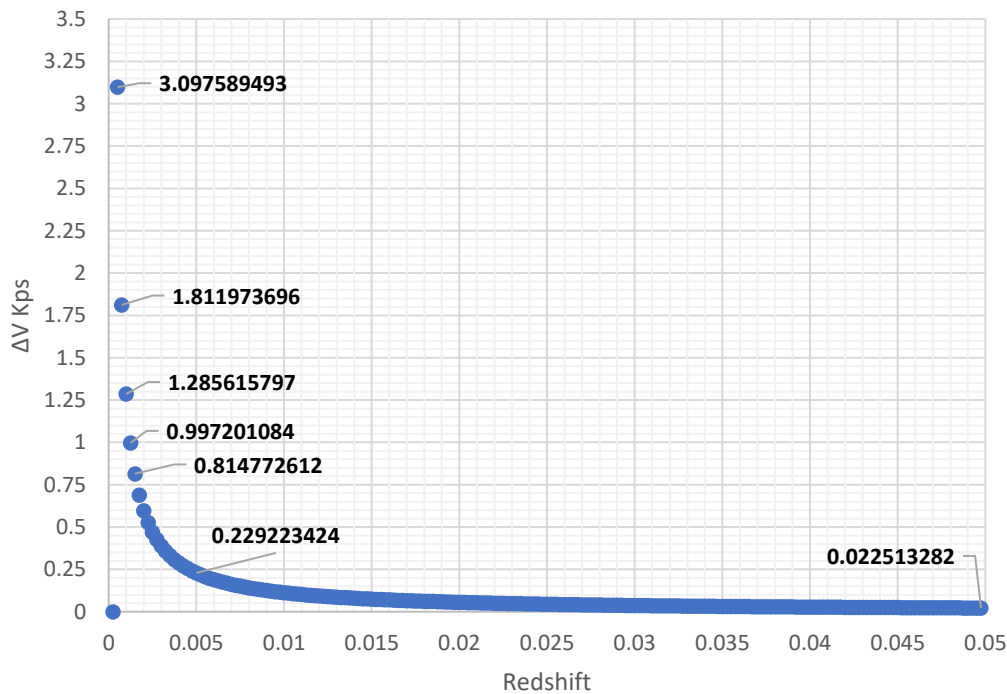
Plot 16: RA2-RA14 Helocentric ΔV vs Redshift



Plot 17: RA2-14hel Heliocentric ΔV vs Distance



Plot 18: RA2_14hel ΔV Diff/MPC

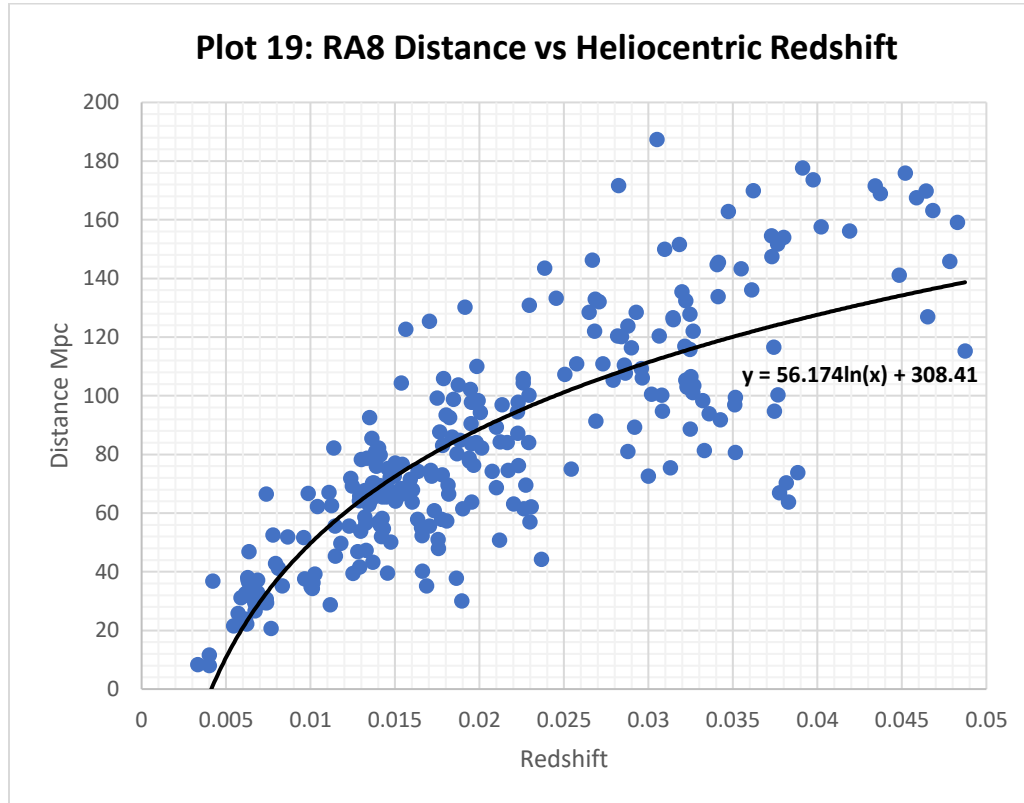


Plot 18 shows the computed change in velocity of the Milky Way relative to objects in RA2 and RA14 during the last 480 million years. From peculiar velocity-corrected heliocentric velocity measurements this plot shows that during the most recent 3.26-million-year period that we can measure, the velocity of the Milky Way in the direction of RA14 relative to RA2 increased by an average of 3.09 km/s every 3.26 million years, and increasingly less in the past.

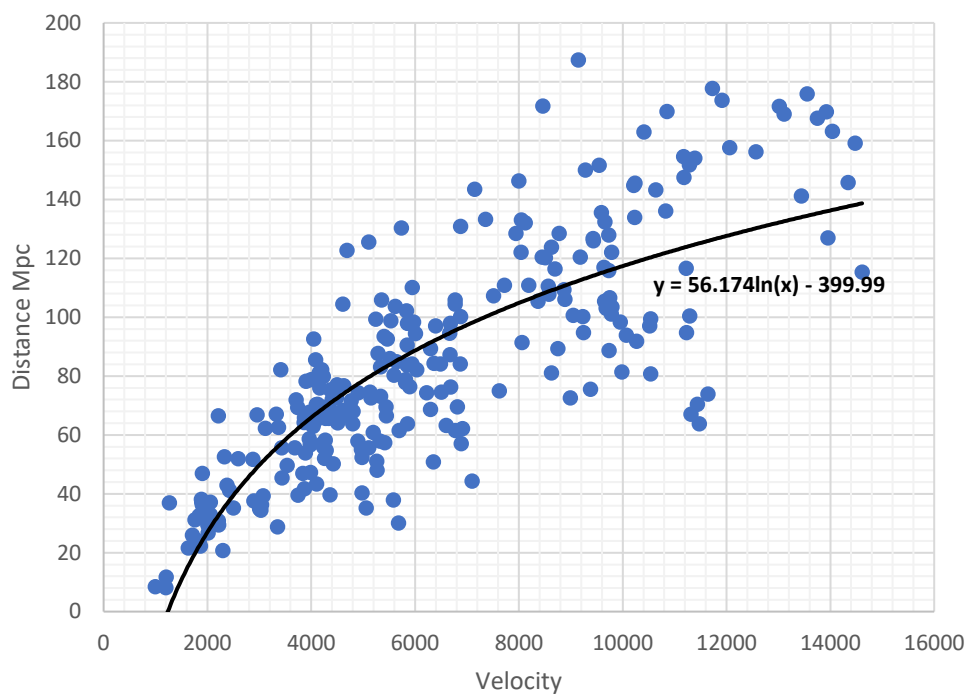
Plots 19 through 22 Displaying Samples at Ninety degrees to RA2-RA14 by Redshift and Velocity

Plots of samples at 90 degrees from the RA2->RA14 heading, RA8 and RA20, are presented below for comparison with the analysis of the R2-R14 changes in velocity.

The plots 19 and 20 from EDD data displaying the RA8 distance-velocity relation on redshift and velocity scales respectively, are found [here](#):

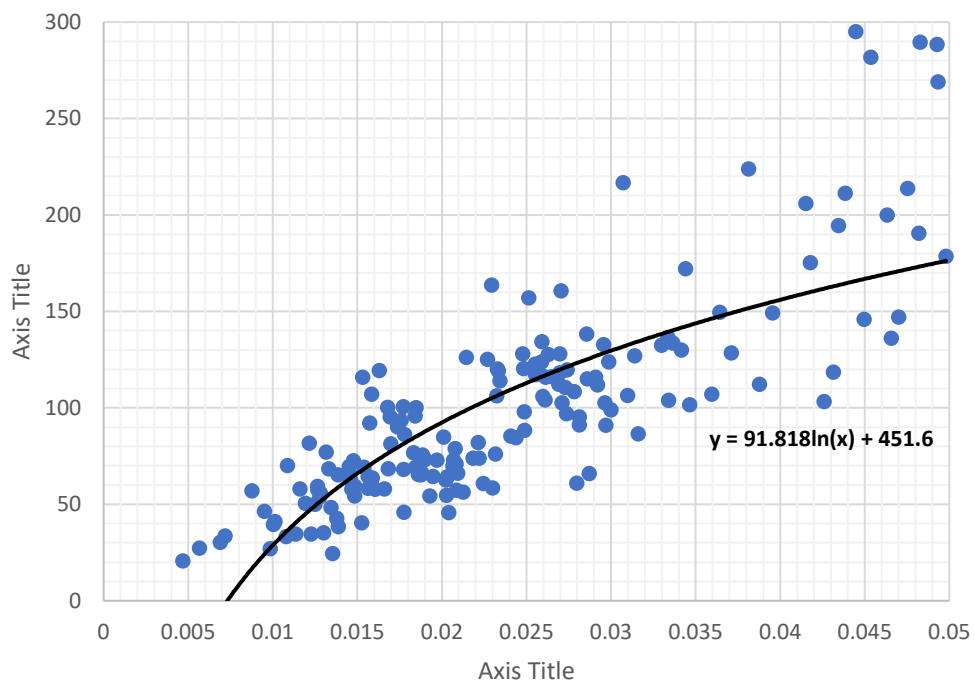


Plot 20: RA8 Distance vs Heliocentric Velocity

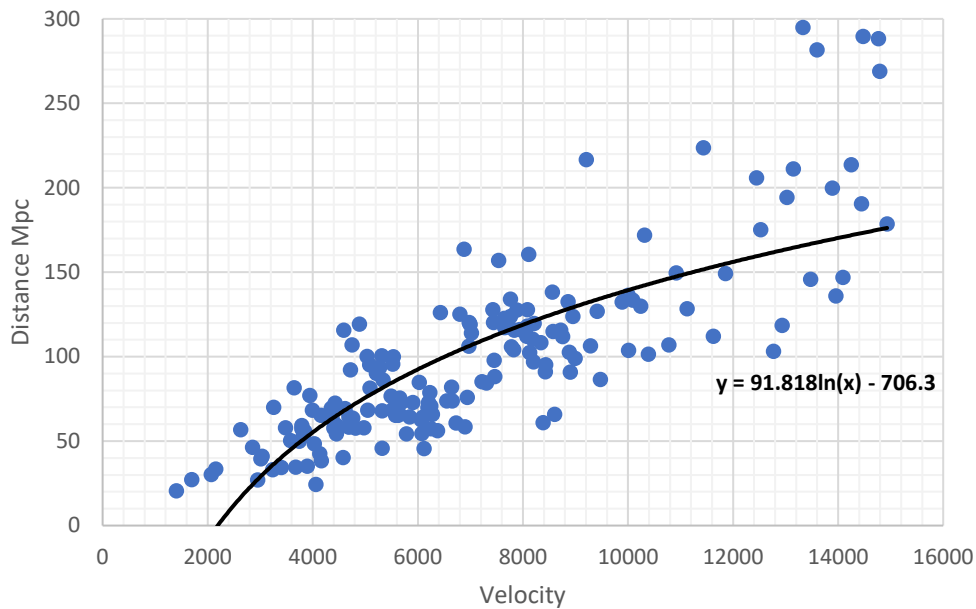


The plots 21 and 22 from EDD data displaying the RA20 distance-velocity relation on redshift and velocity scales respectively, are found [here](#):

Plot 21: RA20 Distance vs Heliocentric Redshift



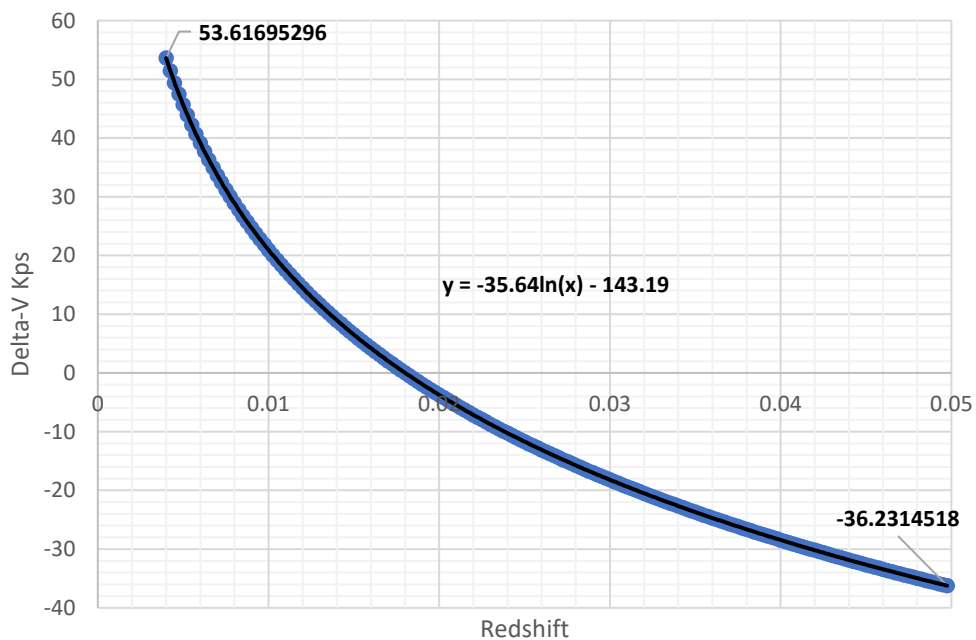
Plot 22: RA20 Distance vs Heliocentric Velocity



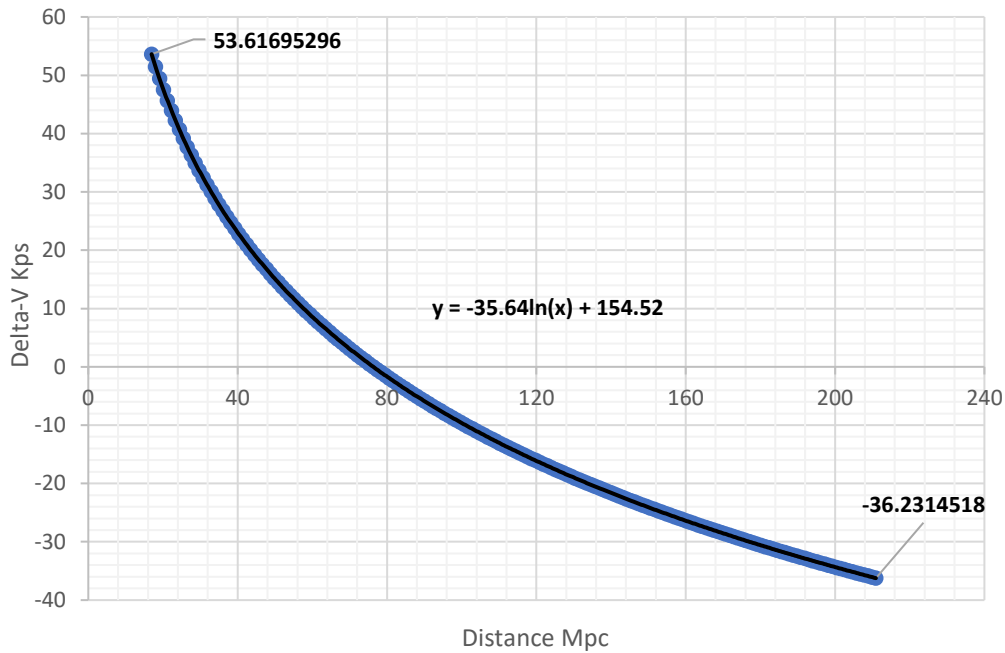
As with the RA2 and RA14 curves in the mean trendlines the RA8 and RA20 trendlines indicate a change in velocity over time in both cohorts, and the plots do not clearly display any difference between them as well. Plots 23, 24 and 25 display the RA8-RA20 differences in the distance-redshift and distance-velocity relations change from data found [here](#):

Plots 23 through 25: Plots Illustrating Heliocentric ΔV Changes by Redshift and Velocity

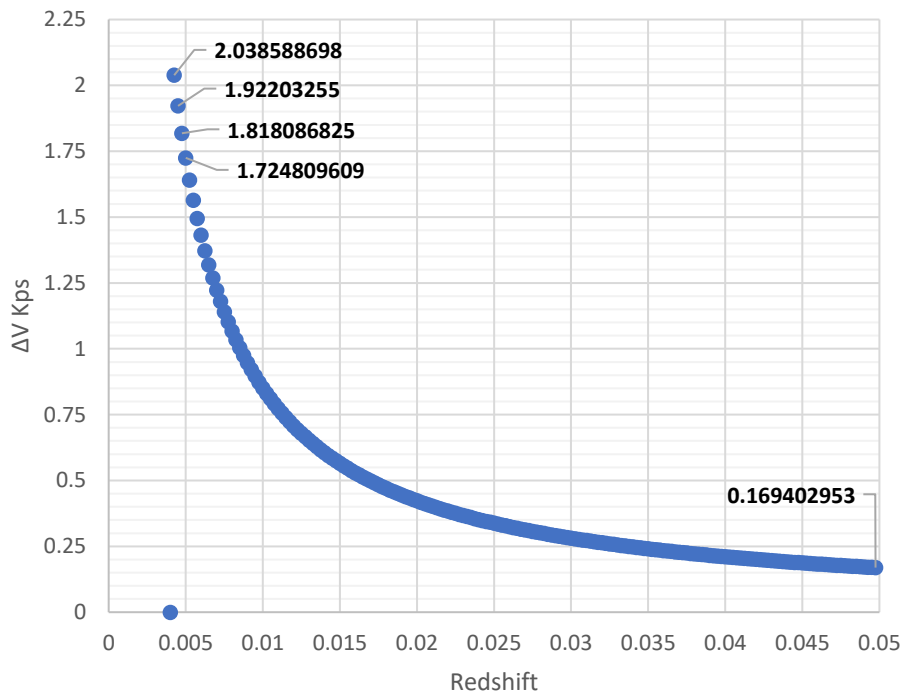
Plot 23: RA8-RA20 Heliocentric ΔV vs Redshift



Plot 24: RA8-20hel ΔV vs Distance Mpc



Plot 25: RA8_20hel ΔV Diff/MPC



Plot 25 displays the computed change in velocity of the milky way relative to objects in RA8 and RA20 during the last 480 million years. Unfortunately, neither of the cohorts contains any observations below redshift 0.004 which skews the trend to higher redshifts thus making direct comparison with the RA2-RA14 comparison difficult. However, these plots display changes in velocity quantitatively different from the RA2-14 cohort analysis. From peculiar velocity-corrected heliocentric velocity measurements this plot shows that during the most recent 3.26-million-year period that we can

measure, 58.9 million years ago, the velocity of the Milky Way in the direction of RA20 relative to RA8 increased by an average of 2.04 km/s every 3.26 million years, and increasingly less in the past.

4 Discussion

Our search of papers concerning dark energy and the Hubble tension provided no evidence that astrometric measurements of them did not implicitly assume that the local reference frame is inertial or sufficiently close to inertial that it can be ignored. While the purely statistical analysis that uses SNe 1a and EDD observations as a random population could not disprove that assumption, we believe that it does support a hypothesis to that effect.

4.1 Type 1a Supernova Data

If the SNe 1a sampled cohort means analysis data [here](#) is taken at face value then the local reference frame is currently accelerating at nearly 2.5kps/MPC on the RA 2-5, 14-17, vector. If the changes in velocity as shown in Plot 11 and Table 4 were due to a change in the isotropic increase of the cosmological constant, then the velocity changes between the same redshift values in Table 4, and the curves in the cohort means in Plot 11 should be nearly identical. However, the differences could be due to the uncorrected random variables affecting the measurements of apparent magnitude and peculiar motion.

4.2 EDD Data

The narrower RA2 and RA14 cohort means from EDD data yields a higher calculated acceleration of nearly 3.1kps/MPC the direction of RA14 and crucially away from RA2, contributing to the redshift of nearby objects with right ascensions of 2.0.0 to 2.9.99. As with the SNe 1a redshift/velocity curves, the EDD curves show an anisotropic change in velocities. The changes are presented in Plot 17 and the EDD data table for Plots 15 through 17 [here](#).

5 Conclusion

An acceleration of the local reference frame could be consequential to the finding of a recent acceleration of the expansion of spacetime if the data used in the Perlmutter and Reis papers contains a selection bias in favor of SNe 1a with RAs in the range 2..5. In fact, that is the case in the results from Perlmutter et al [1] and Reis et al [2]. Of the 60 SNe 1a in tables 1 & 2 in Perlmutter, 14 have right ascensions in the range 2..5, only 1 in the range 14..17. Of the 16 SNe 1a in Reis Table 1, fully half are in range 2..5, and none are from 14..17. Hypothetically, data from RA range 2..5 used in isolation under an assumption that the local reference frame is inertial would clearly present as an increase in λ . As only a substantial fraction of the data in the Perlmutter, and Reis studies, they would bias the results more subtly.

The analysis of the narrower RA2 and RA14 cohorts using EDD data confirmed the SNe 1a analysis of an anisotropic acceleration and yielded a higher acceleration of 3.09kps/MPC away from RA2 alone toward RA14. Though an acceleration of the local reference frame could also contribute to the Hubble tension this value is insufficient to account for all of it. However, if, as the analysis of the calculated means suggests, nearby objects display recent anisotropic changes in velocities relative to the local reference frame.

The analysis of the SNe 1a data is a relatively unsophisticated statistical analysis of raw, uncorrected SAI SNe 1a measurements. Though there is plenty of data, it is of unknown quality. Therefore, finding of recent acceleration could from the SNe 1a data be due to noise in the data. However, a similar analysis using a completely different dataset which contains heliocentric data with peculiar motion correction eliminated two potential sources of noise and yielded a finding in qualitative agreement with the SNe 1a analysis.

Therefore, if these findings are valid, one or more of the following must be true, and possibly consequential to the finding of a recent increase in the rate of expansion of spacetime:

1. The recent rate of expansion of spacetime near the local reference frame is not isotropic and/or

2. the nearby stars and galaxies in the cohort samples are not inertial and/or
3. the local reference frame is not inertial.

An acceleration of the local reference frame coupled with a very small data set and selection bias is a simpler explanation for the finding of acceleration of the expansion of spacetime than dark energy. We believe that acceleration of the local reference frame is most parsimonious explanation for the finding of a relatively recent increase in λ and is sufficiently credible to merit further investigation.

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Availability of data and materials

All data used in this paper is included in the numbered tables in the Research description and the [Data](#) section.

Author

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Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Conflict of Interest

The author declares that he has no conflict of interest.

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6. Data

6.1 SAI Type 1a Supernova Data and Derivatives

All data below is directly from or adapted from the SAI Supernova Catalog.

Legend for the header nomenclature of the following tables:

sn_dec - supernova declination in degrees, minutes, seconds/6
sn_mag - supernova apparent magnitude
sn_name - supernova name as recorded by the International Astronomical Union
sn_ra - supernova right ascension in hours, minutes, seconds, and seconds/100
sn_rs - supernova redshift

Plot 1: Ra 2..5 sn_mag-Redshift Relation

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec
2006rv	0.11	19.5	la	02 00 00.71	56 15.0
2004fz	0.017308	15.9	la	02 01 06.41	52 44.2
1998dj	0.013602	16	la	02 01 06.92	- 6 49 04.8
2006nl	0.19	21.8	la	02 01 44.71	- 1 01 56.7
2004dt	0.019707	15.9	la	02 02 12.77	- 0 05 51.5
2011gk	0.044077	18	la	02 02 19.02	39 39.6
2007jw	0.136953	21.6	la	02 02 32.74	- 1 05 21.0
2006nw	0.16	21.3	la	02 02 55.95	- 0 32 01.9
2005gt	0.279997	22	la:	02 04 03.84	- 0 21 57.0
2006tg	0.52	22.2	la	02 04 14.17	- 4 40 18.7
2006ef	0.017894	15.3	la	02 04 19.51	- 8 43 42.2
2007uq	0.4	23	la	02 04 21.31	- 3 54 10.9
2007td	0.3	23	la	02 04 26.90	- 3 44 18.9
2004ha	0.499999	23	la	02 04 27.00	- 4 52 46.0
2008er	0.016648	18.5	la	02 04 36.27	56 10.4
2002jr	0.4	22.7	la	02 04 41.03	- 5 09 40.7
2005fs	0.329998	21.7	la	02 04 52.97	- 0 19 35.2
2004hz	0.142998	20.1	la	02 05 03.00	0 50 11.9
2007mn	0.076999	21.9	la	02 05 03.96	0 10 28.4
2003R	0.668	22	la	02 05 11.27	- 4 42 30.0
2007tv	0.3	23	la	02 05 13.33	- 5 01 42.5
2007tw	0.6	23	la	02 05 32.97	- 5 02 46.6
2006tn	0.67	23.2	la	02 05 36.03	- 5 08 46.3
2003Q	0.21	20	la	02 05 47.55	- 4 52 48.0
2007ni	0.21	21.8	la	02 05 50.39	- 0 19 54.7
2006mi	0.7	23.4	la	02 05 55.04	- 4 00 53.2
2012U	0.019772	14.9	la	02 06 04.33	-55 11 37.5
2007tm	0.5	23	la	02 06 04.74	- 3 32 29.3
2007uh	0.6	23	la	02 06 05.20	- 4 01 37.5
2007tg	0.5	23	la	02 06 10.51	- 4 42 23.2

2004ee	0.020509	17.2	la	02 06 14.62	-37 20 05.4
2006sn	0.4	23	la	02 06 18.25	- 4 51 33.1
2004hh	0.199998	21.4	la	02 06 25.01	- 4 38 04.0
2007hx	0.08	19.5	la	02 06 27.08	- 0 53 58.3
2006sb	0.3	20.8	la	02 06 30.31	- 4 05 30.6
2007uf	0.5	23	la	02 06 30.88	- 4 09 55.0
2006sq	0.2	23.5	la	02 07 11.63	- 3 57 10.9
2007ul	0.6	23	la	02 07 16.54	- 4 42 23.2
2006ia	0.174964	21	la	02 07 19.18	1 15 07.5
2007ub	0.5	23	la	02 07 24.14	- 3 51 55.2
2002jc	0.499999	23.1	la	02 07 27.28	- 3 50 20.7
2012hq	0.09	18.4	la	02 07 30.50	06 19.3
2006to	0.68	23.2	la	02 07 34.39	- 4 00 04.2
2007pt	0.18	20.5	la	02 07 38.51	- 0 19 26.4
2006od	0.17	22.1	la	02 07 54.31	- 0 32 07.4
2003ji	0.199998	20.9	la	02 07 54.84	- 3 28 28.4
2004hb	0.699997	23.4	la	02 08 09.70	- 4 41 51.8
2006sf	0.6	22.5	la	02 08 11.65	- 3 51 40.2
2006lw	0.2	21.5	la	02 08 33.67	- 3 57 12.9
2004hi	0.399996	22.4	la	02 08 38.82	- 5 08 11.7
2007ur	0.3	23	la	02 08 41.59	- 3 34 10.6
2004hd	0.499999	22.5	la	02 08 48.21	- 4 26 10.4
2006mj	0.7	23.1	la	02 09 03.04	- 3 28 27.8
2006sh	0.3	23.2	la	02 09 11.06	- 3 44 42.0
2006tp	0.72	23.4	la	02 09 14.04	- 4 37 12.2
2003kn	0.199998	21.3	la	02 09 15.55	- 3 35 41.4
2009le	0.017791	16.1	la	02 09 17.14	-23 24 44.8
2003em	0.017791	17.2	la	02 09 20.23	-23 24 53.0
2007te	0.4	23	la	02 09 29.40	- 3 35 35.0
2007qd	0.04313	20.8	laPec	02 09 33.56	- 1 00 02.2
2004hs	0.399996	23.1	la	02 09 33.69	- 4 13 04.0
2004hp	0.499999	22	la	02 09 35.52	- 3 46 23.5
2007ug	0.7	23	la	02 09 36.85	- 4 51 52.2
2003kv	0.8	23.4	la	02 09 42.52	- 3 46 48.6
2005jp	0.209998	21.2	la	02 09 50.39	- 0 03 42.3
2006si	0.5	22.6	la	02 09 51.33	- 3 43 32.5
2000ea	0.42	23.3	la	02 09 54.02	- 5 28 17.8
2007up	0.6	23	la	02 09 56.07	- 4 28 57.4
2001ds	0.036435	16.2	la:	02 10 08.73	42 20.3
2007ti	0.5	23	la	02 10 09.84	- 4 39 49.3
2006sc	0.4	21.8	la	02 10 10.23	- 4 44 12.5
2007uc	0.6	23	la	02 10 15.53	- 4 04 06.5
2006ts	0.56	22.5	la	02 10 18.69	- 3 32 26.3
2003lh	0.499999	22.7	la	02 10 19.51	- 4 59 32.3
2006sj	0.7	23	la	02 10 22.42	- 3 33 09.3
2000eb	0.68	23.6	la	02 10 25.75	- 5 25 33.7

2006sk	0.3	21.6	la	02 10 33.80	- 4 04 03.9
2006tt	0.63	23.4	la	02 10 47.93	- 4 24 56.9
2003jy	0.3	22.7	la	02 10 53.98	- 4 25 49.8
2007th	0.5	23	la	02 10 57.57	- 5 00 24.9
2007tj	0.3	23	la	02 11 04.61	- 4 11 50.0
2003ko	0.4	21.7	la	02 11 06.48	- 3 47 56.1
2006kp	0.29	23.3	la:	02 11 11.66	0 41 45.0
2003lk	0.4	22.8	la	02 11 12.82	- 4 13 52.1
2006na	0.32	22	la	02 11 19.07	- 0 59 53.7
2000ec	0.469998	22.7	la	02 11 32.03	- 4 13 56.1
2007je	0.16	21.2	la	02 11 47.31	- 0 54 44.8
1996bj	0.570001	22.6	la	02 11 49.53	1 24 51.0
2001ec	0.045361	17.8	la	02 12 00.43	32 43.8
2009fu	0.017066	15.7	la	02 12 09.10	33 55.1
1996bf	0.249999	21.5	la	02 12 15.39	1 27 48.9
2005ml	0.12	19	la	02 14 04.42	- 0 14 21.1
2013et	0.057159	17.4	la	02 14 17.04	7 35 12.1
2006kw	0.19	21.2	la	02 14 57.98	0 36 09.0
2006ot	0.052939	17.4	la	02 15 04.84	-20 45 58.2
2007sc	0.27	22.1	la	02 15 11.87	0 32 09.3
2009ns	0.05	16.9	la	02 15 37.60	- 3 25 41.0
2004ih	0.153999	20	la	02 15 54.31	1 04 09.9
2006ri	0.09	19.6	la	02 15 57.44	-21 54 19.4
2002km	0.605999	23.9	la	02 16 23.93	- 4 49 29.4
2007pn	0.31	22.5	la:	02 16 33.90	- 0 43 20.5
2006lq	0.32	22.2	la	02 16 35.88	- 0 09 18.5
2002kn	1.03	25	la	02 16 45.71	- 5 09 51.2
2002ko	0.569997	23.4	la	02 17 00.05	- 4 58 19.6
2005ey	0.129999	19.5	la	02 17 05.50	0 16 49.0
2005jd	0.319998	21.6	la	02 17 06.20	0 32 05.4
2002kr	1.063	24.5	la	02 17 34.51	- 4 53 46.6
2004ia	0.143721	19.5	la	02 18 02.30	- 0 33 32.4
2010kq	0.026596	16.4	la	02 18 10.92	05 42.4
2005ge	0.189998	21.2	la:	02 18 14.72	0 47 47.6
2002hu	0.03	16.3	la	02 18 20.06	27 58.8
2006ka	0.25	21.9	la	02 18 26.68	0 13 36.0
2000dx	0.030345	16.3	la	02 18 26.88	5 39 02.0
2005dm	0.016838	17.5	laPec	02 18 39.25	- 6 54 10.8
2011hk	0.017554	15.6	laPec	02 18 45.79	- 6 38 30.6
2007J	0.016788	17.3	lbPec:	02 18 51.70	43 43.3
2005ie	0.279997	21.5	la	02 19 02.54	- 0 16 22.2
2007ps	0.25	21.8	la	02 19 13.53	- 0 23 05.4
2002iv	0.199998	20.9	la	02 19 16.11	- 7 44 06.7
2010be	0.183	20.2	la	02 19 46.55	- 3 12 10.5
2002ju	0.3	21.6	la	02 20 11.00	- 9 04 37.5
2002js	0.4	22.9	la	02 20 35.39	- 9 34 43.9

2006km	0.3	22	la	02 20 37.93	0 20 54.2
2007pe	0.3	21.8	la	02 21 04.01	0 29 47.1
2006sy	0.21	22.6	la	02 21 05.20	0 49 42.2
2009kv	0.32	21.2	la	02 21 06.60	- 5 01 23.8
2009kx	0.23	21	la	02 21 13.75	- 3 54 35.8
2007rl	0.33	22.5	la	02 21 33.07	- 0 22 29.7
2007rm	0.3	22.7	la	02 21 45.09	0 51 52.1
2013A	0.033805	16.5	la	02 22 04.27	13 57.7
2006ra	0.13	19.8	la	02 22 24.92	5 22 01.3
2009kz	0.27	21	la	02 22 40.07	- 4 01 38.3
2013fb	0.016939	15.9	la	02 22 42.07	16 01.0
2006ce	0.005026	12.4	la	02 22 54.63	-21 14 29.4
2007jr	0.09	18.8	la	02 22 57.28	1 01 32.7
2011H	0.021331	15.6	la	02 23 06.02	02 32.4
2006jw	0.25	22.5	la:	02 23 22.30	0 49 08.4
2010L	0.07	18.5	la	02 23 28.78	5 35 30.6
2007ou	0.113228	22.5	la	02 23 42.69	- 0 49 33.6
2012ie	0.048	18	la	02 24 22.35	51 03.2
2005ky	0.147999	21	la	02 24 36.25	- 4 10 54.9
2011ik	0.033758	17.2	la	02 25 04.09	12 51.9
2001kh	0.219998	21	la	02 25 15.56	- 5 23 20.0
2006rr	0.13	19.7	la	02 25 28.59	7 17 02.5
2008hs	0.017413	17.3	la	02 25 29.62	50 35.1
2007ng	0.4	23.2	la	02 25 38.10	0 42 34.5
2006em	0.018866	17.4	laPec	02 25 44.30	56 31.8
2011ek	0.005031	16.1	la	02 25 48.89	31 59.8
2002eh	0.017974	16.4	la	02 26 08.45	54 45.2
2007E	0.022962	15.9	la	02 26 34.41	-15 50 36.5
2001il	0.208	20.4	la	02 26 41.35	- 0 57 31.7
2006nb	0.21	22.8	la	02 26 53.40	- 0 19 40.1
2010gy	0.06	18.4	la	02 27 12.04	- 4 32 04.9
2002gr	0.089998	21.8	la	02 27 13.22	0 53 57.8
2006pt	0.3	22.1	la	02 27 16.17	- 0 23 36.5
2000ee	0.469998	22.6	la	02 27 34.53	1 11 49.4
2003gs	0.004478	13.4	laPec	02 27 38.36	- 1 09 35.4
2005eu	0.034897	17.6	la	02 27 43.26	10 36.6
2008id	0.26	20.8	la	02 27 46.80	- 4 34 47.1
2003li	0.499999	22.8	la	02 27 47.29	- 7 33 46.2
2001ga	0.129999	19.5	la	02 27 51.76	0 37 20.9
2007us	0.6	23	la	02 27 54.87	- 8 00 55.2
1999fh	0.359999	22.4	la	02 27 58.33	0 39 36.8
2004hm	0.199998	21.5	la	02 28 03.11	- 7 42 29.7
1999fi	0.779999	24.1	la	02 28 11.67	0 43 39.3
1999fj	0.81	23.5	la	02 28 23.72	0 39 09.6
2007ok	0.17	21.3	la	02 28 24.27	0 11 04.8
2009kt	0.27	21.5	la	02 28 28.37	- 4 04 44.1

2003jl	0.4	22.4	la	02 28 28.56	- 8 08 44.7
2006tr	0.58	23.2	la	02 28 29.54	- 7 53 28.5
2007jt	0.14	20.4	la	02 28 32.78	- 1 02 31.6
2007tx	0.7	23	la	02 28 33.31	- 8 35 25.7
2007ty	0.5	23	la	02 28 34.38	- 8 23 49.5
2004fr	0.199998	22.2	la	02 28 43.77	- 8 54 24.0
2003jm	0.499999	22.9	la	02 28 50.93	- 9 09 58.1
1999fk	1.05	24.3	la	02 28 53.88	1 16 24.2
2001if	0.037637	17.2	la	02 28 54.93	05 52.7
2001jh	0.880609	23.1	la	02 29 00.29	0 20 44.2
2000ga	0.140714	20	la	02 29 03.73	- 8 24 13.7
2003jn	0.299997	20.8	la	02 29 21.21	- 9 02 15.6
2007tq	0.1	23	la	02 29 23.34	- 7 52 27.7
2004hj	0.399996	21.5	la	02 29 41.93	- 8 43 49.4
2007to	0.6	23	la	02 29 42.06	- 9 02 05.2
2004he	0.599998	23	la	02 29 48.79	- 8 20 45.9
2003js	0.4	22	la	02 29 52.15	- 8 32 28.1
2006tu	0.44	22.2	la	02 29 56.54	- 7 59 50.8
2002jw	0.4	22.8	la	02 30 00.52	- 8 36 22.4
2007tz	0.5	23	la	02 30 07.15	- 8 43 09.3
2003km	0.3	21.8	la	02 30 09.00	- 9 04 35.9
2007uw	0.4	23	la	02 30 09.80	- 7 40 49.1
2006lx	0.3	22.3	la	02 30 10.38	- 8 06 54.0
2007ud	0.6	23	la	02 30 13.15	- 9 15 39.5
2006mk	0.3	22.4	la	02 30 16.91	- 8 40 47.3
2004hq	0.699997	23.1	la	02 30 18.04	- 8 22 25.0
2000eg	0.54	22.5	la	02 30 21.05	1 03 48.5
2007ut	0.4	23	la	02 30 23.64	- 9 12 20.0
2007tp	0.5	23	la	02 30 23.94	- 9 13 39.9
2007tk	0.3	23	la	02 30 24.61	- 8 17 54.4
1999fm	0.93	23.6	la	02 30 35.62	1 09 43.3
2006mf	0.2	20.9	la	02 30 37.32	- 7 57 04.4
2002iy	0.499999	21.3	la	02 30 40.00	- 8 11 40.5
2005A	0.019138	17.1	la	02 30 43.25	- 2 56 19.8
2012fk	0.035	16.7	la	02 30 52.04	28 45.9
2006mb	0.3	21.6	la	02 30 54.30	- 8 57 42.1
2006mv	0.17	21.9	la	02 30 55.46	0 56 46.7
2003kp	0.600001	22.1	la	02 31 02.64	- 8 39 50.8
2003kq	0.600001	22.6	la	02 31 04.09	- 8 10 56.6
2005ev	0.0154	16	la	02 31 04.93	42 06.5
2003jw	0.3	22.6	la	02 31 06.84	- 8 45 36.5
2004fs	0.499999	22.6	la	02 31 19.95	- 8 49 21.7
2002iz	0.399996	22.1	la	02 31 20.73	- 8 36 13.1
2003kr	0.399996	22	la	02 31 20.96	- 8 36 14.2
2003ks	0.499999	22.2	la	02 31 34.54	- 8 36 46.4
2006mg	0.4	21.9	la	02 31 37.75	- 8 06 40.2

1999gp	0.026744	16.1	la	02 31 39.15	22 52.3
2002gx	0.079998	19	la	02 31 44.69	16 39.5
2003jt	0.4	22	la	02 31 54.60	- 8 35 48.4
2004hf	0.399996	22	la	02 32 00.14	- 8 42 23.8
2009hn	0.021855	17.5	la	02 32 00.31	1 14 53.5
2006mc	0.4	22.3	la	02 32 02.61	- 9 07 21.2
2006sl	0.4	22.3	la	02 32 15.95	- 8 48 34.3
2006pa	0.25	22	la:	02 32 23.95	- 0 42 48.9
2010A	0.020334	15.8	la	02 32 39.46	0 37 10.2
1999es	0.069998	18.5	la	02 32 43.40	27 08.0
2007uj	0.3	23	la	02 33 19.03	- 8 32 30.2
2012E	0.020384	15.5	la	02 33 22.81	9 35 05.9
2012hm	0.036248	17.8	la	02 33 23.32	40 16.9
2006sm	0.6	22.6	la	02 33 29.49	- 8 30 11.9
2004ft	0.499999	22.4	la	02 33 32.63	- 8 09 34.1
2007ir	0.035304	17.4	la	02 33 41.90	40 08.2
2003kt	0.600001	22.8	la	02 33 47.01	- 8 36 22.1
2006so	0.1	21.5	la	02 33 49.16	- 8 59 15.8
2005gv	0.359999	22.2	la	02 33 54.13	0 16 50.6
1999ff	0.460001	23.1	la	02 33 54.39	0 32 55.6
2002fi	0.057164	18.3	la	02 33 54.40	-21 02 29.4
1999dq	0.014329	14.7	laPec	02 33 59.68	58 30.4
2008fk	0.072	18.4	la	02 34 05.06	1 23 42.5
1997dp	0.01496	17.8	la	02 34 06.48	56 13.4
2008J	0.015941	15.4	lInPec	02 34 24.20	-10 50 38.5
2002jf	0.078997	17.8	la	02 34 35.43	17 25.4
2006ly	0.3	21.9	la	02 34 42.38	- 8 30 39.9
2004hg	0.599998	22.7	la	02 34 55.19	- 8 30 43.6
2007ui	0.4	23	la	02 34 57.12	- 8 04 00.2
2005je	0.093939	19	la:	02 35 26.62	1 04 29.6
2006tv	0.76	23.5	la	02 35 34.23	- 8 34 22.0
2003ll	0.600001	23.2	la	02 35 41.19	- 8 06 29.6
2006hs	0.259999	22.4	la	02 36 04.86	- 0 59 39.0
2007ns	0.37	22.5	la	02 37 02.97	- 0 51 59.8
2007hf	0.051432	18.6	la	02 37 28.26	-23 32 04.7
2001eu	0.135093	19.4	la	02 37 58.80	- 1 01 40.1
2009ig	0.008773	14	la	02 38 11.61	- 1 18 45.1
2006lr	0.26	21.9	la	02 38 52.96	0 05 24.3
1994am	0.372	21.7	la	02 40 02.06	- 1 37 14.9
1994H	0.373998	21.9	la	02 40 04.73	- 1 34 06.6
1999eo	0.079998	19.6	la	02 40 13.20	4 54 53.3
2002gt	0.369999	21.7	la	02 40 29.78	- 0 22 46.0
2006nh	0.37	23	la	02 40 50.57	0 39 31.6
2005hi	0.074998	18.9	la	02 41 00.24	42 38.2
2007no	0.135	20.5	la	02 41 05.70	- 3 38 14.1
2007ov	0.32	22.3	la	02 41 08.76	0 08 40.0

2005lq	0.369999	22.3	la	02 41 36.04	0 12 18.1
2013ae	0.028	16.2	la	02 41 53.16	23 58.8
2005ft	0.159997	20.5	la	02 42 04.98	- 0 32 26.9
2006hh	0.239999	21.9	la	02 42 26.97	- 0 47 38.9
2007qq	0.24	23	la	02 42 30.21	- 0 58 16.1
2012hh	0.031185	16.7	la	02 42 39.56	31 54.6
2004fd	0.017323	15.7	la	02 43 15.25	25 25.6
2007kl	0.26	21.9	la	02 44 50.90	0 21 53.4
2005mh	0.39	22.4	la:	02 44 56.68	0 12 12.9
2009l	0.026177	16.4	la	02 45 10.40	- 4 42 49.4
2002go	0.235999	21.3	la	02 45 43.16	- 0 37 44.7
1995ak	0.02272	16.2	la	02 45 48.83	3 13 50.1
2006fj	0.189998	20.3	la	02 47 08.67	0 46 30.5
2007so	0.02983	17	la	02 47 43.13	15 14.8
2006gx	0.179997	21.2	la	02 48 14.08	- 0 20 49.3
2007km	0.25	21.1	la	02 48 20.07	- 0 17 17.3
2010kj	0.064	18	la	02 48 37.15	7 24 10.8
2011iq	0.015	18.3	la	02 48 49.60	- 8 04 30.0
2003hm	0.013915	17.7	la	02 48 58.39	3 10 07.6
2010he	0.028412	16.8	la	02 49 10.80	-14 26 59.8
2013l	0.035214	17.8	la	02 49 42.17	0 45 35.7
2003iv	0.034372	17.1	la	02 50 07.25	50 46.5
2012gz	0.03	17.2	la	02 50 17.61	24 39.9
2007nh	0.27	21.8	la	02 50 27.69	- 0 33 04.2
2005fu	0.199998	20.6	la	02 50 32.09	0 48 28.1
2005jt	0.359999	23.1	la	02 50 40.16	- 0 03 57.5
2007he	0.12	19.8	la	02 51 40.17	-12 39 31.5
2008ey	0.018084	18.1	la	02 51 42.39	49 51.5
2007nj	0.15	21.9	la	02 52 27.45	0 15 06.6
2007qr	0.136027	20.5	la	02 52 29.23	- 1 08 22.3
2000dp	0.034523	16.8	la	02 52 44.41	-14 31 54.7
2006nt	0.28	22	la	02 53 58.91	0 59 13.1
2010lp	0.01014	16.7	laPec	02 54 03.50	2 57 43.4
2005ls	0.021136	15.8	la	02 54 15.97	43 29.8
2006os	0.03281	17.2	la	02 55 01.01	00 34.8
2007jk	0.18	21.9	la	02 55 05.64	- 0 08 50.8
2006pz	0.33	22.7	la	02 55 08.24	0 14 05.2
2012fx	0.017652	16.7	laPec	02 55 41.24	-27 25 26.7
2004go	0.02903	16.5	la	02 55 41.76	-14 14 14.5
2012fl	0.086	19.2	la	02 56 04.38	0 56 01.0
2006nk	0.2	21.7	la	02 56 16.61	- 0 24 38.8
2009mm	0.17	20.6	la	02 56 23.61	40 31.6
2005et	0.034377	17.9	la	02 56 30.53	56 12.8
1994ah	0.021664	18	la	02 56 37.75	-33 54 43.6
2011hh	0.015	16.9	la	02 57 04.61	47 43.3
1996bb	0.56	23.6	la:	02 57 06.06	- 2 42 17.4

2008ih	0.072	18.58	la	02 57 26.41	58 07.6
1995ao	0.240166	21.5	la	02 57 30.70	- 1 41 19.8
2011id	0.0631	18	la	02 57 40.49	-51 02 28.1
2009iv	0.0226	17.6	la	02 58 14.19	5 58 19.3
2009hp	0.021016	16.7	la	02 58 23.96	6 35 35.1
2012l	0.029	16.2	la	02 58 27.83	6 11 25.3
1998fc	0.107	20.5	la	02 59 12.61	3 29 39.0
2007jd	0.072633	22.5	la	02 59 53.37	1 09 38.6
2011el	0.048	17.6	la	03 00 18.20	5 49 24.9
2003kd	0.030187	16.7	la	03 00 45.80	27 13.0
2001dw	0.02544	16.6	la	03 00 47.88	46 27.5
2003ls	0.0434	16.5	la	03 01 00.39	-10 53 04.5
2006qa	0.4	23	la	03 01 09.73	- 0 01 34.5
2005gj	0.059998	17.2	laPec	03 01 11.95	- 0 33 13.9
2005fb	0.159997	20.6	la	03 01 17.54	- 0 38 38.6
2005do	0.030471	17.4	la	03 02 00.42	34 34.2
1993ab	0.013931	18	la:	03 02 01.45	34 53.5
2013hk	0.017135	15.9	la	03 02 10.85	55 38.8
2008fu	0.052406	17.4	la	03 02 28.50	-24 27 21.5
1999fc	0.649999	24.8	la	03 02 30.41	0 10 14.0
2009km	0.018346	15.6	la	03 02 59.01	-14 49 01.9
1999fd	0.879998	25.3	la:	03 03 17.49	0 03 06.6
2014dd	0.023244	17.5	la	03 03 36.18	56 52.0
2013fe	0.02032	14.4	la	03 03 53.27	-39 24 20.3
2008R	0.013512	14.6	la	03 03 53.72	-11 59 39.3
2003hv	0.005619	12.5	la	03 04 09.32	-26 05 07.5
2005ij	0.109999	20.1	la	03 04 21.26	- 1 03 46.6
2010ly	0.04	17.9	la	03 05 03.56	-19 40 38.8
1992bc	0.020163	15.2	la	03 05 17.28	-39 33 39.7
2005fv	0.118411	19.8	la	03 05 22.43	0 51 30.1
2003V	0.044997	18.2	la	03 05 43.05	- 1 24 12.8
1994al	0.42	22.6	la	03 06 22.45	18 33.7
2007mg	0.16	21.1	la	03 06 33.83	0 47 35.9
2006np	0.107344	21	la	03 06 39.48	0 03 50.5
2007nt	0.21	22.1	la	03 06 43.80	- 0 45 14.5
2004il	0.107207	19.5	la	03 07 02.69	- 0 00 40.1
2005ez	0.129999	20.3	la:	03 07 10.97	1 07 10.3
1997ee	0.166114	20.5	la	03 07 24.82	- 3 10 26.7
2006tc	0.21	22.3	la	03 08 01.96	0 56 36.4
2000fs	0.02884	18.7	la	03 08 26.24	4 06 39.9
2014de	0.05	17.2	la	03 08 31.86	25 30.2
2006qw	0.03	17.9	la	03 08 46.88	56 26.0
2005eq	0.029026	17.2	laPec	03 08 49.31	- 7 01 59.7
2001kl	0.126202	20.4	la	03 08 51.44	- 1 10 24.1
2007hd	0.09	18.9	la	03 08 56.43	-11 16 22.6
2009bt	0.014263	16.9	la	03 08 56.99	33 35.1

2009aq	0.031	16.8	la	03 09 19.79	05 05.3
2013gv	0.03412	17.76	la	03 09 57.30	12 48.3
2008gy	0.029	16.8	la	03 10 00.95	13 23.1
2007pp	0.26	22.2	la	03 11 01.16	0 21 24.3
2007qs	0.29	21.5	la	03 11 46.03	0 05 30.9
2007nu	0.28	21.8	la	03 11 50.18	- 0 41 32.7
1996bc	0.460001	22.5	la	03 12 06.58	0 38 17.1
2011ag	0.032343	17.3	la	03 12 26.55	15 06.4
1995ap	0.300207	21.5	la	03 12 28.13	0 41 43.4
1996au	0.519999	22.5	la	03 12 47.79	0 45 11.9
2006hw	0.139996	22.5	la	03 13 03.44	- 0 28 17.9
2012eu	0.029937	17.3	la	03 13 04.16	- 8 23 31.7
2007lm	0.21	21.4	la	03 13 40.44	0 37 47.9
2012ic	0.040898	17.1	la	03 13 53.71	58 03.7
2013hi	0.025367	16.2	la	03 14 24.72	10 49.1
2007mh	0.13	19.9	la	03 14 31.77	0 16 11.4
2007kh	0.05	18.1	la	03 15 12.10	10 13.0
2006ib	0.179997	22.1	la	03 16 11.83	- 0 36 03.4
2007gn	0.03	18.3	la	03 16 31.37	27 40.7
2006dr	0.015124	16.1	la	03 17 14.19	-32 34 31.8
2008L	0.019483	17.8	la	03 17 16.65	22 57.6
2005hr	0.119999	19.5	la	03 18 33.83	0 07 24.1
2008fg	0.010884	17	la	03 18 44.10	28 57.2
2006P	0.015364	17.4	la:	03 19 17.90	-12 06 18.3
2006lb	0.18	20.9	la	03 19 28.19	- 0 19 04.9
2005mz	0.017678	18	laPec	03 19 49.88	30 18.6
2003if	0.00566	17.6	la	03 19 52.61	-26 03 50.5
2008fh	0.01	17.1	lb:	03 20 18.62	21 44.5
2005fy	0.199998	20.9	la	03 20 21.70	- 0 53 08.0
1991bc	0.021351	16	la	03 20 45.66	- 1 02 47.2
2011fw	0.016896	17.2	la	03 20 54.21	52 05.0
2007nk	0.22	21.5	la	03 20 56.52	1 03 29.3
1998dz	0.089998	18.5	la	03 20 58.18	-41 05 22.8
2011iz	0.038	17.2	la	03 21 36.48	33 46.1
2012Z	0.007127	15.6	laPec	03 22 05.35	-15 23 15.6
2002fk	0.007127	13.1	la	03 22 05.71	-15 24 03.2
2006dd	0.005922	14	la	03 22 41.62	-37 12 13.0
2006mr	0.005922	15.14	la	03 22 42.84	-37 12 28.5
2008gp	0.033523	18.1	la	03 23 00.73	1 21 42.8
2007mi	0.13	19.9	la	03 23 31.52	0 40 00.0
2002es	0.017992	16	laPec	03 23 47.23	33 53.5
2006kj	0.21	20.9	la:	03 24 32.81	1 01 20.5
1994aa	0.009059	17	la	03 24 49.40	- 3 02 33.6
2006mw	0.12	22.1	la:	03 25 08.47	- 0 02 26.1
2007nz	0.47	22.8	la:	03 25 11.35	- 0 06 22.5
2007ry	0.048	17.9	la	03 25 43.16	14 41.6

2010ka	0.166	19.3	la	03 26 01.99	- 0 49 48.0
2013gp	0.233872	21.6	la	03 26 55.51	-28 46 45.8
2008hm	0.019664	17.2	la	03 27 10.90	56 39.6
2006pg	0.32	22.1	la	03 27 20.71	1 05 22.8
2013go	0.076	20.4	laPec	03 27 44.64	-28 29 13.6
2006qb	0.33	22.3	la	03 28 14.65	- 0 12 03.5
2005jo	0.229999	21.3	la	03 28 21.68	- 0 19 33.9
1997cu	0.062289	18.2	la	03 29 03.00	-52 41 41.1
2005hs	0.299997	21.8	la	03 29 22.06	- 1 05 40.9
2007qt	0.31	22.7	la	03 29 25.41	- 0 38 46.7
1992bs	0.063377	18.3	la	03 29 27.20	-37 16 18.9
2007py	0.21	22.4	la	03 29 31.60	0 30 56.0
2011gy	0.016881	15.4	la	03 29 35.30	52 03.3
2010ip	0.052	17.6	la	03 29 48.50	6 32 55.3
2006ta	0.29	22	la	03 29 50.42	0 17 42.3
2007jg	0.037131	18.4	la	03 29 50.82	0 03 24.6
2009ku	0.08	19.9	laPec	03 29 53.23	-28 05 12.2
2005if	0.067088	18.8	la	03 30 12.87	- 0 58 28.5
2007pz	0.13	20.9	la	03 30 25.18	1 00 33.9
2005fw	0.159997	19.9	la	03 30 49.04	- 1 14 17.1
2001ip	0.54	23.8	la	03 31 13.03	-27 50 55.5
1993Y	0.020009	17.1	la	03 31 24.41	45 02.6
2012gv	0.57	23.3	la	03 31 37.09	-27 21 18.1
2006lk	0.31	23.1	la	03 32 04.60	- 0 06 00.6
2002fx	1.4	26.41	la	03 32 06.80	-27 44 34.4
HST04Mcg	1.37	25.9	la	03 32 10.02	-27 49 50.0
1999gt	0.273999	22.1	la	03 32 10.28	-28 06 16.0
HST04Rak	0.74	24.1	la	03 32 18.15	-27 44 10.6
HST04Gre	1.14	25.1	la	03 32 21.49	-27 46 58.3
2002kd	0.735	24.86	la	03 32 22.34	-27 44 26.9
2002hr	0.526	24.07	la	03 32 22.57	-27 41 52.2
2002hp	1.305	25.8	la	03 32 24.79	-27 46 17.8
HST04Omb	0.975	24.7	la	03 32 25.34	-27 45 03.0
2012fq	0.67	22.6	la	03 32 32.90	-27 51 21.1
2002kc	0.216	23.06	la	03 32 34.72	-27 39 58.3
HST04Kur	0.359	24	la	03 32 36.03	-27 51 17.7
2002fw	1.3	25.63	la	03 32 37.52	-27 46 46.6
2003aj	1.307	26.62	la	03 32 44.33	-27 55 06.4
HST05Zwi	0.521	23	la	03 32 45.65	-27 44 24.3
2003ak	1.551	26.3	la	03 32 46.90	-27 54 49.3
2012gt	0.491	23.3	la	03 33 08.76	-28 05 04.2
2009im	0.013164	15.1	la	03 33 22.08	- 4 59 56.8
2012fr	0.005462	13.78	la	03 33 36.23	-36 07 35.4
2012gs	0.525	22.5	la	03 33 38.18	-27 20 20.8
2005jf	0.299997	21.8	la:	03 33 40.76	- 0 06 43.5

2005gq	0.369999	22.6	la	03 33 48.97	0 42 33.6
2006hu	0.139996	22	la	03 34 22.72	- 1 07 23.5
2009ky	0.26	20.8	la	03 34 28.80	-27 54 30.3
2007mj	0.12	20.4	la	03 34 44.44	0 21 19.9
2012fa	0.4	23.4	laPec	03 34 59.02	-27 51 55.4
2005ke	0.004879	16.3	la	03 35 04.35	-24 56 38.8
2012ez	0.348	23.2	la	03 35 16.37	-27 29 49.2
2013S	0.018576	15.9	la	03 35 30.29	16 59.3
2007po	0.29	22.1	la	03 35 32.23	0 42 12.1
2003in	0.021331	17.7	la	03 35 33.31	5 03 52.7
2007jh	0.040769	19.2	la	03 36 01.54	1 06 12.2
2010kf	0.040769	17.5	la	03 36 03.53	1 06 04.0
1992A	0.006152	12.6	la	03 36 27.43	-34 57 31.5
2005gr	0.239999	21	la	03 36 37.49	1 04 45.0
1992bp	0.079001	18.5	la	03 36 37.95	-18 21 13.7
2014H	0.015	16.3	la	03 37 01.41	05 01.0
2011dx	0.013854	16.5	laPec	03 37 05.61	- 5 01 56.3
2006jq	0.13	22.7	la	03 37 06.50	0 00 33.7
2010jd	0.039033	17.4	la	03 37 22.20	-33 02 39.7
1990Y	0.039033	17.7	la	03 37 22.64	-33 02 40.1
2010hk	0.032102	17.6	la	03 37 52.61	4 56 52.2
2006rw	0.08	19.4	la	03 38 09.57	2 26 05.6
2009kw	0.24	21.3	la	03 38 23.39	-28 15 11.8
2006pv	0.21	21.4	la	03 38 29.47	- 0 40 32.1
2007on	0.006338	14.9	la	03 38 50.90	-35 34 30.0
2011iv	0.006338	12.4	la	03 38 51.34	-35 35 31.8
2005ew	0.002998	15.1	la	03 39 23.74	02 49.0
2007hy	0.19	20.9	la	03 39 42.33	1 05 32.2
2006jr	0.18	22.5	la	03 39 47.15	0 59 34.2
2007ln	0.09	21.8	la:	03 40 43.21	1 00 11.0
2010jf	0.023949	17.7	laPec	03 40 43.47	1 03 34.0
2013D	0.027119	17.5	laPec	03 41 15.13	23 03.9
1991bj	0.018132	18.8	la	03 41 30.48	- 4 39 49.6
2010ey	0.004906	16.8	la	03 41 31.50	-19 54 00.4
2006kf	0.021251	17.4	la	03 41 50.48	8 09 25.0
2010it	0.013754	15.9	la	03 41 57.50	- 4 42 21.1
2005gp	0.129999	20.2	la	03 41 59.29	- 0 46 57.6
2006kx	0.16	21.1	la	03 42 14.67	0 28 41.8
2013gy	0.014069	17.9	la	03 42 16.88	- 4 43 18.5
2007rk	0.2	22.2	la	03 42 17.43	1 03 47.3
2007kk	0.041027	17.6	la	03 42 23.26	14 30.4
2006es	0.041027	17	la	03 42 24.48	14 31.0
1992bk	0.058413	18.1	la	03 43 01.90	-53 37 56.8
2007ia	0.13099	20	la	03 43 10.06	0 06 08.9
2001el	0.003902	12.7	la	03 44 30.59	-44 38 23.6
2003lb	0.018105	15.8	la	03 45 05.67	45 39.3

2008hy	0.008538	14.3	la	03 45 08.45	39 55.5
2006tb	0.3	22.3	la	03 45 15.49	- 0 07 42.8
2010jm	0.022362	17.4	la	03 46 03.55	42 15.5
2006rz	0.03092	20	la	03 46 06.78	0 23 23.1
2014dg	0.004005	14.9	la	03 48 19.88	07 54.2
2006pn	0.13	21.6	la	03 49 02.85	- 0 31 58.0
2005mo	0.28	22.2	la	03 50 12.90	- 0 14 24.8
2006ro	0.11	19.8	la	03 51 16.85	50 05.4
2012B	0.017341	16.4	la	03 51 34.52	04 42.9
1990ac	0.063377	18	la	03 53 09.26	-29 44 37.8
2010kk	0.213	20.2	la	03 53 23.23	9 54 33.3
1991bb	0.026563	17.7	la	03 53 37.51	06 19.3
2012hp	0.019456	16	la	03 54 17.37	30 38.7
2009D	0.025053	16.5	la	03 54 22.83	-19 10 54.2
2010ia	0.017909	17.3	la	03 56 56.20	8 30 45.1
2011ha	0.094	18.5	la	03 57 40.87	09 55.2
1996bx	0.060001	18.3	la	03 59 16.45	-53 22 26.3
1991bd	0.012731	17	la	04 02 49.66	1 58 26.3
2010iv	0.074	17.4	la	04 03 52.23	-43 25 38.5
2012en	0.017295	17.8	la	04 07 25.20	1 45 32.9
2003ay	0.073	19.1	la	04 07 26.25	07 55.4
2014dm	0.033116	16.55	la	04 08 07.13	- 8 49 37.0
2008ge	0.003502	12.4	laPec	04 08 24.68	-47 53 47.4
2007hg	0.03	18	la	04 08 32.65	2 22 43.7
2006ig	0.039997	19.2	la	04 10 21.09	28 24.4
2005hh	0.064998	19.3	la	04 13 05.51	-25 04 00.5
2011U	0.01335	16.6	la	04 13 33.94	32 36.7
1999fn	0.469998	23.5	la	04 14 03.88	4 17 55.0
1999fo	1.07	24	la	04 14 45.75	6 38 34.3
2000eh	0.489998	22.4	la	04 15 02.44	4 23 18.1
2004ea	0.006517	18.2	la	04 16 13.20	-16 45 20.5
2009ab	0.011171	16.5	la	04 16 36.39	2 45 51.0
2005df	0.004319	12.5	la	04 17 37.85	-62 46 09.5
1997ej	0.022302	16.5	la	04 17 53.49	-56 36 58.2
2014dn	0.022302	17.1	laPec	04 17 54.28	-56 36 45.2
2010el	0.005004	16.5	laPec	04 19 58.83	-54 56 38.5
2011gs	0.027	17.4	la	04 21 09.99	28 04.4
2013fh	0.029803	17.8	la	04 21 38.29	-17 55 41.4
2009la	0.020385	15.8	la	04 22 45.81	-40 36 49.3
2013fz	0.020607	15.1	la	04 23 46.44	-51 35 46.3
2014cd	0.020607	15.9	la	04 23 47.24	-51 36 02.9
2011do	0.018392	14.8	la	04 25 47.56	-67 48 40.7
2001gi	0.199998	21	la	04 28 07.06	-36 21 45.2
2001eb	0.012652	16.3	la	04 30 45.10	0 52 17.9
1997A	0.058473	18.5	la	04 31 33.39	-61 07 10.4
1998ea	0.057456	19.5	la	04 33 46.59	-61 35 20.4

2012fu	0.060502	17.5	la	04 37 19.13	-69 08 25.4
2006lf	0.013208	17.6	la	04 38 29.49	02 01.5
2008gw	0.064	18.8	la	04 39 26.21	9 08 31.6
2001fs	0.840001	23.9	la	04 39 30.68	- 1 28 21.9
2010kg	0.016646	17.7	la	04 40 08.40	7 21 00.0
1999ep	0.060001	18.9	la	04 41 04.76	- 3 00 39.6
2004B	0.01565	17.8	la	04 42 04.72	- 7 12 07.8
2011bx	0.058	17.1	la	04 42 12.57	-48 44 12.6
2012id	0.015748	16.3	la	04 42 41.13	34 59.8
2003ah	0.03	17	la	04 43 08.54	0 46 00.4
1995bd	0.015393	17.3	laPec	04 45 21.24	04 02.5
2011jv	0.082	18.6	la	04 48 02.55	- 4 08 22.6
2010ll	0.066	18.1	la	04 50 29.81	-10 44 17.0
2009ic	0.015347	14.8	la	04 53 18.03	- 3 00 59.6
2005ec	0.029263	16.6	la	04 54 19.17	1 38 27.6
1997F	0.580001	23.9	la	04 55 14.27	- 5 51 44.8
2004gb	0.219998	20.5	la	04 55 22.30	-67 30 44.3
1997ek	0.860001	23.8	la	04 56 11.63	- 3 41 26.0
1998eo	0.840001	23.6	la	04 56 15.47	- 3 46 38.7
1997el	0.639999	23.1	la	04 56 41.21	- 3 27 54.7
1997em	0.460001	23.6	la	04 56 50.44	- 3 51 37.1
1997en	0.769999	24.4	la:	04 56 57.21	- 4 11 46.0
1997ey	0.580001	22.9	la	04 56 58.19	- 2 37 36.7
2001ep	0.013012	15	la	04 57 00.26	- 4 45 40.2
1997ep	0.460001	22.4	la	04 57 48.59	- 3 42 44.7
1997G	0.762997	23.7	la	04 58 30.23	- 3 16 04.0
1997eq	0.54	22.5	la	04 58 56.32	- 3 59 29.4
2009F	0.013337	15.5	la	04 59 23.56	-11 07 50.1
1992bh	0.045001	17.7	la	04 59 27.55	-58 49 44.2
1997H	0.529999	22.8	la	04 59 36.57	- 3 09 34.6
1997I	0.180001	20.9	la	04 59 37.31	- 3 09 01.6
1997fc	0.054037	20.5	la	04 59 58.81	-38 55 04.3
1997er	0.469998	22.3	la	05 00 38.56	- 3 59 32.2
2010kt	0.053	16.8	la	05 00 39.19	-38 40 46.1
2011M	0.017425	17.1	la	05 00 41.55	14 38.6
2006le	0.017425	17.6	la	05 00 41.99	15 19.0
2012he	0.055968	18.2	la	05 00 50.07	-38 39 11.4
2011hq	0.025721	18.3	la	05 00 56.13	-13 24 57.9
1997fb	0.053101	18.6	la	05 01 14.60	-38 38 12.7
2012hx	0.028	16.3	la	05 01 29.88	-13 43 46.4
2011gl	0.040444	17.7	la	05 01 43.07	-15 23 24.7
2006hb	0.01527	15.7	laPec	05 02 01.28	-21 07 55.1
2009ad	0.028387	16.6	la	05 03 33.38	6 39 35.7
2006aw	0.01617	14.9	la	05 04 18.18	-63 34 57.3
2011kk	0.043113	17.4	la	05 07 37.90	7 15 24.6
1993af	0.003345	17	la:	05 08 00.71	-37 29 18.0

2004gw	0.01701	17.9	la	05 08 48.41	26 20.7
2011kj	0.038894	16.7	la	05 11 21.23	-25 53 05.9
2003F	0.017271	15.9	la	05 11 33.01	03 28.4
2014aj	0.020395	17.6	la	05 11 43.91	29 29.1
2005el	0.01493	16	la	05 11 48.72	5 11 39.4
2011ka	0.016408	14.5	la	05 14 28.23	-62 10 19.3
2011jq	0.032604	18.4	laPec	05 16 41.55	6 29 30.2
2012H	0.031852	16.5	la	05 20 14.94	-25 18 56.4
2004gc	0.032088	17.4	la	05 21 49.95	6 40 33.7
2010fy	0.049	17.1	la	05 24 52.46	-46 46 37.1
1998Z	0.03858	19.6	la	05 24 58.78	-31 21 38.1
2013ex	0.01043	15.6	la	05 32 46.62	-14 02 45.4
2010ko	0.01043	16.8	la	05 32 49.44	-14 05 45.9
2004N	0.050001	17.9	la	05 35 20.37	-69 27 18.3
1999J	0.033299	17	laPec	05 35 32.27	-69 29 52.1
1999ek	0.017522	17.9	la	05 36 31.60	38 17.8
2013az	0.037332	17.1	la	05 39 52.13	-40 30 28.1
2009jz	0.023959	17	laPec	05 40 05.29	-55 32 04.0
2002B	0.142998	20.5	la	05 40 46.06	-71 51 15.1
2010ju	0.015244	16.7	la	05 41 55.99	29 51.0
1998eb	0.013119	17.8	la	05 42 12.02	22 26.3
2014I	0.03012	17	la	05 42 19.80	-25 32 39.9
1993ac	0.049	18.4	la:	05 46 23.60	22 07.0
2004J	0.025	17.5	la	05 46 32.18	-17 46 53.0
2003hx	0.007098	14.3	la	05 46 46.97	-16 47 00.6
2003hz	0.020173	16.7	la	05 48 07.86	15 22.8
1997eh	0.045127	18.5	la	05 49 04.59	-24 29 01.6
2006ke	0.017181	18.3	la	05 52 37.38	49 00.5
2011ah	0.027198	16	la	05 53 50.77	-32 44 44.2
2009J	0.015783	17.4	laPec	05 55 21.13	-76 55 20.8
2009iw	0.015783	14.6	la	05 55 25.63	-76 55 15.9
2001gc	0.01929	15.5	la	05 55 26.14	54 34.2
2003ij	0.018382	17.8	la	05 55 41.18	54 21.7
2006nr	0.018382	15.8	la	05 56 23.51	54 38.8
1996by	0.013722	16.1	la	05 58 24.96	27 12.1
2012fd	0.018898	15.2	la	05 58 51.93	-23 20 24.2

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Plot 2: RA 14..17 sn_mag-Redshift Relation

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec
2002fc	0.879998	24.2	la	14 00 23.29	5 45 41.9
2007dv	0.1	19	la	14 00 51.02	57 28.4

2012T	0.026378	17.4	laPec	14 01 41.69	49 33.9
2011is	0.020869	16.6	la	14 01 47.00	9 29 50.8
2001gm	0.478	23.4	la	14 01 51.18	5 05 38.5
2001gq	0.671	23.9	la	14 01 51.38	4 53 12.4
2002fl	0.259999	21.9	la	14 01 52.33	4 39 23.2
2000fr	0.542998	24.5	la	14 01 57.75	4 43 42.4
2001gn	1.1	25	la	14 01 59.90	5 04 59.6
2001go	0.551998	23.7	la	14 02 00.95	5 00 59.2
2002am	0.03002	19.1	la	14 02 03.14	-10 35 23.9
1998D	0.012309	15.5	la	14 02 59.28	44 54.3
2011fe	0.000796	10.1	la	14 03 05.81	16 25.4
1991B	0.008713	16	la	14 03 24.29	- 6 04 22.9
2009mz	0.008713	14.7	la	14 03 24.64	- 6 03 31.3
2002ff	1.1	24	la:	14 03 39.82	5 46 50.6
2002fd	0.277998	23.4	la	14 03 54.08	4 59 49.0
1999ax	0.050001	18.5	la:	14 03 57.92	51 09.2
2002fe	1.086	24.7	la	14 04 18.16	5 19 25.6
2001U	0.028422	17.3	la	14 04 42.94	- 9 42 29.7
2011bz	0.028422	17.4	la	14 04 43.75	- 9 43 04.7
1999cp	0.009485	14.2	la	14 06 31.30	- 5 26 49.0
2002cr	0.009485	14.2	la	14 06 37.59	- 5 26 21.9
1995P	0.056006	18	la:	14 07 14.33	- 2 43 32.7
2010fd	0.53	22.4	la	14 07 14.93	59 51.5
1997ct	0.03	18.6	la	14 07 26.88	26 05.9
2008cf	0.046031	16.8	la	14 07 32.56	-26 33 06.6
2012di	0.07	18.1	la	14 08 06.69	03 07.7
2005S	0.019813	19.1	la	14 08 28.84	7 03 27.2
2007cc	0.029083	15.8	la	14 08 41.98	-21 35 48.4
1999ck	0.431998	21.9	la	14 08 56.59	- 0 05 50.7
2009ey	0.179	20.6	la	14 09 16.68	06 12.8
2010ff	0.27	22.9	la	14 09 19.94	15 45.2
1997cn	0.016766	16.2	laPec	14 09 57.76	32 32.3
2007ei	0.1	20.1	la	14 10 11.29	8 18 39.8
2001ko	0.14057	20	la	14 10 58.32	50 50.9
2009nk	0.019639	17	la	14 10 58.74	6 21 47.9
2004dl	0.249999	21.2	la	14 11 11.50	-12 02 36.9
1990M	0.008652	12.4	la	14 11 29.30	- 5 02 36.0
2010fr	0.45	22.3	la	14 11 57.76	04 18.6
2010bp	0.009663	15.2	la	14 12 07.89	-49 23 43.3
2010fa	0.373	21.9	la	14 13 01.87	27 46.6
2012dm	0.077906	19.5	la	14 13 46.13	13 17.3
2010fs	0.441	22.3	la	14 14 03.34	21 43.8
2000bz	0.259999	21.2	la	14 15 02.66	- 6 17 16.0
2009cs	0.17	19.7	la	14 15 19.36	25 14.0
2009gf	0.018517	16.1	la	14 15 37.11	16 48.6
2003fg	0.239999	20.4	la	14 16 18.78	14 55.4

2007fd	0.07	19.5	la	14 16 19.03	13 01.3
2003fn	0.29	21.5	la	14 16 33.44	20 32.1
1997ca	0.519999	22.6	la	14 16 40.24	31 59.2
2007ao	0.023734	17.7	laPec	14 16 49.74	48 24.1
2010fh	0.387	22.3	la	14 17 18.59	58 41.9
2003fo	0.369999	22.4	la	14 17 58.43	28 57.5
1996aa	0.010842	17	la	14 18 25.16	29 41.9
2013gn	0.010842	15.5	la	14 18 28.54	30 24.2
2003fi	0.440001	22.4	la	14 18 39.96	36 44.1
2003fj	0.469998	22.2	la	14 19 45.19	32 25.7
2003fk	0.349998	22.3	la	14 19 55.84	05 50.9
2003ey	0.065001	18.8	la	14 20 03.28	- 8 28 40.0
2004aj	0.247	22.3	la	14 20 37.58	-12 24 14.4
1996ah	0.047386	18	la	14 20 38.90	07 21.0
2003fp	0.450001	22.6	la	14 20 53.61	36 20.7
1999bo	0.129999	19.7	la	14 21 07.48	- 5 57 25.8
2008cq	0.00421	14.4	la	14 21 09.61	-29 15 04.0
2003ff	0.499999	23.3	la	14 21 14.92	32 15.3
2013bt	0.036445	16.8	la	14 21 15.12	34 15.5
2003fh	0.249999	22.2	la	14 21 35.89	31 37.7
2006dy	0.007683	16.5	la	14 22 11.50	55 14.0
2007af	0.005471	15.3	la	14 22 21.03	- 0 23 37.6
2004K	0.03613	17.1	la	14 23 39.85	-19 26 50.0
2009av	0.0555	18.62	la	14 23 55.82	11 05.2
2012ei	0.006417	14.7	la	14 24 05.76	02 56.5
2009ft	0.056835	17.9	la	14 24 06.03	7 46 10.3
2005bv	0.035654	16.5	la	14 24 07.44	17 50.3
2002bz	0.036992	16.9	la	14 24 40.52	37 34.7
2001ay	0.030242	16.7	la	14 26 17.00	14 55.8
2014by	0.024794	16	la	14 27 48.59	33 42.5
1991ai	0.052803	18.5	la	14 27 55.19	12 20.5
2010V	0.01279	14.3	la	14 28 38.46	38 09.5
2011ai	0.035181	16.6	la	14 29 05.03	54 42.4
2009bi	0.126	20	la	14 29 39.61	09 32.8
2000fw	0.096249	19.1	la	14 30 14.07	0 30 35.4
2009ce	0.095	19.8	la	14 31 01.13	46 57.9
2009ei	0.23	20.9	la	14 32 17.26	36 15.8
2013aa	0.004007	11.9	la	14 32 33.88	-44 13 27.8
2011cv	0.111587	19.2	la	14 33 37.37	-12 02 20.9
2006bw	0.03	16.6	la	14 33 56.73	3 47 55.8
2003du	0.006396	13.5	la	14 34 35.80	20 03.8
2002db	0.036488	16	la	14 34 51.63	39 52.9
2006dt	0.026468	16.8	la	14 35 43.11	8 17 55.8
2012N	0.035209	16	la	14 35 44.65	43 41.6
2014bg	0.035209	16.3	la	14 35 45.97	43 18.2
2005bc	0.012266	16.4	la	14 37 15.05	27 23.1

2001ck	0.034697	16.4	la	14 37 50.08	29 02.2
2007cw	0.1	19.1	la	14 38 07.48	- 8 35 55.7
2002jo	0.009172	16.3	la	14 38 16.42	27 14.0
2012ci	0.030611	17.5	la	14 38 23.48	20 55.1
2010ax	0.050792	17	la	14 41 53.42	45 01.4
2009Y	0.009294	14.9	la	14 42 24.55	-17 14 46.3
2010cy	0.0389	17	la	14 43 42.85	3 58 16.2
2002lh	0.235999	21	la	14 44 20.38	15 44.4
2009en	0.046711	17.6	la	14 46 22.62	01 27.0
2009gb	0.022572	14.9	la	14 47 25.83	-30 39 02.5
2009as	0.022572	16.7	la	14 47 26.64	-30 39 34.5
2007gc	0.12	19.3	la	14 47 47.32	28 14.5
2007ee	0.045748	19.4	la	14 47 47.34	49 53.1
2010cs	0.041888	19.6	la	14 47 55.78	03 17.7
2006cz	0.042007	17.3	laPec	14 48 36.66	- 4 44 30.7
2003jb	0.041075	16.5	la	14 49 22.28	16 06.2
2009fb	0.08	19.1	la	14 50 00.12	55 05.8
2014cb	0.033183	16.4	la	14 50 49.90	-13 31 03.7
2007at	0.05412	17.7	la	14 51 12.28	-21 23 31.2
2014an	0.060608	18.6	la	14 51 42.93	8 34 12.5
2011jt	0.027777	16.5	la	14 53 23.01	2 57 43.1
2009eg	0.057	17.6	la	14 54 15.47	57 52.8
2009hv	0.054	18.6	la	14 54 32.90	39 39.5
2007O	0.036083	16.8	la	14 56 05.18	24 16.9
2008dk	0.07	18.8	la	14 56 13.33	51 14.1
2012M	0.033266	16.9	la	14 56 59.85	35 59.6
2011cy	0.16	20	la	14 58 37.10	2 20 59.1
2013hr	0.026191	16.2	la	14 59 00.81	48 47.5
2008af	0.033366	17.1	la	14 59 28.50	39 12.3
2005be	0.034997	16.1	la	14 59 32.72	40 11.6
2002bg	0.042452	16.9	la	14 59 39.23	12 44.5
2012af	0.053	16.7	laPec	15 00 30.87	55 45.1
2009dy	0.089	18.4	la	15 01 04.03	13 13.9
2013bh	0.074458	18.5	laPec	15 02 13.09	38 45.6
2007dm	0.08	19.6	la	15 02 55.12	7 12 05.6
2004bw	0.021198	17.6	la	15 03 46.75	- 3 18 16.4
2006bk	0.049519	16.9	la	15 04 33.65	57 51.1
2014ac	0.028935	16.6	la	15 04 40.09	37 54.2
2011ct	0.11	19.1	la	15 06 34.40	-10 19 36.5
2009ej	0.083	19	la	15 10 59.53	6 33 10.0
2013eb	0.018779	17.1	la	15 11 14.80	09 11.1
1999cm	0.045114	17.1	la	15 11 19.18	07 11.4
1999dg	0.021928	15.8	la	15 11 28.41	29 05.7
2009ai	0.040164	17.6	la	15 11 35.92	5 23 47.5
2007ey	0.11	19.7	la	15 12 21.36	30 03.7
2012bf	0.07	18.2	la	15 13 41.81	06 06.6

2014M	0.0222	16.3	la	15 15 17.18	29 09.7
2007ba	0.038539	18.2	la	15 16 42.63	7 23 47.8
2012ao	0.065	19.8	la	15 16 42.88	-14 38 38.1
2002ec	0.040394	17.5	la	15 19 24.89	53 14.0
2008dl	0.31	21.6	la	15 19 30.37	53 56.8
2009ek	0.21	20.7	la	15 19 46.76	31 50.6
2009eh	0.044	21.2	la	15 20 38.08	7 39 32.5
2005bm	0.102997	19.5	la	15 20 45.10	48 42.5
1996ab	0.13009	19.7	la	15 21 08.35	55 36.8
2005cf	0.006461	15.5	la	15 21 32.21	- 7 24 47.5
2009gw	0.11	20.7	la	15 22 13.62	58 01.3
2009hb	0.2	20.7	la	15 22 29.65	04 48.4
2010dw	0.03812	17.1	la	15 22 40.31	- 5 55 15.9
2008ck	0.065	19.3	la	15 22 42.30	22 08.0
2007dn	0.07	18.9	la	15 22 45.80	13 20.2
2012bs	0.066	18.1	la	15 23 01.70	7 11 41.2
2007ek	0.08	18.7	la	15 23 04.86	8 46 55.7
2001cw	0.930643	24.3	la	15 23 06.31	39 31.9
2007cf	0.032836	17.9	la	15 23 07.66	8 31 45.5
2014am	0.053	17.4	la	15 23 18.48	17 33.3
2003hj	0.075919	17.5	la	15 24 20.51	57 11.9
2013ck	0.049	17.5	la	15 24 29.07	32 54.6
2009fc	0.081256	19.4	la	15 27 48.59	35 34.1
2007bk	0.032188	16.65	la	15 28 45.58	52 12.8
2009fd	0.139	20.4	la	15 29 10.96	47 38.8
2007gd	0.13	19.9	la	15 29 31.48	7 59 51.1
2013dh	0.013382	16.5	laPec	15 30 01.09	59 12.9
2011et	0.09	18.8	la	15 30 01.40	52 29.1
1996cm	0.450001	22.7	la	15 30 11.25	5 55 27.0
2004cq	0.021998	17.5	la	15 31 19.76	16 52.1
2003K	0.021817	15.4	la	15 32 01.91	14 35.9
2011bw	0.089	19.2	la	15 35 58.75	18 42.8
2013dd	0.05205	17.5	la	15 36 05.15	57 06.9
1990L	0.014436	18	la	15 36 29.15	29 59.5
2014bp	0.068	17.9	la	15 36 31.24	54 14.2
2002gk	0.209998	21.3	la	15 37 07.50	9 36 19.0
2012dc	0.089902	18.6	la	15 38 17.95	44 17.3
2010gb	0.022595	15.8	la	15 38 39.79	00 19.9
2012el	0.018175	16.4	la	15 39 57.23	-30 33 18.8
2009Q	0.025604	16.1	la	15 40 12.88	44 18.1
2004cp	0.053997	19.6	la	15 40 24.76	51 57.2
2010bu	0.039	16.9	la	15 42 58.38	2 16 52.6
2002gl	0.510996	23.3	la	15 43 24.40	7 53 58.0
2001bs	0.029186	18.2	la	15 43 39.38	45 31.3
2004ct	0.033373	17.5	la	15 43 45.75	24 59.5
2001gw	0.363001	22	la	15 43 45.86	7 57 50.3

2011de	0.029186	16.1	la	15 43 53.25	45 42.5
2007fi	0.12	19.7	la	15 44 16.87	43 13.7
2009fh	0.123	20.4	la	15 44 38.77	47 51.2
2001al	0.069998	21.1	la	15 44 51.74	07 29.0
2001hd	0.511	22.8	la	15 45 35.92	8 16 50.6
2001he	0.581999	23	la:	15 46 35.69	8 11 26.4
2002gm	0.489998	22.3	la	15 46 57.00	8 12 37.0
2002ck	0.029882	15.9	la	15 47 00.75	- 0 59 25.5
2011ex	0.04	17.6	la	15 48 51.75	57 48.9
2011er	0.12	18.9	la	15 49 50.65	49 30.1
2009dc	0.021391	15.6	laPec	15 51 12.11	42 28.2
2000cf	0.036001	17	la	15 52 56.19	56 12.7
2005dh	0.038359	16.9	la	15 54 03.32	08 09.9
2008cg	0.036168	16.6	lln	15 54 15.15	58 25.0
2009ji	0.048	17.9	la	15 54 52.48	05 05.6
2009ih	0.032882	17.3	laPec	15 55 31.05	56 54.0
2004di	0.019767	16.8	la	15 55 41.00	51 49.0
2007ap	0.015444	15.5	la	15 56 23.06	30 57.9
2006bt	0.032155	17.4	la	15 56 30.53	02 45.6
2014ch	0.044	16.5	la	15 58 31.07	51 58.7
1991M	0.007236	14.4	la	15 58 34.82	27 28.7
2002li	0.326999	20.5	la	15 59 03.08	18 16.0
2006ay	0.09	19	la	15 59 12.76	44 27.9
2010ft	0.42	21.8	la	16 01 15.41	17 53.5
2003ar	0.025214	16.8	la	16 02 08.11	24 55.5
2001bp	0.094999	17.5	la	16 02 09.25	43 08.0
1999cc	0.031328	16.1	la	16 02 42.03	21 34.4
2000Q	0.02	16	la	16 05 11.85	39 51.5
2001cq	0.199998	22.8	la:	16 05 18.70	11 42.1
2000cp	0.034223	18	la	16 05 27.62	49 48.8
2008ek	0.034537	18.9	la	16 05 33.17	35 33.2
2010fi	0.331	22.1	la	16 05 44.83	04 27.9
2008ba	0.03	18.6	la	16 05 49.17	27 17.2
2009df	0.12	18.6	la	16 05 52.67	24 45.5
1996O	0.037245	18	la	16 06 00.00	11 48.0
2004cv	0.037125	16.6	la	16 06 14.45	24 54.0
2010fj	0.55	23.1	la	16 06 48.80	58 51.4
2002lk	0.119999	18.1	la	16 06 55.92	28 18.2
1999ac	0.009497	14.2	laPec	16 07 15.01	7 58 20.4
2014bq	0.08	17.8	la	16 07 25.38	47 35.7
2010fb	0.336	22.2	la	16 08 18.40	54 29.2
2010fe	0.43	22.4	la	16 08 52.65	00 17.4
2014be	0.071	18.6	la	16 09 35.20	26 31.1
2006cc	0.032612	18.1	la	16 09 56.47	07 35.9
2010dy	0.042619	17.6	la	16 10 11.03	0 45 07.5
1992bi	0.458	22	la	16 10 12.81	47 12.7

2008cl	0.063434	17.7	la	16 11 04.35	27 08.0
2003au	0.030791	19.2	la	16 11 11.56	15 58.2
2011dv	0.031103	16	la	16 12 04.62	12 33.2
2011dz	0.024598	16.4	la	16 12 44.82	17 03.2
2007ai	0.031661	17.3	la	16 12 53.74	-21 37 48.7
2010fl	0.36	21.5	la	16 13 48.22	36 30.7
2007ds	0.14	19.7	la	16 14 04.60	8 55 20.0
2000df	0.039435	17.2	la	16 14 12.22	6 09 00.6
2007di	0.13	19.7	la	16 14 25.92	5 09 21.1
2010fc	0.233	22.5	la	16 14 28.71	43 33.0
2002ci	0.022228	17.1	la	16 15 37.95	19 17.4
2013eh	0.034997	16.6	la	16 16 09.19	32 53.0
2013ed	0.033158	15.8	la	16 16 24.25	53 05.7
2002de	0.027965	16	la	16 16 30.38	42 30.2
2001kt	0.103791	19.9	la	16 17 13.40	28 27.7
2013dp	0.022324	15.5	la	16 17 32.30	34 56.7
2010an	0.02952	17	la	16 17 40.46	00 10.1
2003ia	0.02952	17.2	la	16 17 41.17	00 07.2
2006dw	0.027042	15.8	la	16 17 43.29	57 55.1
2010fm	0.36	21.6	la	16 17 47.71	18 08.3
2011dl	0.0341	16.9	la	16 18 04.97	33 04.0
2012bp	0.028291	15.5	la	16 18 12.44	28 52.8
2010fn	0.323	21.9	la	16 18 15.87	23 04.9
2007en	0.12	19.6	la	16 18 43.84	3 02 50.1
2010fo	0.347	22	la	16 18 53.81	46 58.5
2002lj	0.14	19.7	la	16 19 19.65	09 54.2
2003lx	0.037862	18.5	la	16 19 21.66	05 23.6
1991ad	0.069998	18.5	la	16 19 24.20	38 46.0
2013cl	0.06345	17.9	la	16 19 31.59	47 11.3
2013cp	0.074921	18.1	la	16 19 52.11	56 08.1
2003ge	0.033453	17.8	la	16 20 08.75	47 53.7
2012ar	0.028259	16.6	la	16 20 36.02	-10 27 38.2
2007bj	0.016656	15.1	laPec	16 22 10.59	- 1 30 51.4
2009he	0.030647	17.5	laPec	16 22 12.33	16 22.5
2013cv	0.035	16.5	laPec	16 22 43.18	57 35.4
2006R	0.034074	17.5	la	16 23 20.82	15 49.8
2012ds	0.03403	16.4	la	16 23 45.90	9 47 12.9
2009fl	0.029146	17.6	laPec	16 25 10.10	53 20.8
1999cb	0.028899	15.7	la	16 25 48.41	20 32.4
2014al	0.04	16.8	la	16 26 55.28	38 24.4
2012aj	0.031	16.1	la	16 27 03.96	36 49.8
2014bo	0.133525	19.3	la	16 27 46.15	44 23.7
2013ec	0.081	18.5	la	16 27 50.24	28 20.9
2010ef	0.11	18.5	la	16 28 52.10	22 29.0
2009fv	0.029359	16.3	la	16 29 44.22	48 41.8
1991aj	0.031418	18	la	16 29 44.90	46 43.0

2014dl	0.032966	16.5	laPec	16 29 46.09	8 38 30.6
1992ap	0.029876	18	la	16 30 27.46	29 18.3
2014ag	0.031658	15.5	la	16 30 40.68	30 34.7
2010gl	0.0188	15.8	la	16 31 38.62	37 26.2
2009ff	0.17	20.5	la	16 33 10.92	05 30.8
2003hq	0.040001	17.1	la	16 33 40.90	22 37.7
2001az	0.040694	16.1	la	16 34 27.71	01 46.8
2003il	0.174997	23	la:	16 35 47.50	13 26.9
1995O	0.175121	22	la:	16 35 56.12	11 43.9
2002ll	0.050001	20.5	la:	16 37 08.30	24 37.7
1992R	0.052326	18	la	16 37 10.48	10 00.4
1992ac	0.052326	18	la	16 37 10.48	10 04.4
2002aw	0.026428	16.6	la	16 37 29.06	52 49.7
2009ew	0.09	18.7	la	16 38 59.85	58 58.1
2009ae	0.031147	16.5	la	16 39 28.87	18 55.6
2002lo	0.14	21.8	la	16 39 56.42	19 20.5
2002lp	0.113998	20.4	la	16 40 11.45	28 30.2
2002lq	0.069998	21.9	la	16 40 28.83	14 09.1
2013cw	0.017505	16.9	la	16 41 27.18	47 05.0
1991am	0.061025	18	la:	16 41 50.73	44 11.1
2007dr	0.14	19.9	la	16 41 56.00	22 59.1
2010dt	0.052889	17.9	la	16 43 14.68	40 30.4
2007gk	0.026981	18.8	la	16 45 18.22	55 50.0
2003dw	0.02992	16.7	la	16 45 51.10	37 38.0
2013dj	0.025304	16.6	laPec	16 46 01.94	6 27 59.3
2009fa	0.042	17.7	la	16 46 42.82	15 28.6
2007hh	0.11	19.9	la	16 46 59.10	56 02.5
2007is	0.029653	16.3	la	16 47 14.59	14 36.9
2009dx	0.042	18.8	la	16 49 25.67	5 52 48.1
1994Q	0.029477	17	la	16 49 51.15	25 55.9
2009kp	0.017758	15.1	la	16 49 51.49	32 35.8
2011aj	0.017556	16.6	la	16 50 13.98	22 28.0
2002di	0.036411	17.6	laPec	16 52 23.30	42 40.0
2010dd	0.02957	17.2	la	16 52 47.60	03 45.7
2010gp	0.024262	17.5	la	16 52 57.39	2 23 16.4
2009fx	0.047659	18	laPec	16 53 11.28	57 54.9
2007ep	0.12	19.4	la	16 54 38.51	02 59.7
1999ch	0.15		la	16 54 45.69	59 13.9
1998cx	0.019562	17.8	la	16 54 55.31	-72 35 24.0
2007hu	0.034257	17.3	la	16 56 29.96	58 40.4
2008dt	0.034257	17.2	la	16 56 30.56	58 33.2
2008eq	0.056835	18.4	la	17 00 07.20	07 56.6
2007ae	0.064387	17.4	la	17 01 51.95	01 54.6
2013dv	0.057	17.1	la	17 03 10.73	26 53.9
2010ag	0.033803	18.6	laPec	17 03 53.63	30 06.2
2013cx	0.034	17.5	la	17 04 16.05	30 37.6

2013ci	0.036	16.1	la	17 04 53.60	9 07 59.4
1997cd	0.509999	22.9	la	17 06 17.07	04 34.0
1997ce	0.440001	23.3	la	17 07 48.26	01 26.2
2010ed	0.048974	18.7	la	17 09 24.13	12 48.1
2011T	0.029193	16.3	la	17 10 03.62	30 01.2
2012cx	0.027672	17.3	la	17 10 05.86	22 23.5
2001cp	0.022416	15.9	la	17 11 02.58	5 50 26.8
2002er	0.008577	14.6	la	17 11 29.88	7 59 44.8
1999bt	0.049901	17	la	17 11 37.77	25 15.5
2006mp	0.023	16.7	laPec	17 12 00.20	33 20.8
2008fj	0.027015	18.6	la	17 12 49.86	48 51.8
2011cm	0.03	18.1	la	17 14 19.18	59 55.2
1990O	0.030664	16.6	la	17 15 35.92	19 25.8
2002bw	0.017333	17.4	la	17 16 35.60	-10 20 31.8
2013bs	0.027612	16	la	17 17 22.03	04 00.2
2010gn	0.0365	16.4	la	17 17 49.90	52 52.0
2003ek	0.036038	18.2	la	17 18 32.50	40 00.8
2013dr	0.016834	15.2	la	17 19 30.22	42 04.3
2013cm	0.04	18.3	laPec	17 20 01.94	44 51.3
2003U	0.02834	18	la	17 22 45.66	09 50.4
2009ia	0.027413	17.5	la	17 26 11.25	18 31.3
1991af	0.022388	18.5	la	17 27 07.67	28 23.3
2007eo	0.1	19	la	17 28 46.33	10 40.3
2006ap	0.022248	17.2	la	17 30 41.19	6 16 33.1
2009hl	0.049447	18		17 31 10.14	25 40.1
2007kf	0.046698	17	la	17 31 31.23	18 39.8
2012er	0.039694	16	la	17 31 52.62	50 10.1
2000gb	0.122504	20.4	la	17 32 28.54	04 25.5
1999da	0.012275	16.1	la	17 35 22.96	48 49.3
2009ex	0.08	20.2	la	17 38 26.07	23 00.7
2014bm	0.041265	17.4	la	17 42 32.11	35 41.2
2012fe	0.05	17.5	laPec	17 43 12.18	46 02.5
2005ao	0.038406	16.6	la	17 44 49.64	54 28.1
2012ea	0.010209	16.4	laPec	17 45 10.40	08 26.8
2013gz	0.016401	16.3	la	17 46 27.70	42 13.2
2011bd	0.028246	16	la	17 47 06.32	18 04.7
2012df	0.07	18.2	la	17 48 18.72	18 02.1
2012db	0.019313	14.6	la	17 48 48.70	-60 42 19.3
2002by	0.012451	14.5	laPec	17 50 18.58	-59 33 51.6
2013hm	0.031988	17	la	17 50 48.49	11 50.9
1998bp	0.01046	14.6	la	17 54 50.72	19 49.9
2009hs	0.027495	18.1	la	17 55 50.93	35 59.1
2000cn	0.023449	16.6	la	17 57 40.42	49 58.1
2010hh	0.019114	17.6	laPec	17 59 18.38	52 32.2

Plot 3: RA 2..5 Data with Calculated sn_mag Trend

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec	Trend Line	sn_mag-Trend
2005ew	0.002998	15.1	la	03 39 23.74	02 49.0	14.112	0.988
1993af	0.003345	17	la:	05 08 00.71	-37 29 18.0	14.2589	2.7411
2008ge	0.003502	12.4	laPec	04 08 24.68	-47 53 47.4	14.3205	-1.9205
2001el	0.003902	12.7	la	03 44 30.59	-44 38 23.6	14.4656	-1.7656
2014dg	0.004005	14.9	la	03 48 19.88	07 54.2	14.5005	0.3995
2005df	0.004319	12.5	la	04 17 37.85	-62 46 09.5	14.6018	-2.1018
2003gs	0.004478	13.4	laPec	02 27 38.36	- 1 09 35.4	14.6503	-1.2503
2005ke	0.004879	16.3	la	03 35 04.35	-24 56 38.8	14.7654	1.5346
2010ey	0.004906	16.8	la	03 41 31.50	-19 54 00.4	14.7728	2.0272
2010el	0.005004	16.5	laPec	04 19 58.83	-54 56 38.5	14.7993	1.7007
2006ce	0.005026	12.4	la	02 22 54.63	-21 14 29.4	14.8052	-2.4052
2011ek	0.005031	16.1	la	02 25 48.89	31 59.8	14.8065	1.2935
2012fr	0.005462	13.78	la	03 33 36.23	-36 07 35.4	14.9168	-1.1368
2003hv	0.005619	12.5	la	03 04 09.32	-26 05 07.5	14.9548	-2.4548
2003if	0.00566	17.6	la	03 19 52.61	-26 03 50.5	14.9646	2.6354
2006dd	0.005922	14	la	03 22 41.62	-37 12 13.0	15.0253	-1.0253
2006mr	0.005922	15.14	la	03 22 42.84	-37 12 28.5	15.0253	0.1147
1992A	0.006152	12.6	la	03 36 27.43	-34 57 31.5	15.0764	-2.4764
2007on	0.006338	14.9	la	03 38 50.90	-35 34 30.0	15.1164	-0.2164
2011iv	0.006338	12.4	la	03 38 51.34	-35 35 31.8	15.1164	-2.7164
2004ea	0.006517	18.2	la	04 16 13.20	-16 45 20.5	15.1538	3.0462
2003hx	0.007098	14.3	la	05 46 46.97	-16 47 00.6	15.2683	-0.9683
2012Z	0.007127	15.6	laPec	03 22 05.35	-15 23 15.6	15.2738	0.3262
2002fk	0.007127	13.1	la	03 22 05.71	-15 24 03.2	15.2738	-2.1738
2008hy	0.008538	14.3	la	03 45 08.45	39 55.5	15.5162	-1.2162
2009ig	0.008773	14	la	02 38 11.61	- 1 18 45.1	15.5526	-1.5526
1994aa	0.009059	17	la	03 24 49.40	- 3 02 33.6	15.5956	1.4044
2010lp	0.01014	16.7	laPec	02 54 03.50	2 57 43.4	15.7469	0.9531
2013ex	0.01043	15.6	la	05 32 46.62	-14 02 45.4	15.7847	-0.1847
2010ko	0.01043	16.8	la	05 32 49.44	-14 05 45.9	15.7847	1.0153
2008fg	0.010884	17	la	03 18 44.10	28 57.2	15.8419	1.1581
2009ab	0.011171	16.5	la	04 16 36.39	2 45 51.0	15.8768	0.6232
2001eb	0.012652	16.3	la	04 30 45.10	0 52 17.9	16.0439	0.2561
1991bd	0.012731	17	la	04 02 49.66	1 58 26.3	16.0522	0.9478
2001ep	0.013012	15	la	04 57 00.26	- 4 45 40.2	16.0815	-1.0815
1998eb	0.013119	17.8	la	05 42 12.02	22 26.3	16.0925	1.7075
2009im	0.013164	15.1	la	03 33 22.08	- 4 59 56.8	16.0971	-0.9971
2006lf	0.013208	17.6	la	04 38 29.49	02 01.5	16.1016	1.4984
2009F	0.013337	15.5	la	04 59 23.56	-11 07 50.1	16.1146	-0.6146
2011U	0.01335	16.6	la	04 13 33.94	32 36.7	16.1159	0.4841
2008R	0.013512	14.6	la	03 03 53.72	-11 59 39.3	16.1321	-1.5321
1998dj	0.013602	16	la	02 01 06.92	- 6 49 04.8	16.141	-0.141

1996by	0.013722	16.1	la	05 58 24.96	27 12.1	16.1528	-0.0528
2010it	0.013754	15.9	la	03 41 57.50	- 4 42 21.1	16.1559	-0.2559
2011dx	0.013854	16.5	laPec	03 37 05.61	- 5 01 56.3	16.1656	0.3344
2003hm	0.013915	17.7	la	02 48 58.39	3 10 07.6	16.1715	1.5285
1993ab	0.013931	18	la:	03 02 01.45	34 53.5	16.1731	1.8269
2013gy	0.014069	17.9	la	03 42 16.88	- 4 43 18.5	16.1863	1.7137
2009bt	0.014263	16.9	la	03 08 56.99	33 35.1	16.2047	0.6953
1999dq	0.014329	14.7	laPec	02 33 59.68	58 30.4	16.2109	-1.5109
2005el	0.01493	16	la	05 11 48.72	5 11 39.4	16.266	-0.266
1997dp	0.01496	17.8	la	02 34 06.48	56 13.4	16.2687	1.5313
2011iq	0.015	18.3	la	02 48 49.60	- 8 04 30.0	16.2723	2.0277
2011hh	0.015	16.9	la	02 57 04.61	47 43.3	16.2723	0.6277
2014H	0.015	16.3	la	03 37 01.41	05 01.0	16.2723	0.0277
2006dr	0.015124	16.1	la	03 17 14.19	-32 34 31.8	16.2833	-0.1833
2010ju	0.015244	16.7	la	05 41 55.99	29 51.0	16.2939	0.4061
2006hb	0.01527	15.7	laPec	05 02 01.28	-21 07 55.1	16.2962	-0.5962
2009ic	0.015347	14.8	la	04 53 18.03	- 3 00 59.6	16.3029	-1.5029
2006P	0.015364	17.4	la:	03 19 17.90	-12 06 18.3	16.3044	1.0956
1995bd	0.015393	17.3	laPec	04 45 21.24	04 02.5	16.307	0.993
2005ev	0.0154	16	la	02 31 04.93	42 06.5	16.3076	-0.3076
2004B	0.01565	17.8	la	04 42 04.72	- 7 12 07.8	16.3292	1.4708
2012id	0.015748	16.3	la	04 42 41.13	34 59.8	16.3375	-0.0375
2009J	0.015783	17.4	laPec	05 55 21.13	-76 55 20.8	16.3405	1.0595
2009iw	0.015783	14.6	la	05 55 25.63	-76 55 15.9	16.3405	-1.7405
2008J	0.015941	15.4	llnPec	02 34 24.20	-10 50 38.5	16.3539	-0.9539
2006aw	0.01617	14.9	la	05 04 18.18	-63 34 57.3	16.373	-1.473
2011ka	0.016408	14.5	la	05 14 28.23	-62 10 19.3	16.3926	-1.8926
2010kg	0.016646	17.7	la	04 40 08.40	7 21 00.0	16.412	1.288
2008er	0.016648	18.5	la	02 04 36.27	56 10.4	16.4121	2.0879
2007J	0.016788	17.3	lbPec:	02 18 51.70	43 43.3	16.4234	0.8766
2005dm	0.016838	17.5	laPec	02 18 39.25	- 6 54 10.8	16.4273	1.0727
2011gy	0.016881	15.4	la	03 29 35.30	52 03.3	16.4308	-1.0308
2011fw	0.016896	17.2	la	03 20 54.21	52 05.0	16.432	0.768
2013fb	0.016939	15.9	la	02 22 42.07	16 01.0	16.4354	-0.5354
2004gw	0.01701	17.9	la	05 08 48.41	26 20.7	16.441	1.459
2009fu	0.017066	15.7	la	02 12 09.10	33 55.1	16.4454	-0.7454
2013hk	0.017135	15.9	la	03 02 10.85	55 38.8	16.4508	-0.5508
2006ke	0.017181	18.3	la	05 52 37.38	49 00.5	16.4544	1.8456
2003F	0.017271	15.9	la	05 11 33.01	03 28.4	16.4614	-0.5614
2012en	0.017295	17.8	la	04 07 25.20	1 45 32.9	16.4633	1.3367
2004fz	0.017308	15.9	la	02 01 06.41	52 44.2	16.4643	-0.5643
2004fd	0.017323	15.7	la	02 43 15.25	25 25.6	16.4654	-0.7654
2012B	0.017341	16.4	la	03 51 34.52	04 42.9	16.4668	-0.0668
2008hs	0.017413	17.3	la	02 25 29.62	50 35.1	16.4724	0.8276
2011M	0.017425	17.1	la	05 00 41.55	14 38.6	16.4733	0.6267
2006le	0.017425	17.6	la	05 00 41.99	15 19.0	16.4733	1.1267

1999ek	0.017522	17.9	la	05 36 31.60	38 17.8	16.4808	1.4192
2011hk	0.017554	15.6	laPec	02 18 45.79	- 6 38 30.6	16.4832	-0.8832
2012fx	0.017652	16.7	laPec	02 55 41.24	-27 25 26.7	16.4907	0.2093
2005mz	0.017678	18	laPec	03 19 49.88	30 18.6	16.4927	1.5073
2009le	0.017791	16.1	la	02 09 17.14	-23 24 44.8	16.5012	-0.4012
2003em	0.017791	17.2	la	02 09 20.23	-23 24 53.0	16.5012	0.6988
2006ef	0.017894	15.3	la	02 04 19.51	- 8 43 42.2	16.509	-1.209
2010ia	0.017909	17.3	la	03 56 56.20	8 30 45.1	16.5101	0.7899
2002eh	0.017974	16.4	la	02 26 08.45	54 45.2	16.5149	-0.1149
2002es	0.017992	16	laPec	03 23 47.23	33 53.5	16.5163	-0.5163
2008ey	0.018084	18.1	la	02 51 42.39	49 51.5	16.5231	1.5769
2003lb	0.018105	15.8	la	03 45 05.67	45 39.3	16.5247	-0.7247
1991bj	0.018132	18.8	la	03 41 30.48	- 4 39 49.6	16.5267	2.2733
2009km	0.018346	15.6	la	03 02 59.01	-14 49 01.9	16.5424	-0.9424
2003ij	0.018382	17.8	la	05 55 41.18	54 21.7	16.5451	1.2549
2006nr	0.018382	15.8	la	05 56 23.51	54 38.8	16.5451	-0.7451
2011do	0.018392	14.8	la	04 25 47.56	-67 48 40.7	16.5458	-1.7458
2013S	0.018576	15.9	la	03 35 30.29	16 59.3	16.5591	-0.6591
2006em	0.018866	17.4	laPec	02 25 44.30	56 31.8	16.5799	0.8201
2012fd	0.018898	15.2	la	05 58 51.93	-23 20 24.2	16.5822	-1.3822
2005A	0.019138	17.1	la	02 30 43.25	- 2 56 19.8	16.5991	0.5009
2001gc	0.01929	15.5	la	05 55 26.14	54 34.2	16.6097	-1.1097
2012hp	0.019456	16	la	03 54 17.37	30 38.7	16.6212	-0.6212
2008L	0.019483	17.8	la	03 17 16.65	22 57.6	16.6231	1.1769
2008hm	0.019664	17.2	la	03 27 10.90	56 39.6	16.6355	0.5645
2004dt	0.019707	15.9	la	02 02 12.77	- 0 05 51.5	16.6384	-0.7384
2012U	0.019772	14.9	la	02 06 04.33	-55 11 37.5	16.6429	-1.7429
1993Y	0.020009	17.1	la	03 31 24.41	45 02.6	16.6588	0.4412
1992bc	0.020163	15.2	la	03 05 17.28	-39 33 39.7	16.6691	-1.4691
2003hz	0.020173	16.7	la	05 48 07.86	15 22.8	16.6698	0.0302
2013fe	0.02032	14.4	la	03 03 53.27	-39 24 20.3	16.6795	-2.2795
2010A	0.020334	15.8	la	02 32 39.46	0 37 10.2	16.6805	-0.8805
2012E	0.020384	15.5	la	02 33 22.81	9 35 05.9	16.6838	-1.1838
2009la	0.020385	15.8	la	04 22 45.81	-40 36 49.3	16.6838	-0.8838
2014aj	0.020395	17.6	la	05 11 43.91	29 29.1	16.6845	0.9155
2004ee	0.020509	17.2	la	02 06 14.62	-37 20 05.4	16.692	0.508
2013fz	0.020607	15.1	la	04 23 46.44	-51 35 46.3	16.6984	-1.5984
2014cd	0.020607	15.9	la	04 23 47.24	-51 36 02.9	16.6984	-0.7984
2009hp	0.021016	16.7	la	02 58 23.96	6 35 35.1	16.7247	-0.0247
2005ls	0.021136	15.8	la	02 54 15.97	43 29.8	16.7324	-0.9324
2006kf	0.021251	17.4	la	03 41 50.48	8 09 25.0	16.7396	0.6604
2011H	0.021331	15.6	la	02 23 06.02	02 32.4	16.7447	-1.1447
2003in	0.021331	17.7	la	03 35 33.31	5 03 52.7	16.7447	0.9553
1991bc	0.021351	16	la	03 20 45.66	- 1 02 47.2	16.7459	-0.7459
1994ah	0.021664	18	la	02 56 37.75	-33 54 43.6	16.7655	1.2345
2009hn	0.021855	17.5	la	02 32 00.31	1 14 53.5	16.7772	0.7228

1997ej	0.022302	16.5	la	04 17 53.49	-56 36 58.2	16.8044	-0.3044
2014dn	0.022302	17.1	laPec	04 17 54.28	-56 36 45.2	16.8044	0.2956
2010jm	0.022362	17.4	la	03 46 03.55	42 15.5	16.808	0.592
2009iv	0.0226	17.6	la	02 58 14.19	5 58 19.3	16.8222	0.7778
1995ak	0.02272	16.2	la	02 45 48.83	3 13 50.1	16.8293	-0.6293
2007E	0.022962	15.9	la	02 26 34.41	-15 50 36.5	16.8435	-0.9435
2014dd	0.023244	17.5	la	03 03 36.18	56 52.0	16.8599	0.6401
2010jf	0.023949	17.7	laPec	03 40 43.47	1 03 34.0	16.9	0.8
2009jz	0.023959	17	laPec	05 40 05.29	-55 32 04.0	16.9006	0.0994
2004J	0.025	17.5	la	05 46 32.18	-17 46 53.0	16.9576	0.5424
2009D	0.025053	16.5	la	03 54 22.83	-19 10 54.2	16.9605	-0.4605
2013hi	0.025367	16.2	la	03 14 24.72	10 49.1	16.9772	-0.7772
2001dw	0.02544	16.6	la	03 00 47.88	46 27.5	16.981	-0.381
2011hq	0.025721	18.3	la	05 00 56.13	-13 24 57.9	16.9958	1.3042
2009I	0.026177	16.4	la	02 45 10.40	- 4 42 49.4	17.0194	-0.6194
1991bb	0.026563	17.7	la	03 53 37.51	06 19.3	17.039	0.661
2010kq	0.026596	16.4	la	02 18 10.92	05 42.4	17.0407	-0.6407
1999gp	0.026744	16.1	la	02 31 39.15	22 52.3	17.0481	-0.9481
2011gs	0.027	17.4	la	04 21 09.99	28 04.4	17.0609	0.3391
2013D	0.027119	17.5	laPec	03 41 15.13	23 03.9	17.0668	0.4332
2011ah	0.027198	16	la	05 53 50.77	-32 44 44.2	17.0707	-1.0707
2013ae	0.028	16.2	la	02 41 53.16	23 58.8	17.1097	-0.9097
2012hx	0.028	16.3	la	05 01 29.88	-13 43 46.4	17.1097	-0.8097
2009ad	0.028387	16.6	la	05 03 33.38	6 39 35.7	17.1281	-0.5281
2010he	0.028412	16.8	la	02 49 10.80	-14 26 59.8	17.1293	-0.3293
2000fs	0.02884	18.7	la	03 08 26.24	4 06 39.9	17.1493	1.5507
2012I	0.029	16.2	la	02 58 27.83	6 11 25.3	17.1568	-0.9568
2008gy	0.029	16.8	la	03 10 00.95	13 23.1	17.1568	-0.3568
2005eq	0.029026	17.2	laPec	03 08 49.31	- 7 01 59.7	17.158	0.042
2004go	0.02903	16.5	la	02 55 41.76	-14 14 14.5	17.1582	-0.6582
2005ec	0.029263	16.6	la	04 54 19.17	1 38 27.6	17.1689	-0.5689
2013fh	0.029803	17.8	la	04 21 38.29	-17 55 41.4	17.1934	0.6066
2007so	0.02983	17	la	02 47 43.13	15 14.8	17.1946	-0.1946
2012eu	0.029937	17.3	la	03 13 04.16	- 8 23 31.7	17.1994	0.1006
2002hu	0.03	16.3	la	02 18 20.06	27 58.8	17.2023	-0.9023
2012gz	0.03	17.2	la	02 50 17.61	24 39.9	17.2023	-0.0023
2006qw	0.03	17.9	la	03 08 46.88	56 26.0	17.2023	0.6977
2007gn	0.03	18.3	la	03 16 31.37	27 40.7	17.2023	1.0977
2007hg	0.03	18	la	04 08 32.65	2 22 43.7	17.2023	0.7977
2003ah	0.03	17	la	04 43 08.54	0 46 00.4	17.2023	-0.2023
2014I	0.03012	17	la	05 42 19.80	-25 32 39.9	17.2076	-0.2076
2003kd	0.030187	16.7	la	03 00 45.80	27 13.0	17.2106	-0.5106
2000dx	0.030345	16.3	la	02 18 26.88	5 39 02.0	17.2176	-0.9176
2005do	0.030471	17.4	la	03 02 00.42	34 34.2	17.2232	0.1768
2006rz	0.03092	20	la	03 46 06.78	0 23 23.1	17.2428	2.7572
2009aq	0.031	16.8	la	03 09 19.79	05 05.3	17.2462	-0.4462

2012hh	0.031185	16.7	la	02 42 39.56	31 54.6	17.2542	-0.5542
2012H	0.031852	16.5	la	05 20 14.94	-25 18 56.4	17.2826	-0.7826
2004gc	0.032088	17.4	la	05 21 49.95	6 40 33.7	17.2925	0.1075
2010hk	0.032102	17.6	la	03 37 52.61	4 56 52.2	17.2931	0.3069
2011ag	0.032343	17.3	la	03 12 26.55	15 06.4	17.3031	-0.0031
2011jq	0.032604	18.4	laPec	05 16 41.55	6 29 30.2	17.3139	1.0861
2006os	0.03281	17.2	la	02 55 01.01	00 34.8	17.3224	-0.1224
2014dm	0.033116	16.55	la	04 08 07.13	- 8 49 37.0	17.3348	-0.7848
1999J	0.033299	17	laPec	05 35 32.27	-69 29 52.1	17.3422	-0.3422
2008gp	0.033523	18.1	la	03 23 00.73	1 21 42.8	17.3512	0.7488
2011ik	0.033758	17.2	la	02 25 04.09	12 51.9	17.3606	-0.1606
2013A	0.033805	16.5	la	02 22 04.27	13 57.7	17.3625	-0.8625
2013gv	0.03412	17.76	la	03 09 57.30	12 48.3	17.3749	0.3851
2003iv	0.034372	17.1	la	02 50 07.25	50 46.5	17.3848	-0.2848
2005et	0.034377	17.9	la	02 56 30.53	56 12.8	17.385	0.515
2000dp	0.034523	16.8	la	02 52 44.41	-14 31 54.7	17.3907	-0.5907
2005eu	0.034897	17.6	la	02 27 43.26	10 36.6	17.4051	0.1949
2012fk	0.035	16.7	la	02 30 52.04	28 45.9	17.4091	-0.7091

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Plot 4: RA 14..17 Data with Calculated sn_mag Trend

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec	Trend Line	sn_mag - Trend
2013aa	0.004007	11.9	la	14 32 33.88	-44 13 27.8	13.7898	-1.8898
2008cq	0.00421	14.4	la	14 21 09.61	-29 15 04.0	13.8698	0.5302
2007af	0.005471	15.3	la	14 22 21.03	- 0 23 37.6	14.2944	1.0056
2003du	0.006396	13.5	la	14 34 35.80	20 03.8	14.5476	-1.0476
2012ei	0.006417	14.7	la	14 24 05.76	02 56.5	14.5529	0.1471
2005cf	0.006461	15.5	la	15 21 32.21	- 7 24 47.5	14.564	0.936
1991M	0.007236	14.4	la	15 58 34.82	27 28.7	14.7476	-0.3476
2006dy	0.007683	16.5	la	14 22 11.50	55 14.0	14.8447	1.6553
2002er	0.008577	14.6	la	17 11 29.88	7 59 44.8	15.0231	-0.4231
1990M	0.008652	12.4	la	14 11 29.30	- 5 02 36.0	15.0372	-2.6372
1991B	0.008713	16	la	14 03 24.29	- 6 04 22.9	15.0486	0.9514
2009mz	0.008713	14.7	la	14 03 24.64	- 6 03 31.3	15.0486	-0.3486
2002jo	0.009172	16.3	la	14 38 16.42	27 14.0	15.1318	1.1682
2009Y	0.009294	14.9	la	14 42 24.55	-17 14 46.3	15.1532	-0.2532
1999cp	0.009485	14.2	la	14 06 31.30	- 5 26 49.0	15.1862	-0.9862
2002cr	0.009485	14.2	la	14 06 37.59	- 5 26 21.9	15.1862	-0.9862
1999ac	0.009497	14.2	laPec	16 07 15.01	7 58 20.4	15.1882	-0.9882
2010bp	0.009663	15.2	la	14 12 07.89	-49 23 43.3	15.2163	-0.0163

2012ea	0.010209	16.4	laPec	17 45 10.40	08 26.8	15.3054	1.0946
1998bp	0.01046	14.6	la	17 54 50.72	19 49.9	15.3447	-0.7447
1996aa	0.010842	17	la	14 18 25.16	29 41.9	15.4029	1.5971
2013gn	0.010842	15.5	la	14 18 28.54	30 24.2	15.4029	0.0971
2005bc	0.012266	16.4	la	14 37 15.05	27 23.1	15.6029	0.7971
1999da	0.012275	16.1	la	17 35 22.96	48 49.3	15.6041	0.4959
1998D	0.012309	15.5	la	14 02 59.28	44 54.3	15.6085	-0.1085
2002by	0.012451	14.5	laPec	17 50 18.58	-59 33 51.6	15.6271	-1.1271
2010V	0.01279	14.3	la	14 28 38.46	38 09.5	15.6707	-1.3707
2013dh	0.013382	16.5	laPec	15 30 01.09	59 12.9	15.744	0.756
1990L	0.014436	18	la	15 36 29.15	29 59.5	15.8668	2.1332
2007ap	0.015444	15.5	la	15 56 23.06	30 57.9	15.9762	-0.4762
2013gz	0.016401	16.3	la	17 46 27.70	42 13.2	16.0737	0.2263
2007bj	0.016656	15.1	laPec	16 22 10.59	- 1 30 51.4	16.0987	-0.9987
1997cn	0.016766	16.2	laPec	14 09 57.76	32 32.3	16.1093	0.0907
2013dr	0.016834	15.2	la	17 19 30.22	42 04.3	16.1159	-0.9159
2002bw	0.017333	17.4	la	17 16 35.60	-10 20 31.8	16.1632	1.2368
2013cw	0.017505	16.9	la	16 41 27.18	47 05.0	16.1792	0.7208
2011aj	0.017556	16.6	la	16 50 13.98	22 28.0	16.184	0.416
2009kp	0.017758	15.1	la	16 49 51.49	32 35.8	16.2025	-1.1025
2012el	0.018175	16.4	la	15 39 57.23	-30 33 18.8	16.2401	0.1599
2009gf	0.018517	16.1	la	14 15 37.11	16 48.6	16.2703	-0.1703
2013eb	0.018779	17.1	la	15 11 14.80	09 11.1	16.2931	0.8069
2010gl	0.0188	15.8	la	16 31 38.62	37 26.2	16.2949	-0.4949
2010hh	0.019114	17.6	laPec	17 59 18.38	52 32.2	16.3217	1.2783
2012db	0.019313	14.6	la	17 48 48.70	-60 42 19.3	16.3385	-1.7385
1998cx	0.019562	17.8	la	16 54 55.31	-72 35 24.0	16.3593	1.4407
2009nk	0.019639	17	la	14 10 58.74	6 21 47.9	16.3657	0.6343
2004di	0.019767	16.8	la	15 55 41.00	51 49.0	16.3762	0.4238
2005S	0.019813	19.1	la	14 08 28.84	7 03 27.2	16.38	2.72
2000Q	0.02	16	la	16 05 11.85	39 51.5	16.3952	-0.3952
2011is	0.020869	16.6	la	14 01 47.00	9 29 50.8	16.4641	0.1359
2004bw	0.021198	17.6	la	15 03 46.75	- 3 18 16.4	16.4895	1.1105
2009dc	0.021391	15.6	laPec	15 51 12.11	42 28.2	16.5041	-0.9041
2003K	0.021817	15.4	la	15 32 01.91	14 35.9	16.5361	-1.1361
1999dg	0.021928	15.8	la	15 11 28.41	29 05.7	16.5443	-0.7443
2004cq	0.021998	17.5	la	15 31 19.76	16 52.1	16.5495	0.9505
2014M	0.0222	16.3	la	15 15 17.18	29 09.7	16.5643	-0.2643
2002ci	0.022228	17.1	la	16 15 37.95	19 17.4	16.5663	0.5337
2006ap	0.022248	17.2	la	17 30 41.19	6 16 33.1	16.5678	0.6322
2013dp	0.022324	15.5	la	16 17 32.30	34 56.7	16.5733	-1.0733
1991af	0.022388	18.5	la	17 27 07.67	28 23.3	16.578	1.922
2001cp	0.022416	15.9	la	17 11 02.58	5 50 26.8	16.58	-0.68
2009gb	0.022572	14.9	la	14 47 25.83	-30 39 02.5	16.5912	-1.6912
2009as	0.022572	16.7	la	14 47 26.64	-30 39 34.5	16.5912	0.1088
2010gb	0.022595	15.8	la	15 38 39.79	00 19.9	16.5929	-0.7929

2006mp	0.023	16.7	laPec	17 12 00.20	33 20.8	16.6217	0.0783
2000cn	0.023449	16.6	la	17 57 40.42	49 58.1	16.653	-0.053
2007ao	0.023734	17.7	laPec	14 16 49.74	48 24.1	16.6726	1.0274
2010gp	0.024262	17.5	la	16 52 57.39	2 23 16.4	16.7082	0.7918
2011dz	0.024598	16.4	la	16 12 44.82	17 03.2	16.7305	-0.3305
2014by	0.024794	16	la	14 27 48.59	33 42.5	16.7434	-0.7434
2003ar	0.025214	16.8	la	16 02 08.11	24 55.5	16.7706	0.0294
2013dj	0.025304	16.6	laPec	16 46 01.94	6 27 59.3	16.7764	-0.1764
2009Q	0.025604	16.1	la	15 40 12.88	44 18.1	16.7955	-0.6955
2013hr	0.026191	16.2	la	14 59 00.81	48 47.5	16.8322	-0.6322
2012T	0.026378	17.4	laPec	14 01 41.69	49 33.9	16.8438	0.5562
2002aw	0.026428	16.6	la	16 37 29.06	52 49.7	16.8468	-0.2468
2006dt	0.026468	16.8	la	14 35 43.11	8 17 55.8	16.8493	-0.0493
2007gk	0.026981	18.8	la	16 45 18.22	55 50.0	16.8804	1.9196
2008fj	0.027015	18.6	la	17 12 49.86	48 51.8	16.8824	1.7176
2006dw	0.027042	15.8	la	16 17 43.29	57 55.1	16.884	-1.084
2009ia	0.027413	17.5	la	17 26 11.25	18 31.3	16.9061	0.5939
2009hs	0.027495	18.1	la	17 55 50.93	35 59.1	16.911	1.189
2013bs	0.027612	16	la	17 17 22.03	04 00.2	16.9178	-0.9178
2012cx	0.027672	17.3	la	17 10 05.86	22 23.5	16.9214	0.3786
2011jt	0.027777	16.5	la	14 53 23.01	2 57 43.1	16.9275	-0.4275
2002de	0.027965	16	la	16 16 30.38	42 30.2	16.9384	-0.9384
2011bd	0.028246	16	la	17 47 06.32	18 04.7	16.9546	-0.9546
2012ar	0.028259	16.6	la	16 20 36.02	-10 27 38.2	16.9554	-0.3554
2012bp	0.028291	15.5	la	16 18 12.44	28 52.8	16.9572	-1.4572
2003U	0.02834	18	la	17 22 45.66	09 50.4	16.96	1.04
2001U	0.028422	17.3	la	14 04 42.94	- 9 42 29.7	16.9647	0.3353
2011bz	0.028422	17.4	la	14 04 43.75	- 9 43 04.7	16.9647	0.4353
1999cb	0.028899	15.7	la	16 25 48.41	20 32.4	16.9917	-1.2917
2014ac	0.028935	16.6	la	15 04 40.09	37 54.2	16.9937	-0.3937
2007cc	0.029083	15.8	la	14 08 41.98	-21 35 48.4	17.002	-1.202
2009fl	0.029146	17.6	laPec	16 25 10.10	53 20.8	17.0055	0.5945
2001bs	0.029186	18.2	la	15 43 39.38	45 31.3	17.0077	1.1923
2011de	0.029186	16.1	la	15 43 53.25	45 42.5	17.0077	-0.9077
2011T	0.029193	16.3	la	17 10 03.62	30 01.2	17.0081	-0.7081
2009fv	0.029359	16.3	la	16 29 44.22	48 41.8	17.0173	-0.7173
1994Q	0.029477	17	la	16 49 51.15	25 55.9	17.0238	-0.0238
2010an	0.02952	17	la	16 17 40.46	00 10.1	17.0261	-0.0261
2003ia	0.02952	17.2	la	16 17 41.17	00 07.2	17.0261	0.1739
2010dd	0.02957	17.2	la	16 52 47.60	03 45.7	17.0289	0.1711
2007is	0.029653	16.3	la	16 47 14.59	14 36.9	17.0334	-0.7334
2008fn	0.029843	16.8	lb/c	16 21 48.53	03 41.0	17.0438	-0.2438
1992ap	0.029876	18	la	16 30 27.46	29 18.3	17.0456	0.9544
2002ck	0.029882	15.9	la	15 47 00.75	- 0 59 25.5	17.0459	-1.1459
2003dw	0.02992	16.7	la	16 45 51.10	37 38.0	17.0479	-0.3479
1997ct	0.03	18.6	la	14 07 26.88	26 05.9	17.0523	1.5477

2006bw	0.03	16.6	la	14 33 56.73	3 47 55.8	17.0523	-0.4523
2008ba	0.03	18.6	la	16 05 49.17	27 17.2	17.0523	1.5477
2011cm	0.03	18.1	la	17 14 19.18	59 55.2	17.0523	1.0477
2002am	0.03002	19.1	la	14 02 03.14	-10 35 23.9	17.0534	2.0466
2001ay	0.030242	16.7	la	14 26 17.00	14 55.8	17.0653	-0.3653
2012ci	0.030611	17.5	la	14 38 23.48	20 55.1	17.0849	0.4151
2009he	0.030647	17.5	laPec	16 22 12.33	16 22.5	17.0869	0.4131
1990O	0.030664	16.6	la	17 15 35.92	19 25.8	17.0878	-0.4878
2003au	0.030791	19.2	la	16 11 11.56	15 58.2	17.0944	2.1056
2012aj	0.031	16.1	la	16 27 03.96	36 49.8	17.1054	-1.0054
2011dv	0.031103	16	la	16 12 04.62	12 33.2	17.1108	-1.1108
2009ae	0.031147	16.5	la	16 39 28.87	18 55.6	17.1131	-0.6131
1999cc	0.031328	16.1	la	16 02 42.03	21 34.4	17.1225	-1.0225
1991aj	0.031418	18	la	16 29 44.90	46 43.0	17.1271	0.8729
2014ag	0.031658	15.5	la	16 30 40.68	30 34.7	17.1395	-1.6395
2007ai	0.031661	17.3	la	16 12 53.74	-21 37 48.7	17.1396	0.1604
2013hm	0.031988	17	la	17 50 48.49	11 50.9	17.1563	-0.1563
2006bt	0.032155	17.4	la	15 56 30.53	02 45.6	17.1647	0.2353
2007bk	0.032188	16.65	la	15 28 45.58	52 12.8	17.1664	-0.5164
2006cc	0.032612	18.1	la	16 09 56.47	07 35.9	17.1876	0.9124
2007cf	0.032836	17.9	la	15 23 07.66	8 31 45.5	17.1987	0.7013
2009ih	0.032882	17.3	laPec	15 55 31.05	56 54.0	17.2009	0.0991
2014dl	0.032966	16.5	laPec	16 29 46.09	8 38 30.6	17.2051	-0.7051
2013ed	0.033158	15.8	la	16 16 24.25	53 05.7	17.2145	-1.4145
2014cb	0.033183	16.4	la	14 50 49.90	-13 31 03.7	17.2157	-0.8157
2012M	0.033266	16.9	la	14 56 59.85	35 59.6	17.2197	-0.3197
2008af	0.033366	17.1	la	14 59 28.50	39 12.3	17.2246	-0.1246
2004ct	0.033373	17.5	la	15 43 45.75	24 59.5	17.2249	0.2751
2003ge	0.033453	17.8	la	16 20 08.75	47 53.7	17.2288	0.5712
2010ag	0.033803	18.6	laPec	17 03 53.63	30 06.2	17.2457	1.3543
2013cx	0.034	17.5	la	17 04 16.05	30 37.6	17.2551	0.2449
2012ds	0.03403	16.4	la	16 23 45.90	9 47 12.9	17.2565	-0.8565
2006R	0.034074	17.5	la	16 23 20.82	15 49.8	17.2586	0.2414
2011dl	0.0341	16.9	la	16 18 04.97	33 04.0	17.2599	-0.3599
2000cp	0.034223	18	la	16 05 27.62	49 48.8	17.2657	0.7343
2007hu	0.034257	17.3	la	16 56 29.96	58 40.4	17.2673	0.0327
2008dt	0.034257	17.2	la	16 56 30.56	58 33.2	17.2673	-0.0673
2008ek	0.034537	18.9	la	16 05 33.17	35 33.2	17.2805	1.6195
2001ck	0.034697	16.4	la	14 37 50.08	29 02.2	17.288	-0.888
2005be	0.034997	16.1	la	14 59 32.72	40 11.6	17.3019	-1.2019
2013eh	0.034997	16.6	la	16 16 09.19	32 53.0	17.3019	-0.7019
2013cv	0.035	16.5	laPec	16 22 43.18	57 35.4	17.3021	-0.8021

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Plot 5: RA 2..5 Data with Calculated sn_mag-Trend

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec	Trend Line	sn_mag-Trend
2014dg	0.004005	14.9	la	03 48 19.88	07 54.2	14.5005	0.3995
2006mr	0.005922	15.14	la	03 22 42.84	-37 12 28.5	15.0253	0.1147
2007on	0.006338	14.9	la	03 38 50.90	-35 34 30.0	15.1164	-0.2164
2012Z	0.007127	15.6	laPec	03 22 05.35	-15 23 15.6	15.2738	0.3262
2013ex	0.01043	15.6	la	05 32 46.62	-14 02 45.4	15.7847	-0.1847
2001eb	0.012652	16.3	la	04 30 45.10	0 52 17.9	16.0439	0.2561
2011U	0.01335	16.6	la	04 13 33.94	32 36.7	16.1159	0.4841
1998dj	0.013602	16	la	02 01 06.92	- 6 49 04.8	16.141	-0.141
1996by	0.013722	16.1	la	05 58 24.96	27 12.1	16.1528	-0.0528
2010it	0.013754	15.9	la	03 41 57.50	- 4 42 21.1	16.1559	-0.2559
2011dx	0.013854	16.5	laPec	03 37 05.61	- 5 01 56.3	16.1656	0.3344
2005el	0.01493	16	la	05 11 48.72	5 11 39.4	16.266	-0.266
2014H	0.015	16.3	la	03 37 01.41	05 01.0	16.2723	0.0277
2006dr	0.015124	16.1	la	03 17 14.19	-32 34 31.8	16.2833	-0.1833
2010ju	0.015244	16.7	la	05 41 55.99	29 51.0	16.2939	0.4061
2005ev	0.0154	16	la	02 31 04.93	42 06.5	16.3076	-0.3076
2012id	0.015748	16.3	la	04 42 41.13	34 59.8	16.3375	-0.0375
2012B	0.017341	16.4	la	03 51 34.52	04 42.9	16.4668	-0.0668
2012fx	0.017652	16.7	laPec	02 55 41.24	-27 25 26.7	16.4907	0.2093
2009le	0.017791	16.1	la	02 09 17.14	-23 24 44.8	16.5012	-0.4012
2002eh	0.017974	16.4	la	02 26 08.45	54 45.2	16.5149	-0.1149
1993Y	0.020009	17.1	la	03 31 24.41	45 02.6	16.6588	0.4412
2003hz	0.020173	16.7	la	05 48 07.86	15 22.8	16.6698	0.0302
2009hp	0.021016	16.7	la	02 58 23.96	6 35 35.1	16.7247	-0.0247
1997ej	0.022302	16.5	la	04 17 53.49	-56 36 58.2	16.8044	-0.3044
2014dn	0.022302	17.1	laPec	04 17 54.28	-56 36 45.2	16.8044	0.2956
2009jz	0.023959	17	laPec	05 40 05.29	-55 32 04.0	16.9006	0.0994
2009D	0.025053	16.5	la	03 54 22.83	-19 10 54.2	16.9605	-0.4605
2001dw	0.02544	16.6	la	03 00 47.88	46 27.5	16.981	-0.381
2011gs	0.027	17.4	la	04 21 09.99	28 04.4	17.0609	0.3391
2013D	0.027119	17.5	laPec	03 41 15.13	23 03.9	17.0668	0.4332
2010he	0.028412	16.8	la	02 49 10.80	-14 26 59.8	17.1293	-0.3293
2008gy	0.029	16.8	la	03 10 00.95	13 23.1	17.1568	-0.3568
2005eq	0.029026	17.2	laPec	03 08 49.31	- 7 01 59.7	17.158	0.042
2007so	0.02983	17	la	02 47 43.13	15 14.8	17.1946	-0.1946
2012eu	0.029937	17.3	la	03 13 04.16	- 8 23 31.7	17.1994	0.1006
2012gz	0.03	17.2	la	02 50 17.61	24 39.9	17.2023	-0.0023
2003ah	0.03	17	la	04 43 08.54	0 46 00.4	17.2023	-0.2023
2014I	0.03012	17	la	05 42 19.80	-25 32 39.9	17.2076	-0.2076

2005do	0.030471	17.4	la	03 02 00.42	34 34.2	17.2232	0.1768
2009aq	0.031	16.8	la	03 09 19.79	05 05.3	17.2462	-0.4462
2004gc	0.032088	17.4	la	05 21 49.95	6 40 33.7	17.2925	0.1075
2010hk	0.032102	17.6	la	03 37 52.61	4 56 52.2	17.2931	0.3069
2011ag	0.032343	17.3	la	03 12 26.55	15 06.4	17.3031	-0.0031
2006os	0.03281	17.2	la	02 55 01.01	00 34.8	17.3224	-0.1224
1999J	0.033299	17	laPec	05 35 32.27	-69 29 52.1	17.3422	-0.3422
2011ik	0.033758	17.2	la	02 25 04.09	12 51.9	17.3606	-0.1606
2013gv	0.03412	17.76	la	03 09 57.30	12 48.3	17.3749	0.3851
2003iv	0.034372	17.1	la	02 50 07.25	50 46.5	17.3848	-0.2848
2005eu	0.034897	17.6	la	02 27 43.26	10 36.6	17.4051	0.1949

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Plot 6: RA 14..17 Data with Calculated sn_mag-Trend

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec	Trend Line	sn_mag - Trend
2012ei	0.006417	14.7	la	14 24 05.76	02 56.5	14.5529	0.1471
1991M	0.007236	14.4	la	15 58 34.82	27 28.7	14.7476	-0.3476
2002er	0.008577	14.6	la	17 11 29.88	7 59 44.8	15.0231	-0.4231
2009mz	0.008713	14.7	la	14 03 24.64	- 6 03 31.3	15.0486	-0.3486
2009Y	0.009294	14.9	la	14 42 24.55	-17 14 46.3	15.1532	-0.2532
2010bp	0.009663	15.2	la	14 12 07.89	-49 23 43.3	15.2163	-0.0163
2013gn	0.010842	15.5	la	14 18 28.54	30 24.2	15.4029	0.0971
1999da	0.012275	16.1	la	17 35 22.96	48 49.3	15.6041	0.4959
1998D	0.012309	15.5	la	14 02 59.28	44 54.3	15.6085	-0.1085
2007ap	0.015444	15.5	la	15 56 23.06	30 57.9	15.9762	-0.4762
2013gz	0.016401	16.3	la	17 46 27.70	42 13.2	16.0737	0.2263
1997cn	0.016766	16.2	laPec	14 09 57.76	32 32.3	16.1093	0.0907
2011aj	0.017556	16.6	la	16 50 13.98	22 28.0	16.184	0.416
2012el	0.018175	16.4	la	15 39 57.23	-30 33 18.8	16.2401	0.1599
2009gf	0.018517	16.1	la	14 15 37.11	16 48.6	16.2703	-0.1703
2010gl	0.0188	15.8	la	16 31 38.62	37 26.2	16.2949	-0.4949
2004di	0.019767	16.8	la	15 55 41.00	51 49.0	16.3762	0.4238
2000Q	0.02	16	la	16 05 11.85	39 51.5	16.3952	-0.3952
2011is	0.020869	16.6	la	14 01 47.00	9 29 50.8	16.4641	0.1359
2014M	0.0222	16.3	la	15 15 17.18	29 09.7	16.5643	-0.2643
2009as	0.022572	16.7	la	14 47 26.64	-30 39 34.5	16.5912	0.1088

2006mp	0.023	16.7	laPec	17 12 00.20	33 20.8	16.6217	0.0783
2000cn	0.023449	16.6	la	17 57 40.42	49 58.1	16.653	-0.053
2011dz	0.024598	16.4	la	16 12 44.82	17 03.2	16.7305	-0.3305
2003ar	0.025214	16.8	la	16 02 08.11	24 55.5	16.7706	0.0294
2013dj	0.025304	16.6	laPec	16 46 01.94	6 27 59.3	16.7764	-0.1764
2002aw	0.026428	16.6	la	16 37 29.06	52 49.7	16.8468	-0.2468
2006dt	0.026468	16.8	la	14 35 43.11	8 17 55.8	16.8493	-0.0493
2012cx	0.027672	17.3	la	17 10 05.86	22 23.5	16.9214	0.3786
2011jt	0.027777	16.5	la	14 53 23.01	2 57 43.1	16.9275	-0.4275
2012ar	0.028259	16.6	la	16 20 36.02	-10 27 38.2	16.9554	-0.3554
2001U	0.028422	17.3	la	14 04 42.94	- 9 42 29.7	16.9647	0.3353
2011bz	0.028422	17.4	la	14 04 43.75	- 9 43 04.7	16.9647	0.4353
2014ac	0.028935	16.6	la	15 04 40.09	37 54.2	16.9937	-0.3937
1994Q	0.029477	17	la	16 49 51.15	25 55.9	17.0238	-0.0238
2010an	0.02952	17	la	16 17 40.46	00 10.1	17.0261	-0.0261
2003ia	0.02952	17.2	la	16 17 41.17	00 07.2	17.0261	0.1739
2010dd	0.02957	17.2	la	16 52 47.60	03 45.7	17.0289	0.1711
2008fn	0.029843	16.8	lb/c	16 21 48.53	03 41.0	17.0438	-0.2438
2003dw	0.02992	16.7	la	16 45 51.10	37 38.0	17.0479	-0.3479
2006bw	0.03	16.6	la	14 33 56.73	3 47 55.8	17.0523	-0.4523
2001ay	0.030242	16.7	la	14 26 17.00	14 55.8	17.0653	-0.3653
2012ci	0.030611	17.5	la	14 38 23.48	20 55.1	17.0849	0.4151
2009he	0.030647	17.5	laPec	16 22 12.33	16 22.5	17.0869	0.4131
1990O	0.030664	16.6	la	17 15 35.92	19 25.8	17.0878	-0.4878
2007ai	0.031661	17.3	la	16 12 53.74	-21 37 48.7	17.1396	0.1604
2013hm	0.031988	17	la	17 50 48.49	11 50.9	17.1563	-0.1563
2006bt	0.032155	17.4	la	15 56 30.53	02 45.6	17.1647	0.2353
2009ih	0.032882	17.3	laPec	15 55 31.05	56 54.0	17.2009	0.0991
2012M	0.033266	16.9	la	14 56 59.85	35 59.6	17.2197	-0.3197
2008af	0.033366	17.1	la	14 59 28.50	39 12.3	17.2246	-0.1246
2004ct	0.033373	17.5	la	15 43 45.75	24 59.5	17.2249	0.2751
2013cx	0.034	17.5	la	17 04 16.05	30 37.6	17.2551	0.2449
2006R	0.034074	17.5	la	16 23 20.82	15 49.8	17.2586	0.2414
2011dl	0.0341	16.9	la	16 18 04.97	33 04.0	17.2599	-0.3599
2007hu	0.034257	17.3	la	16 56 29.96	58 40.4	17.2673	0.0327
2008dt	0.034257	17.2	la	16 56 30.56	58 33.2	17.2673	-0.0673

Plots 7 and 8: sn_mag and Distance Modulus

Sequenc e	Redshif t	2<=RA<=5 sn_mag	14<=RA<=1 7 sn_mag	Dist. Modulus	exponent	parsecs/2	dist (LY)	km/year	km/s/MPC
1	0.001	12.94754068	11.30808329	1.639457385	1.327891477	10.63803663	34.67999941	23826467.33	2.461349516
2	0.002	13.80371608	12.4741648	1.329551281	1.265910256	9.223170997	30.06753745	20657532.03	2.133988466
3	0.003	14.30454658	13.15627875	1.148267831	1.229653566	8.484447575	27.65929909	19002981.47	1.963068154
4	0.004	14.65989147	13.6402463	1.019645176	1.203929035	7.996483392	26.06853586	17910067.14	1.850166644
5	0.005	14.93551839	14.01564069	0.919877695	1.183975539	7.637400112	24.89792437	17105812.9	1.767084635
6	0.006	15.16072198	14.32236025	0.838361727	1.167672345	7.356010655	23.98059474	16475572.86	1.701978842
7	0.007	15.3511289	14.58168794	0.769440958	1.153888192	7.126203101	23.23142211	15960863.01	1.648807686
8	0.008	15.51606687	14.8063278	0.709739072	1.141947814	6.932946019	22.60140402	15528016.83	1.604093304
9	0.009	15.66155248	15.0044742	0.657078277	1.131415655	6.766836133	22.05988579	15155973.39	1.565660039
10	0.01	15.79169379	15.1817222	0.60997159	1.121994318	6.621621043	21.5864846	14830728.92	1.532061255
11	0.011	15.90942092	15.34206251	0.567358409	1.113471682	6.492944432	21.16699885	14542526.38	1.502289021
12	0.012	16.01689737	15.48844175	0.528455622	1.105691124	6.377656563	20.7911604	14284311.2	1.475614575
13	0.013	16.11576613	15.6230976	0.492668528	1.098533706	6.273410548	20.45131839	14050826.92	1.45149491
14	0.014	16.20730429	15.74776944	0.459534853	1.091906971	6.17841356	20.1416282	13838058.09	1.429515216
15	0.015	16.29252429	15.86383615	0.42868814	1.085737628	6.091266943	19.85753023	13642872.07	1.409351882
16	0.016	16.37224227	15.9724093	0.399832968	1.079966594	6.010859792	19.59540292	13462780.72	1.390747875
17	0.017	16.4471258	16.0743981	0.372727699	1.07454554	5.936295948	19.35232479	13295776.88	1.37349585
18	0.018	16.51772787	16.1705557	0.347172172	1.069434434	5.866842627	19.12590696	13140219.29	1.357426259
19	0.019	16.58451171	16.26151299	0.322998718	1.064599744	5.801893437	18.9141726	12994749.8	1.3423988
20	0.02	16.64786918	16.3478037	0.300065486	1.060013097	5.740941236	18.71546843	12858232.54	1.328296134
21	0.021	16.70813479	16.42988339	0.278251403	1.055650281	5.683557852	18.5283986	12729708.52	1.315019195
22	0.022	16.76559632	16.50814401	0.257452304	1.051490461	5.629378696	18.35177455	12608361.13	1.302483627
23	0.023	16.82050313	16.58292521	0.237577921	1.047515584	5.578090918	18.18457639	12493489.7	1.290617043
24	0.024	16.87307277	16.65452325	0.218549518	1.043709904	5.529424187	18.02592285	12384488.73	1.279356898
25	0.025	16.9234961	16.72319809	0.200298004	1.040059601	5.483143413	17.87504753	12280831.69	1.268648798
26	0.026	16.97194152	16.7891791	0.182762423	1.036552485	5.439042958	17.73128004	12182058.01	1.258445164
27	0.027	17.01855838	16.85266965	0.165888722	1.033177744	5.396941975	17.59403084	12087762.63	1.248704153

28	0.028	17.0634796 9	16.9138509 4	0.14962874 9	1.02992575	5.35668062 9	17.4627788 5	11997587.5 7	1.23938878 3
29	0.029	17.1068244 9	16.9728850 7	0.13393942	1.02678788 4	5.31811700 7	17.3370614 4	11911214.9 7	1.23046622
30	0.03	17.1486996 9	17.0299176 5	0.11878203 6	1.02375640 7	5.28112456 8	17.2164660 9	11828361.4 1	1.22190718 6
31	0.031	17.1892016 7	17.0850799 7	0.10412170 6	1.02082434 1	5.24559003 4	17.1006235 1	11748773.1 9	1.21368547 1
32	0.032	17.2284176 7	17.1384908	0.08992686 3	1.01798537 3	5.21141162	16.9892018 8	11672222.3 3	1.20577752 4
33	0.033	17.2664268 2	17.1902579 6	0.07616885 5	1.01523377 1	5.17849755 1	16.8819020 2	11598503.2 8	1.19816211 3
34	0.034	17.3033012	17.2404796	0.06282159 5	1.01256431 9	5.14676481 4	16.7784533	11527430.1	1.19082002 9
35	0.035	17.3391066	17.2892453 4	0.04986126 7	1.00997225 3	5.11613808 6	16.6786101 6	11458834.1 1	1.18373384 5

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Plot 9: RA 8..11 sn_mag-Redshift Relation

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec
2014J*	0.00075	11.4	la	09 55 42.15	40 25.9
1999by*	0.00212	13.1	laPec	09 21 52.07	00 06.5
2011by*	0.002836	14.2	la	11 55 45.56	19 33.8
1998bu*	0.002974	11.9	la	10 46 46.03	50 07.1
2006mq	0.003228	12.7	la:	08 06 12.39	-27 33 45.4
2001dp	0.003508	14.4	la	11 53 45.22	20 56.8
2012ht	0.003572	15.9	la	10 53 22.71	46 34.8
1998aq	0.003701	12.4	la	11 56 25.81	07 41.6
2003cg	0.004133	14.1		10 14 15.99	3 28 02.1
1994ae	0.004274	13.2	la	10 47 01.95	16 31.1
2002cv	0.004377	16.6	la	10 18 03.68	50 06.0
2002bo	0.004377	13.8	la	10 18 06.51	49 41.4
1993Z	0.004523	13.9	la	09 10 19.60	7 01 40.3
2011B	0.004613	15.4	la	08 55 48.10	13 01.5
1995al	0.005134	13.4	la	09 50 55.97	33 09.4
2007sa	0.0052	14.2	la	11 03 10.78	13 26.3
1992G	0.005295	13.6	la	10 36 18.52	19 14.0
2014ad	0.0053	14.56	lcPec:	11 57 44.44	-10 10 15.7
2001fu	0.005653	15.1	la	08 52 16.58	-17 44 29.8
2011ae	0.006047	15.3	la	11 54 49.25	-16 51 43.6
2007bm	0.006222	16	la	11 25 02.30	- 9 47 53.8
2010fz	0.00631	15.8	la	09 42 04.77	0 19 51.0
1995D	0.006572	13.4	la	09 40 54.79	5 08 26.6
2011eh	0.006741	14.6	laPec	11 18 31.57	58 36.9
2011at	0.006755	14.5	la	09 28 57.56	-14 48 20.6
2002hl	0.006898	16.3	la	11 24 40.12	46 03.0
2007ax	0.007058	16.4	la	08 22 43.26	33 16.9
2001bg	0.007184	13.7	la	08 35 18.86	28 05.8
1996Z	0.007595	14.6	la	09 36 44.82	-21 08 51.7
1999gh	0.007778	14.7	la	09 44 19.75	-21 16 25.0
2005am	0.007906	14	la	09 16 12.77	-16 18 16.2
2013cg	0.007912	13.98	la	09 26 56.77	-24 46 59.6
2010hg	0.008241	13.9	la	09 46 13.70	-30 27 13.3
2007cj	0.008264	15.7	la	09 59 55.76	-29 37 03.3
2008fw	0.008484	14	la	10 28 55.97	-44 39 55.6
1998cn	0.008992	15.8	la	11 35 54.40	32 10.2
2004bd	0.009024	14.3	la	11 39 42.18	54 31.8
2010ev	0.009182	14.3	la	10 25 29.01	-39 49 51.0
2013eu	0.009253	15.4	la	10 24 22.31	36 23.5
2010hx	0.009259	15.2	la	10 28 51.06	-35 36 22.3

2012gl	0.009361	16.1	la	10 12 50.32	40 56.7
2008fv	0.009395	16.1	la	10 16 57.28	24 36.4
1997bq	0.009395	14.5	la	10 17 05.33	23 02.1
2013E	0.00942	14	la	10 00 05.54	-34 14 01.1
2003aa	0.010133	15.9	laPec	10 46 36.82	45 32.2
1997ei	0.010599	16.3	lc	11 54 59.98	29 26.4
2011ao	0.010693	15.6	la	11 53 51.03	21 46.3
2004gi	0.010811	14.9	la	10 39 23.34	-27 54 40.0
2010Y	0.010865	15.9	la	10 51 03.95	46 47.0
2012ij	0.010997	16.6	la	11 40 15.84	27 22.2
2014K	0.011625	16.4	la	08 51 08.19	50 33.4
2009kq	0.011693	16.7	la	08 36 15.09	04 01.7
2007al	0.012078	16.6	laPec	09 59 18.48	-19 28 25.8
2011ic	0.012122	16	la	10 15 33.21	-20 34 06.0
2008hv	0.012622	16.8	la	09 07 34.06	3 23 32.1
1993C	0.012785	18	la	09 40 23.82	56 11.6
2013hh	0.012981	15.9	laPec	11 29 04.39	14 09.2
2011hr	0.01332	16	laPec	08 54 46.03	32 16.1
2005as	0.013425	15.9	la	10 48 03.52	-20 50 56.5
2008bi	0.013445	15.9	la	08 35 53.39	0 42 23.1
2006ou	0.013483	16	la	11 37 13.10	26 07.3
2001fe	0.013545	14.9	la	09 37 57.06	29 41.5
2013gq	0.013772	15.2	la	08 17 53.46	28 10.5
2007S	0.013883	16.7	laPec	10 00 31.26	4 24 26.2
2014ao	0.014077	15.3	la	08 34 33.32	- 2 32 36.3
1999aa	0.014383	14.8	laPec	08 27 42.12	29 15.5
2009lp	0.015	16.5	la	10 37 28.45	-27 39 18.9
2001V	0.015018	14.5	la	11 57 24.93	12 09.0
2008bc	0.015087	15.2	la	09 38 31.23	-63 58 25.6
2013eg	0.01521	17.2	la	10 43 28.19	-25 51 52.6
2010H	0.015283	15.2	la	08 06 24.36	1 02 09.1
2013fg	0.015341	15.4	la	08 21 22.44	-13 18 37.0
2008bt	0.01536	16.5	lbPec	10 50 16.93	-12 06 31.8
2001L	0.015452	15.4	la	11 36 48.83	- 8 35 07.0
2013H	0.015547	16.5	la	09 06 30.70	-75 49 01.5
2010ja	0.015555	17.9	la	08 02 28.39	9 23 40.9
2010jq	0.015951	17.1	la	10 36 36.40	-27 28 44.5
2001er	0.01615	17.2	la	09 53 20.66	50 44.8
2000ce	0.016304	16.6	la	08 05 09.45	47 15.2
2009U	0.016505	15.8	laPec	11 43 18.72	-12 52 46.1
2003jz	0.016513	16	la	09 46 28.67	45 04.7
2012gw	0.016574	14.8	la	10 10 09.14	-38 08 05.1
2001G	0.016694	14.2	la	09 09 33.18	16 51.3
2006ax	0.016811	16.5	la	11 24 03.46	-12 17 29.2
2013gs	0.016888	16.2	la	09 31 08.83	23 05.3
2003Y	0.016932	16.7	la	08 54 34.60	10 19.8

2014aa	0.01695	15.2	la	11 45 03.56	58 25.3
1999gj	0.016968	17.3	la	10 29 19.20	06 20.2
1991K	0.016998	18	la:	09 20 30.47	-16 30 01.7
2007as	0.017095	15.8	la	09 27 36.01	-80 10 39.2
2011hd	0.017139	16	la	09 58 48.30	47 03.3
1999bh	0.017198	16.8	la	10 54 46.97	17 20.0
2006hn	0.017198	15.5	la	11 07 18.67	41 49.8
2002jm	0.018012	17.5	laPec	10 19 25.20	- 5 39 14.5
2007ci	0.018132	17.5	la	11 45 45.85	46 13.9
2002au	0.018392	17.3	la:	09 34 37.57	5 50 15.7
1999gd	0.018491	16.6	la	08 38 24.61	45 33.1
2011ia	0.019	15.3	la	09 45 03.45	15 35.5
2009ds	0.019204	15.9	la	11 49 04.12	- 9 43 44.9
2001E	0.019204	15.5	la	11 49 05.00	- 9 44 10.9
2004fw	0.019269	18.3	la	08 52 14.55	53 30.4
2005ki	0.01954	17.7	la	10 40 28.22	9 12 08.4
2009mh	0.019739	16.6	la	11 43 55.93	46 55.2
2003cp	0.01977	16.2	la	08 09 11.13	41 14.0
2008as	0.019787	16.2	la	10 21 47.89	-19 29 42.0
2005lt	0.019931	15.7	la	11 42 26.21	07 05.0
2012cv	0.02	16.3	la	09 58 28.91	-10 53 12.5
2003af	0.02	15.6	la	11 10 21.69	24 50.9
2003W	0.02007	16.9	la	09 46 49.48	02 37.6
2013G	0.02068	15.6	la	11 53 21.40	45 07.9
2001P	0.02068	17.5	la	11 53 21.56	44 53.3
2006oq	0.020734	15.8	la	11 44 00.07	58 38.3
2007bc	0.020818	16	la	11 19 14.57	48 32.5
2009na	0.020916	15.3	la	10 47 01.42	32 38.1
2006or	0.020963	16.3	la	11 48 03.47	21 24.0
2001N	0.020974	16.3	la	10 39 58.08	05 26.0
2008Z	0.020991	17.2	la	09 43 15.25	17 03.9
2014ah	0.021026	15.4	la	11 55 30.86	55 26.3
2004bg	0.021028	15.5	la	11 21 01.53	20 23.4
2009cz	0.021167	16	la	09 15 00.02	44 07.1
2010iw	0.021487	16.3	laPec	08 45 15.01	49 21.8
2012cy	0.021735	16.8	la	10 55 21.80	7 41 50.4
2009lu	0.021763	18	la	10 54 20.96	- 4 20 39.1
2003D	0.021938	17.5	laPec	09 38 53.52	- 4 51 05.1
2008ia	0.022	15.1	la	08 50 35.15	-61 16 40.6
2009al	0.022086	15.8	la	10 51 22.08	8 34 42.4
2014ae	0.022225	15.2	la	11 19 20.95	48 57.3
2004at	0.022335	17.2	la	10 58 45.18	29 12.0
2006ar	0.022478	18.2	la	10 37 30.75	00 58.1
2003ag	0.022851	16.1	la	11 26 01.82	1 59 02.8
2014ai	0.022902	17.23	la	09 19 44.19	45 49.5
2002hv	0.023367	18.6	la	09 22 10.91	50 10.8

2014ap	0.023516	15.7	la	11 30 13.28	10 06.2
2004av	0.023641	15.8	la	11 40 57.84	-22 28 53.6
2003ik	0.023733	16.6	la	08 04 06.52	59 19.8
1996V	0.023789	16.5	la	11 21 31.23	2 48 40.4
1994K	0.023833	17.5	la	10 00 24.61	52 31.7
2004bc	0.023916	16.5	la	10 59 31.41	11 28.9
2004ap	0.023939	16.5	la	10 05 43.81	16 17.1
2013C	0.023956	16.7	la	11 05 55.24	31 20.3
2007kd	0.024183	16.3	la	09 25 58.01	37 59.3
2002bf	0.024396	16.6	la	10 15 42.31	40 06.7
2013P	0.02454	16.7	la	09 13 37.17	59 58.6
2005M	0.024552	18.2	la	09 37 32.36	12 02.7
2002he	0.024563	16.1	laPec:	08 19 58.83	49 13.2
2012hj	0.024597	17.7	la	11 07 19.23	22 46.1
2011C	0.024757	15.4	la	11 17 54.88	- 2 05 45.2
2006bb	0.024983	17.3	la	08 33 31.09	31 04.1
2010jn	0.025052	16.9	la	09 37 30.26	09 33.4
1999X	0.025084	16.3	la	08 54 32.23	30 41.1
2009P	0.02513	16.1	laPec	11 20 38.78	- 3 32 46.3
2014R	0.025148	17.7	la	09 30 12.30	51 13.4
2005ms	0.025204	17.1	la	08 49 14.34	07 47.9
2005mc	0.025236	16.5	la	08 27 06.36	38 45.6
2008gf	0.025441	16.7	ll	09 44 31.40	45 31.1
2013ah	0.025441	18.6	la	09 44 33.89	45 44.1
2003eh	0.025514	17.6	la	11 08 24.34	3 29 47.0
2013N	0.025558	15.9	la	11 50 04.13	16 46.0
2001gb	0.025731	16.8	la	09 59 00.96	49 12.4
2013hl	0.026128	16.9	la	11 50 00.17	20 17.2
2010lq	0.026366	15.2	la	08 32 41.03	-24 02 46.2
2004gs	0.026645	17.1	la	08 38 23.18	37 39.8
2013V	0.026762	17.5	la	09 08 41.54	48 49.2
2008hp	0.027	16.4	la	09 43 26.22	10 21.9
2002bn	0.027241	16.3	la	11 32 39.04	56 54.2
2009mx	0.027245	18.1	laPec	09 20 37.72	38 52.9
1999at	0.027298	18.8	la	10 23 11.30	59 06.0
1993D	0.027318	18	la	11 28 58.81	-22 29 06.2
2003bt	0.027515	16.7	la	10 55 22.48	- 7 39 12.3
2009aa	0.027732	17.4	la	11 23 42.28	-22 16 14.5
2005km	0.027789	17.3	la	11 20 48.72	17 25.2
2012cm	0.028202	16.5	la	09 10 05.45	12 45.1
2013gb	0.028289	16.1	la	08 58 52.50	34 59.9
2005F	0.028573	17.7	la	09 04 53.68	33 56.3
2004az	0.028824	17.8	la	11 52 48.22	20 51.7
2004ck	0.029266	19.8	la	10 14 35.20	52 05.7
2001ba	0.02956	15.9	la	11 38 01.76	-32 19 51.0
2006qo	0.029703	18.5	la:	08 00 08.37	22 07.7

2007uz	0.029743	18	la	11 20 51.63	-29 24 16.5
1997bz	0.029847	17.5	la	11 22 25.46	1 11 21.5
2004bp	0.029962	18	la	11 09 53.25	00 06.4
2003ap	0.03	16.7	la	09 50 52.83	-21 51 10.1
2011J	0.03	18.8	la	10 50 44.20	00 49.0
2013ao	0.03	17	la	11 44 44.74	-20 31 41.1
2008ae	0.030083	17.8	laPec	09 56 03.20	29 58.8
2002ar	0.030094	16.5	la	11 37 43.92	00 34.4
2008bd	0.030104	16.7	la	10 18 23.32	-13 06 11.2
2007V	0.030327	16.7	la	10 27 05.58	- 3 18 05.1
2001ie	0.030787	16.1	la	10 16 50.70	16 44.5
2007ux	0.030915	15.7	la	10 09 19.98	59 32.8
2007bd	0.031018	17.6	la	08 31 33.28	- 1 11 58.0
2004as	0.031021	17.2	la	11 25 39.18	49 49.4
2006te	0.031545	15.8	la	08 11 42.99	33 16.8
2011ho	0.031832	18.3	la	11 44 12.95	30 58.1
2003ae	0.031998	17.1	la	09 28 22.58	26 40.7
1999am	0.032062	17.8	la	08 24 10.88	06 58.6
2004H	0.032065	17.6	la	11 33 59.77	03 46.5
2004L	0.032253	16.8	la	10 27 04.11	01 07.3
2011bg	0.03226	16.3	laPec	11 56 14.31	21 11.9
2012ce	0.032939	16.6	la	11 13 49.46	-29 55 32.0
2003kc	0.033166	18.1	la	09 46 34.32	39 19.0
2003cq	0.033209	17	la	11 56 14.16	31 19.3
2012if	0.033357	18.2	la	11 17 30.29	24 07.4
2003bf	0.033583	17.2	la	08 08 26.35	19 56.2
2011be	0.033957	17.1	la	09 22 52.62	59 15.7
2008E	0.034	18	la	11 25 36.95	08 25.9
2002br	0.034183	17	la	10 34 08.92	42 20.9
2008cz	0.034233	18.1	la	11 23 10.90	12 51.0
2013U	0.034527	16.6	laPec	10 01 12.00	0 19 42.3
2009ee	0.034895	17.3	la	11 21 25.30	20 23.3
2002hd	0.035	18	la	08 54 03.39	- 7 11 21.5
2008at	0.035	16.5	la	10 27 12.35	24 56.4
2007qc	0.035	16.8	la	11 57 04.75	29 55.3

* Removed to create roughly equivalent ranges for comparison

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Plot 10: RA 20..23 sn_mag-Redshift Relation

sn_name	redshift	sn_mag	sn_type	sn_ra	sn_dec
2013dy	0.003874	16.3	la	22 18 17.60	34 09.5
2008ha	0.004658	18.2	laPec	23 34 52.69	13 35.4
2000E	0.00475	13.8	la	20 37 13.77	05 50.2

2011dm	0.004917	16.5	la	21 56 41.59	17 48.9
2014ck	0.005116	16.1	laPec	22 45 38.77	09 43.1
2014ba	0.00584	14.7	laPec	22 55 01.97	-39 39 34.5
1993L	0.006417	14	la	22 57 52.87	-35 51 27.0
2007kg	0.006671	17.17	la	23 58 37.43	59 06.7
2007le	0.006724	14.9	la	23 38 48.41	- 6 31 21.3
1997dt	0.007312	15.3	la	23 00 02.93	58 50.9
2005dc	0.007391	15.7	la	21 42 22.66	-44 47 21.2
2010bv	0.008652	15.4	la	22 14 01.90	-26 55 44.5
2013gh	0.008789	15.9	la	22 02 21.85	-18 55 00.4
2004eq	0.008832	13.4	la	21 57 09.46	-34 34 51.3
1998dh	0.008936	13.9	la	23 14 40.31	4 32 14.1
2004fu	0.009215	16.5	la	20 35 11.58	48 26.1
2002ge	0.010013	14.1	la	22 54 21.49	-45 20 26.9
2012dn	0.01018	16.3	la	20 23 36.26	-28 16 43.4
2002cd	0.01034	16.4	la	20 23 34.42	20 47.4
2008cc	0.010453	16	la	21 03 29.62	-67 11 01.1
2004bv	0.010515	15.3	la	20 25 06.34	-24 48 53.7
2006bh	0.010834	14.6	la	22 40 16.10	-66 29 06.3
2004db	0.011177	17.7	la	22 47 55.88	-22 19 40.6
1999ee	0.011406	14.6	la	22 16 10.00	-36 50 39.7
2002dp	0.011634	15.1	la	23 28 30.12	25 38.8
2012ah	0.012271	14.8	la	23 25 59.63	-81 54 33.3
2003dt	0.014088	17.5	la	20 47 17.56	0 18 42.8
2002ha	0.014088	14.5	la	20 47 18.58	0 18 45.6
1991ag	0.014223	14.7	la	20 00 08.63	-55 22 03.3
2007hj	0.014252	15.7	la	23 01 47.89	35 11.4
2008ea	0.014511	17.5	ll	23 20 22.60	19 10.6
2014ci	0.014526	16.3	la	22 34 04.53	26 25.4
2012fz	0.014596	14.5	la	20 03 24.84	-55 57 19.2
1992al	0.0146	14.6	la	20 45 56.45	-51 23 40.0
2012gm	0.014786	15.9	la	23 17 37.05	00 08.8
2014cg	0.014913	17.8	la	20 04 34.84	44 16.8
2002jg	0.014987	15.8	la	22 19 28.80	23 04.5
2005kc	0.015138	18	la	22 34 07.34	5 34 06.3
2013fa	0.015513	15.6	la	20 43 53.56	30 52.0
2009nq	0.015626	15.2	la	23 15 16.97	01 22.5
2003gt	0.015657	16.4	la	20 32 59.12	9 52 19.3
2013ga	0.015684	15.7	la	22 04 21.56	44 33.6
2004eo	0.015701	16.2	la	20 32 54.19	9 55 42.7
2003ep	0.015705	15.7	la	21 21 07.34	05 05.8
2012ig	0.015737	16.2	la	21 14 22.85	14 40.4
2004ey	0.015844	16	la	21 49 07.81	0 26 39.2
2004da	0.016031	15.2	laPec	20 22 21.24	6 25 50.3
1990R	0.016051	17.5	la	21 12 20.90	36 37.0
2009fk	0.016181	18.5	la	22 44 23.90	- 0 09 42.0

2011im	0.016181	16.9	la	22 44 25.21	- 0 10 02.0
2002dl	0.016261	17.7	laPec	22 20 53.96	17 33.7
2006cm	0.016335	16.6	laPec	21 20 17.46	- 1 41 02.7
2006B	0.016357	16.5	la	23 21 09.78	24 01.2
1996ca	0.016365	16.5	la	22 30 59.26	-13 59 50.9
2008ec	0.016382	17.3	la	23 03 16.56	8 52 19.8
2009jr	0.016548	16	la	20 26 26.03	2 54 32.1
2013fw	0.016957	16.2	la	21 13 44.78	34 33.3
2001da	0.017195	16.3	la	23 53 32.78	8 07 02.6
2006ch	0.017244	16.6	la	23 47 06.12	28 50.6
2013Q	0.017244	15.6	la	23 47 07.84	29 11.5
2007fs	0.017306	15.3	la	22 01 40.44	-21 30 29.6
2013ei	0.017407	16	la	21 26 31.93	10 49.4
2007cs	0.017558	15.9	la	23 49 39.00	55 52.1
2004ca	0.017805	18	la	21 43 32.84	41 33.0
2003gl	0.017936	18.2	la	23 53 53.99	7 57 23.7
2010im	0.018	16.3	la	20 11 31.59	-45 41 57.8
2007fb	0.018012	15.6	la	23 56 52.37	5 30 31.8
2012co	0.018199	17.2	la	21 44 08.52	14 50.9
1998co	0.018205	16	la	21 47 36.24	-13 10 52.3
2009hk	0.018346	16.9	la	20 38 37.42	-25 06 56.0
2006bn	0.018516	18.4	la	20 00 15.75	-38 34 18.3
2012fw	0.018586	15.3	la	21 01 58.98	-48 16 26.4
2001iq	0.018599	16.6	la	22 25 10.42	43 04.2
2012gb	0.018633	16.4	laPec	22 15 42.78	14 37.7
2012bl	0.018702	15.4	la	20 23 55.28	-48 21 17.3
2011gu	0.019033	16.9	laPec	23 06 02.81	06 36.3
2008ff	0.019193	15.5	la	20 13 59.96	-44 21 07.8
2004fa	0.019363	16.8	la	20 22 35.00	-29 49 20.7
2001ib	0.019616	15.3	la	22 15 38.58	17 56.0
2001dd	0.019686	16.4	la	20 30 54.08	- 0 39 26.9
2013hq	0.019933	16.3	la	22 24 13.19	05 00.7
2000ey	0.020407	15.4	la	23 19 25.20	5 54 21.1
2011fs	0.021026	15.8	la	22 17 19.52	34 49.9
2007B	0.021097	16.7	la	22 35 31.10	48 06.6
2001dl	0.021167	16.1	la	21 21 01.73	9 10 50.4
2003gq	0.021439	17.5	laPec	22 53 20.71	07 57.6
2002dr	0.021931	17	la	22 51 01.00	22 23.0
1999do	0.021932	14.9	la	22 53 29.87	38 42.9
2013em	0.022005	15.7	la	23 02 26.64	31 31.3
2009gg	0.022015	15.8	la	21 01 29.91	-52 01 00.2
2006dm	0.02214	16.9	la	23 41 47.84	- 3 40 08.4
2010ex	0.022809	15.8	la	23 00 10.90	05 57.2
2011ff	0.023272	16.8	la	22 45 02.88	00 15.7
2002el	0.023299	17	la	20 56 30.09	-18 33 34.3
2006eu	0.023586	17.2	la	20 02 51.15	19 02.3

2002ef	0.023624	16.2	la	23 51 29.54	-13 22 46.4
2009in	0.023673	16.3	laPec	23 22 35.32	-13 05 43.6
2002dx	0.023677	18.8	la	23 57 06.73	50 15.5
2013di	0.023813	16.6	la	22 36 27.53	36 54.6
2000fo	0.023849	16.5	la	22 58 25.34	38 26.6
2007qe	0.024	17	la	23 54 12.98	24 33.4
2013dt	0.024132	16.7	la	22 44 35.45	3 38 37.2
1998eg	0.024757	15.5	la	22 39 30.32	8 36 20.8
2012et	0.024965	16.6	la	23 42 38.88	05 31.1
2002dm	0.025174	19.6	la	20 32 07.30	-57 35 03.4
2008ct	0.025316	19	la:	22 02 24.48	19 21.4
2005di	0.025318	18.3	la	22 25 32.84	-24 14 20.1
2003he	0.025514	18.1	la	23 58 57.05	- 2 14 53.1
2003gr	0.025654	16.3	la	23 38 12.67	-20 46 56.0
2005er	0.02591	18.4	laPec	22 50 00.84	37 05.7
2007cq	0.025917	15.8	la	22 14 40.43	5 04 48.9
2003kg	0.025979	16.6	la	22 03 34.64	06 10.6
2010ii	0.026928	18	la	22 38 13.18	29 30.0
2012ee	0.027125	15.4	la	20 45 15.28	- 5 37 22.1
2013fn	0.027132	17.3	la	21 00 23.74	-14 29 52.0
2002et	0.027432	16.5	la	20 08 31.02	-25 27 37.5
2010cq	0.027472	16.4	la	21 01 44.10	-14 38 30.5
2002eb	0.027539	17.6	la	22 19 05.24	35 39.8
2011gf	0.027655	16.1	la	21 12 24.27	- 7 48 52.1
2007su	0.027862	16.9	la	22 19 08.88	10 40.3
2013hp	0.027935	17.4	la	23 13 59.72	53 38.6
2013ey	0.027942	15.9	la	20 58 03.73	03 10.6
2009fw	0.028272	16.1	la	20 32 18.50	-19 43 59.6
2006do	0.028426	16.7	la	23 32 03.08	-27 43 31.8
2012eo	0.028546	17.2	la	22 14 37.82	57 18.4
2002df	0.028679	17.1	la	20 45 39.33	- 4 57 04.7
2006ev	0.028728	16.6	la	21 30 59.26	59 21.2
2008cv	0.02876	17	la	21 04 55.31	-21 43 49.5
2000A	0.028899	15.5	la	23 27 58.90	8 47 02.1
1992bb	0.028913	17.5	la	21 18 14.86	- 7 35 03.5
1993ah	0.029285	16.3	la:	23 51 50.27	-27 57 47.0
2011hb	0.029522	17.3	la	23 27 55.51	8 46 45.7
2001dt	0.029757	18.2	la	23 22 19.17	09 25.3
2007oo	0.029757	18.8	la	23 22 19.50	09 20.0
2011hv	0.029813	17.4	la	23 18 16.55	0 15 43.1
2007dz	0.03	17.9	la	21 45 16.26	02 48.6
2010hj	0.03	17.1	la	21 49 09.84	-59 02 23.2
2012go	0.03	16.5	la	22 41 51.81	58 07.0
2006rb	0.03	17.7	la	23 35 25.09	7 06 46.4
2007rx	0.03	17.2	la	23 40 11.74	25 16.5
1991bf	0.030091	17.5	la	23 52 15.36	-29 26 29.2

2004fg	0.030132	18.2	la	23 47 24.45	23 22.4
2000cw	0.030132	17.2	la	23 47 25.10	23 15.8
2010dl	0.0302	16.4	la	21 35 00.97	- 0 30 47.8
2000ej	0.030361	18	la	21 20 15.66	- 4 52 40.5
2005mu	0.030401	17.4	la	21 35 52.50	-26 27 03.5
2006ha	0.03047	18.4	la	22 58 34.30	10 25.8
2013fy	0.030958	15.5	la	21 37 27.13	-47 01 55.6
2004ef	0.030974	17.5	la	22 42 10.00	59 40.3
2005cg	0.030988	17.7	la	21 10 50.42	0 12 07.4
2011ie	0.031	16.7	la	23 00 54.71	50 32.3
2011L	0.031	17	la	23 40 11.52	25 42.2
2001de	0.031064	17.2	la	22 34 18.06	24 54.7
2001fg	0.031101	17.9	la	21 12 45.23	- 0 52 36.2
2013cy	0.031465	16.8	la	22 10 34.23	-22 39 47.8
2006en	0.031938	15.2	la	23 10 05.06	13 24.0
2014at	0.031982	16.4	la	21 46 14.82	-46 31 21.1
2000dn	0.032065	17.3	la	23 05 05.86	- 3 12 01.0
1990ab	0.032829	18	la	21 54 04.01	-40 04 16.1
2006dv	0.032999	17.5	la	23 15 53.06	5 07 50.2
2013fj	0.033453	16.7	la	22 15 28.48	34 03.6
2007ob	0.033926	17	la	23 12 25.99	54 49.3
2011hc	0.034	16.4	la	20 12 10.07	-11 21 57.7
1997dg	0.034	16.4	la	23 40 14.21	12 11.8
2005iq	0.034043	17	la	23 58 32.50	-18 42 33.0
2006op	0.03409	21.6	la:	21 21 31.86	0 59 35.9
2004bz	0.034168	18.3	la	22 15 01.05	24 16.6
2003gj	0.034335	17.6	la	21 07 19.18	-25 29 23.6
2010ij	0.03441	15.9	la	22 20 20.19	03 22.2
2003gn	0.034451	18.1	la	22 33 51.68	48 08.5
2006gr	0.034597	18.3	la	22 32 22.67	49 43.3

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Plot 11: Cohort sn_mag-Redshift Mean Trend Comparison

sn_rs	RA 2-5 sn_mag	RA 8-11 sn_mag	RA14-17 sn_mag	RA20-23 sn_mag	RA 2-5 Δ distmod	RA 8-11 Δ distmod	RA 14-17 Δ distmod	RA 20-23 Δ distmod
0.001	12.947540 68	11.911306 34	11.308083 29	13.105051 06	0	0	0	0
0.002	13.803716 08	12.923533 28	12.474164 8	13.914716 28	0.8561753 97	1.0122269 38	1.1660815 02	0.8096652 22
0.003	14.304546 58	13.555450 65	13.156278 75	14.388340 07	0.5008305 02	0.6319173 71	0.6821139 51	0.4736237 93
0.004	14.659891 47	14.003803 16	13.640246 3	14.724381 5	0.3553448 96	0.4483525 1	0.4839675 5	0.3360414 29
0.005	14.935518 39	14.351572 38	14.015640 69	14.985035 48	0.2756269 15	0.3477692 25	0.3753943 96	0.2606539 82
0.006	15.160721 98	14.635720 53	14.322360 25	15.198005 29	0.2252035 87	0.2841481 46	0.3067195 55	0.2129698 1
0.007	15.351128 9	14.875964 37	14.581687 94	15.378068 7	0.1904069 2	0.2402438 35	0.2593276 89	0.1800634 09
0.008	15.516066 87	15.084073 04	14.806327 8	15.534046 72	0.1649379 76	0.2081086 75	0.2246398 62	0.1559780 2
0.009	15.661552 48	15.267637 9	15.004474 2	15.671629 09	0.1454856 06	0.1835648 61	0.1981464 01	0.1375823 64
0.01	15.791693 79	15.431842 27	15.181722 2	15.794700 71	0.1301413 09	0.1642043 64	0.1772479 95	0.1230716 18
0.011	15.909420 92	15.580383 18	15.342062 51	15.906032 53	0.1177271 34	0.1485409 15	0.1603403 15	0.1113318 21
0.012	16.016897 37	15.715990 41	15.488441 75	16.007670 52	0.1074764 53	0.1356072 31	0.1463792 4	0.1016379 89
0.013	16.115766 13	15.840736 97	15.623097 6	16.101168 4	0.0988687 53	0.1247465 6	0.1346558 47	0.0934978 87
0.014	16.207304 29	15.956234 25	15.747769 44	16.187733 93	0.0915381 67	0.1154972 75	0.1246718 42	0.0865655 22
0.015	16.292524 29	16.063759 64	15.863836 15	16.268324 5	0.0852199 95	0.1075253 9	0.1160667 08	0.0805905 73
0.016	16.372242 27	16.164342 92	15.972409 3	16.343711 95	0.0797179 81	0.1005832 85	0.1085731 54	0.0753874 47
0.017	16.447125 8	16.258826 39	16.074398 1	16.414527 57	0.0748835 33	0.0944834 73	0.1019888 01	0.0708156 21
0.018	16.517727 87	16.347907 78	16.170555 7	16.481294 31	0.0706020 73	0.0890813 88	0.0961576	0.0667667 43
0.019	16.584511 71	16.432171 55	16.261512 99	16.544450 23	0.0667838 32	0.0842637 64	0.0909572 86	0.0631559 21
0.02	16.647869 18	16.512112 15	16.347803 7	16.604365 93	0.0633574 77	0.0799405 99	0.0862907 09	0.0599156 97
0.021	16.708134 79	16.588151 62	16.429883 39	16.661357 72	0.0602656 11	0.0760394 71	0.0820796 93	0.0569917 91
0.022	16.765596 32	16.660653 06	16.508144 01	16.715697 75	0.0574615 23	0.0725014 44	0.0782606 22	0.0543400 3
0.023	16.820503 13	16.729931 13	16.582925 21	16.767621 85	0.0549068 17	0.0692780 72	0.0747812	0.0519241 04

0.024	16.873072 77	16.796260 29	16.654523 25	16.817335 74	0.0525696 36	0.0663291 59	0.0715980 39	0.0497138 86
0.025	16.923496 1	16.859881 37	16.723198 09	16.865019 91	0.0504233 28	0.0636210 78	0.0686748 41	0.0476841 72
0.026	16.971941 52	16.921006 85	16.789179 1	16.910833 62	0.0484454 25	0.0611254 81	0.0659810 06	0.0458137 15
0.027	17.018558 38	16.979825 15	16.852669 65	16.954918 1	0.0466168 53	0.0588183 01	0.0634905 54	0.0440844 77
0.028	17.063479 69	17.036504 13	16.913850 94	16.997399 15	0.0449213 14	0.0566789 73	0.0611812 88	0.0424810 45
0.029	17.106824 49	17.091193 95	16.972885 07	17.038389 32	0.0433447 98	0.0546898 22	0.0590341 27	0.0409901 71
0.03	17.148699 69	17.144029 52	17.029917 65	17.077989 72	0.0418751 97	0.0528355 68	0.0570325 8	0.0396004 03
0.031	17.189201 67	17.195132 46	17.085079 97	17.116291 51	0.0405019 89	0.0511029 39	0.0551623 19	0.0383017 92
0.032	17.228417 67	17.244612 8	17.138490 8	17.153377 17	0.0392159 92	0.0494803 46	0.0534108 35	0.0370856 55
0.033	17.266426 82	17.292570 43	17.190257 96	17.189321 54	0.0380091 53	0.0479576 3	0.0517671 61	0.0359443 74
0.034	17.303301 2	17.339096 28	17.240479 6	17.224192 79	0.0368743 8	0.0465258 43	0.0502216 4	0.0348712 46
0.035	17.339106 6	17.384273 35	17.289245 34	17.258053 13	0.0358054 06	0.0451770 76	0.0487657 33	0.0338603 42

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6.2 EDD Data

All data below is directly from or calculated from the Extragalactic Distance Database.

Legend for the header nomenclature of the following tables:

1PGC	- Principal Galactic Catalog identification of the brightest member of the associated group
Dcmb	- Radial velocity of galaxy in CMB reference frame
D	- Distance Mpc
DE	- Declination J200
Dhel	- Heliocentric radial velocity
HelioRS	- Heliocentric redshift
MPC	- Megaparsec, 3.262 million lightyears
RA	- Right ascension J2000
RSexp	- Expected redshift $H_0=70.5$ Kps/MPC
Vexp	- Expected velocity $H_0=70.5$ Kps/MPC
Vhel	- Heliocentric velocity
Vpwf	- Peculiar velocity following Watkins & Feldman (2014)
ΔV	- Change in Velocity

Plots 12 and 13: RA2 Distance-Heliocentric Redshift and Velocity Relation

1PGC	RA	DE	D	Vhel	Vpwf	Vhel +Vpwf	HelioRS
10854	42.9696	-1.1728	13.8	1506	130	1636	0.005457117
8631	33.8649	6.0022	15.3	1560	75	1635	0.005453781
9126	36.1034	-2.1624	16.5	1338	-54	1284	0.00428297
11202	44.4723	-2.3465	16.6	1671	114	1785	0.005954128
10966	43.6398	-10.0283	16.9	1496	20	1516	0.005056839
9843	38.8661	-9.3564	17.8	1469	-32	1437	0.004793323
7900	31.1309	-6.199	18.4	1363	-104	1259	0.004199578
10464	41.4996	-7.5786	19.1	1402	-91	1311	0.004373032
9354	36.8877	-10.1658	19.4	2106	217	2323	0.007748706
8232	32.3678	-9.68	20.6	2006	102	2108	0.007031542
8673	34.0435	-11.9268	20.8	1906	53	1959	0.006534531
10381	41.0864	0.6751	22.4	2773	474	3247	0.010830843
8160	32.088	10.995	23.2	1735	-101	1634	0.005450446
8762	34.4517	-6.8324	24.3	2164	52	2216	0.007391792
11248	44.6011	-4.2956	24.5	2366	166	2532	0.008445856
8788	34.5633	13.2043	25.3	3617	854	4471	0.014913673
9028	35.6253	-0.6173	26.1	1538	-229	1309	0.004366361
8913	35.1217	6.8104	26.2	1619	-211	1408	0.00469659
11153	44.2876	1.3263	28.6	1776	-206	1570	0.005236964
9347	36.8567	2.105	28.8	2876	241	3117	0.010397209
8974	35.4019	-5.5214	28.9	2341	-20	2321	0.007742034
10507	41.6414	-0.2471	29.4	2769	173	2942	0.009813471
9272	36.5887	-9.8407	31	2108	-165	1943	0.00648116
11252	44.5921	3.8627	32.6	3053	205	3258	0.010867535
8207	32.2689	5.1129	32.7	3379	339	3718	0.012401932
11245	44.59	-2.0426	32.9	2515	-52	2463	0.008215696

9988	39.5483	-1.3187	32.9	2562	-43	2519	0.008402492
10072	39.8693	12.6805	34.3	3556	391	3947	0.013165795
8360	32.7833	3.8525	35.5	3266	172	3438	0.011467951
10942	43.5114	2.9621	35.9	3042	78	3120	0.010407216
10658	42.2231	8.4058	36	3548	320	3868	0.012902279
10928	43.4222	13.0141	36.3	3604	345	3949	0.013172466
9869	39.004	0.4202	36.9	2619	-140	2479	0.008269067
8530	33.4014	10.3358	37.1	3599	285	3884	0.012955649
11156	44.2948	2.7751	37.4	3188	96	3284	0.010954262
8754	34.3862	-11.5188	38.8	3975	428	4403	0.01468685
7714	30.4632	-10.4676	40.3	4736	797	5533	0.01845613
10313	40.8722	-14.7544	41.2	2101	-392	1709	0.005700619
7806	30.758	-9.657	41.2	3863	264	4127	0.013766211
11274	44.7334	-12.3985	41.7	3941	319	4260	0.014209852
8258	32.4618	-7.7625	41.9	3929	272	4201	0.014013049
9721	38.316	-11.7451	42.5	4478	562	5040	0.016811656
8752	34.4074	12.5089	42.5	3616	95	3711	0.012378582
8163	32.1026	14.9718	44.5	4438	430	4868	0.016237925
8739	34.3595	14.5801	44.8	4001	202	4203	0.01401972
7856	30.9576	14.7391	45.2	3632	9	3641	0.012145087
9923	39.2443	-5.3492	46.1	4410	376	4786	0.015964402
8251	32.4139	-6.9222	46.2	4870	606	5476	0.018265998
9120	36.0744	6.4819	46.2	6220	1458	7678	0.02561109
8775	34.4984	14.5441	46.6	3812	48	3860	0.012875594
8986	35.4466	-10.0237	47.2	5221	778	5999	0.020010541
10597	42.0253	-13.9586	47.3	4197	235	4432	0.014783583
9016	35.5553	12.0301	47.5	3814	22	3836	0.012795538
8566	33.5394	-6.8063	48	2147	-518	1629	0.005433767
7917	31.1826	8.5431	48.2	3514	-133	3381	0.011277819
11335	44.9584	3.0829	49.3	6072	1226	7298	0.024343545
11075	43.9886	0.6926	49.5	4146	127	4273	0.014253216
10048	39.7991	10.8468	50.2	3554	-161	3393	0.011317847
8196	32.2344	7.9714	50.5	3461	-218	3243	0.0108175
8173	32.1348	6.3238	51.1	3386	-262	3124	0.010420558
9206	36.3749	11.4715	51.6	3779	-119	3660	0.012208465
10038	39.7411	-14.3206	53.6	4561	182	4743	0.015820969
10659	42.2451	3.1686	53.6	4175	2	4177	0.013932994
8313	32.6382	0.7381	53.8	3716	-211	3505	0.011691439
8075	31.7553	8.1304	53.8	3450	-309	3141	0.010477264
9861	38.9358	-13.6549	55.1	4614	150	4764	0.015891018
10815	42.7891	2.5938	57.1	4504	33	4537	0.015133826
7741	30.5514	-0.1006	58.4	5887	652	6539	0.02181179
10031	39.7319	9.0973	58.7	5128	263	5391	0.017982468
10817	42.7921	-6.7064	59	6909	1270	8179	0.027282249
9631	37.9401	5.5968	60.1	6050	690	6740	0.022482254
7839	30.8979	4.7857	60.9	4747	-8	4739	0.015807627
7649	30.2454	8.3111	61.5	4743	-29	4714	0.015724235
8165	32.1041	14.3495	61.8	4431	-163	4268	0.014236537
8302	32.5939	1.2012	62.3	3540	-485	3055	0.010190399
9800	38.6022	-10.8437	63.4	4601	-124	4477	0.014933687
10413	41.2829	-13.2368	63.8	4319	-240	4079	0.0136061

8260	32.4748	10.9611	64.4	4583	-179	4404	0.014690185
11112	44.1131	0.8757	64.7	6869	979	7848	0.02617815
10327	40.9299	7.6915	65.6	6395	661	7056	0.023536319
7995	31.4525	-5.2939	65.9	5090	-11	5079	0.016941746
10631	42.1444	6.5221	66.2	5961	412	6373	0.021258072
10748	42.4944	-12.1638	66.8	4158	-377	3781	0.012612078
10392	41.1795	5.3354	66.8	6521	682	7203	0.024026658
8581	33.6084	-7.3681	68.4	4922	-154	4768	0.01590436
10125	40.105	-5.4403	68.5	7077	923	8000	0.026685168
8841	34.7715	-6.7908	69.3	5180	-71	5109	0.017041816
9321	36.7512	-2.6947	70	4481	-360	4121	0.013746197
9575	37.7142	3.8553	70	6466	519	6985	0.023299488
10351	41.0014	5.4299	70.1	7328	997	8325	0.027769253
9069	35.8051	-4.5172	71.9	5274	-110	5164	0.017225276
8589	33.6264	-13.2634	72.1	5010	-221	4789	0.015974409
10766	42.574	-8.5972	72.3	5254	-114	5140	0.017145221
8255	32.4368	7.3174	72.6	7295	848	8143	0.027162166
10566	41.9078	4.6376	72.9	6409	389	6798	0.022675722
7889	31.0791	-8.7353	73.6	5341	-141	5200	0.017345359
9560	37.6782	-2.939	74.1	5775	41	5816	0.019400117
8400	32.9331	-6.4901	74.3	5039	-277	4762	0.015884346
8270	32.4816	10.7619	75.5	6814	475	7289	0.024313524
8406	33.0008	14.0163	75.6	4416	-532	3884	0.012955649
10215	40.4758	5.9481	76	6378	259	6637	0.022138683
9735	38.3448	9.6017	76	6069	110	6179	0.020610957
11067	43.9536	1.0782	76.7	5012	-337	4675	0.015594145
10068	39.9048	10.8436	77.1	8578	1421	9999	0.033353125
10166	40.2302	8.5958	77.8	5477	-197	5280	0.017612211
10913	43.3396	6.5395	78.1	5431	-219	5212	0.017385387
8686	34.0839	-10.9997	78.8	5918	-51	5867	0.019570235
11198	44.457	-10.1677	80.7	4591	-575	4016	0.013395955
9917	39.2364	5.4523	80.7	6395	105	6500	0.021681699
10498	41.6054	3.6072	82.2	6797	248	7045	0.023499626
7812	30.7718	2.6142	82.5	6364	17	6381	0.021284757
9248	36.4863	-4.3159	82.6	5516	-322	5194	0.017325346
10559	41.8661	-0.2851	83.3	6501	75	6576	0.021935208
9997	39.5814	2.1192	83.3	6574	101	6675	0.022265437
10915	43.3507	9.4314	83.3	7479	549	8028	0.026778566
8318	32.6573	5.87	84.1	4566	-682	3884	0.012955649
9894	39.0984	0.7086	85.7	6585	30	6615	0.022065299
11120	44.1508	2.2346	86.9	6705	56	6761	0.022552303
10891	43.2157	-1.2746	87.1	6912	141	7053	0.023526312
10315	40.8804	0.3068	88.1	8003	636	8639	0.028816646
9813	38.6491	1.3477	88.5	7306	267	7573	0.025260848
8039	31.6081	3.706	88.9	9571	1455	11026	0.036778833
10933	43.4684	2.2907	90.1	6728	-39	6689	0.022312136
9745	38.3794	6.5277	90.3	8277	685	8962	0.02989406
8635	33.9081	1.662	90.9	9053	1072	10125	0.033773416
10500	41.6022	-1.7425	91	6870	-8	6862	0.022889203
10246	40.5958	-3.1075	91.4	6893	-13	6880	0.022949245
7951	31.3083	9.9253	91.4	7735	355	8090	0.026985377

8369	32.8071	-1.4855	92.4	8107	508	8615	0.028736591
10416	41.2912	-4.7109	92.6	7890	415	8305	0.02770254
11188	44.4234	6.0261	94.3	7305	85	7390	0.024650424
9256	36.528	-0.3319	94.4	6344	-335	6009	0.020043897
10794	42.6842	-6.7459	94.8	6987	-71	6916	0.023069328
9266	36.5624	10.4149	97.5	11910	2523	14433	0.048143379
9915	39.2319	11.087	97.5	7908	245	8153	0.027195522
8518	33.368	4.0064	100.2	9394	883	10277	0.034280434
11061	43.9342	-14.2077	101	8831	595	9426	0.0314418
9598	37.859	1.3462	101.1	7296	-146	7150	0.023849869
8904	35.0831	8.0382	101.6	7183	-214	6969	0.023246117
10429	41.3526	2.8806	103.5	6788	-410	6378	0.02127475
11099	44.0736	4.5293	103.5	8190	187	8377	0.027942707
7800	30.7288	7.5239	104.4	7592	-137	7455	0.024867241
10862	43.0146	12.1361	104.9	8223	151	8374	0.0279327
9973	39.4947	-1.8442	105.1	8574	302	8876	0.029607194
7963	31.3374	8.5261	105.4	5759	-819	4940	0.016478091
8662	34.0234	5.1454	106.4	9033	467	9500	0.031688637
8293	32.5675	7.8453	106.9	7275	-334	6941	0.023152719
8838	34.7379	4.815	107.8	5803	-857	4946	0.016498105
10251	40.6392	-9.4678	109.4	9056	395	9451	0.031525191
10372	41.0818	9.7559	110.9	7985	-146	7839	0.026148129
8056	31.6533	1.5158	111.4	6818	-625	6193	0.020657656
9292	36.6555	12.1554	112.4	8258	-84	8174	0.027265571
8950	35.3269	13.7179	112.9	7837	-279	7558	0.025210813
8026	31.5808	9.2274	113.8	9209	290	9499	0.031685302
10857	42.9774	0.6648	114	8778	110	8888	0.029647222
9100	35.9738	-7.3524	116.9	9474	324	9798	0.03268266
10633	42.1605	-7.9511	117.4	9223	203	9426	0.0314418
8489	33.2971	9.511	119.3	8209	-319	7890	0.026318247
10664	42.2672	-14.4705	120.2	8504	-195	8309	0.027715883
10542	41.7782	-2.9725	120.4	7582	-571	7011	0.023386214
8079	31.8011	8.978	120.4	8026	-425	7601	0.025354246
9118	36.0516	5.373	121	8269	-337	7932	0.026458344
8632	33.8745	13.8592	123.3	6581	-979	5602	0.018686289
10716	42.4167	-0.0698	123.5	8445	-324	8121	0.027088782
10677	42.2936	-10.6801	125	10086	358	10444	0.034837487
7776	30.6495	4.1513	125.5	9586	75	9661	0.032225676
10190	40.3243	-9.9326	126.7	10979	732	11711	0.039063751
7574	30.0203	-0.2791	126.7	8329	-483	7846	0.026171479
8563	33.525	-12.8202	127.6	9658	56	9714	0.032402466
7930	31.2114	11.4228	128.5	7812	-717	7095	0.023666409
10781	42.6486	13.3351	128.5	7622	-763	6859	0.022879196
10198	40.3596	-13.1283	131.5	10348	258	10606	0.035377862
10308	40.808	-8.125	131.6	9229	-241	8988	0.029980787
8261	32.4729	11.3466	137	10918	315	11233	0.037469312
9048	35.7323	14.4768	139.6	12057	793	12850	0.042863052
8593	33.6495	-7.3101	145.5	12637	875	13512	0.045071249
10738	42.5368	12.8437	148.1	10281	-292	9989	0.033319768
10958	43.6196	14.1551	151.6	12551	630	13181	0.043967151
9648	38.0296	-1.362	151.9	11331	36	11367	0.037916289

11241	44.5742	-4.8186	153.2	9367	-777	8590	0.0286532
9552	37.6413	-4.6248	155.5	8934	-995	7939	0.026481694
8498	33.2953	-6.3408	171.2	12990	166	13156	0.043883759
9767	38.4748	9.6318	175.7	12137	-338	11799	0.039357288
9376	36.9644	0.5015	180.6	12254	-434	11820	0.039427336
10232	40.542	-5.5686	196.2	9206	-1801	7405	0.024700459

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Plots 14, and 15 RA14 Distance-Heliocentric Redshift and Velocity Relation

1PGC	RA	DE	D	Vhel	Vpwf	Vhel + Vpwf	HelioRS
50961	213.9853	23.0556	2.2	160	133	293	0.000979042
51207	214.936	9.3623	11.1	1273	400	1673	0.005590232
51604	216.795	5.1336	13.6	1574	461	2035	0.006799834
51846	217.6642	7.275	15	1364	247	1611	0.005383063
50807	213.4053	-17.9836	15.2	1456	314	1770	0.005914352
51523	216.4392	-5.4018	15.9	1718	436	2154	0.007197466
51351	215.6142	15.085	15.9	2281	824	3105	0.010375177
51953	218.1072	8.0785	17.1	2206	689	2895	0.009673474
52809	221.8509	-17.4461	17.5	2172	636	2808	0.009382769
51685	217.0767	13.7802	17.8	1318	103	1421	0.004748189
51973	218.1825	9.8913	18.1	1380	121	1501	0.005015504
51449	216.1014	8.276	18.7	1256	45	1301	0.004347216
52178	218.952	3.0384	18.9	1778	311	2089	0.006980272
50317	211.632	6.029	19.1	1015	-59	956	0.003194418
52730	221.5208	-18.0215	19.2	2208	565	2773	0.009265818
52273	219.421	2.2909	19.3	1693	246	1939	0.006479056
50676	212.9087	-1.1605	19.8	1535	156	1691	0.005650378
50334	211.6689	22.0701	20.1	2323	597	2920	0.00975701
53247	223.49	3.5443	20.2	1609	150	1759	0.005877596
50895	213.7179	25.3174	20.3	1039	-101	938	0.003134273
50194	211.1971	8.8007	21	1214	-38	1176	0.003929536
51245	215.142	-29.2418	22.4	1347	-33	1314	0.004390655
51587	216.7491	8.6836	22.6	1335	-48	1287	0.004300436
51344	215.5991	-0.3876	23.4	1632	65	1697	0.005670427
51400	215.8632	1.7262	23.7	1397	-49	1348	0.004504264
53499	224.5944	-1.0909	24.1	1893	143	2036	0.006803176
52507	220.5285	-9.0095	24.4	1850	126	1976	0.006602689
51233	215.0828	3.9333	24.9	1579	-8	1571	0.005249405
53417	224.1718	-17.2439	26	1903	83	1986	0.006636104
51787	217.4184	3.2333	26	1663	-13	1650	0.005513379
52991	222.6519	-18.1512	27.7	2946	594	3540	0.011828704
52455	220.2348	-0.3181	27.8	1771	-29	1742	0.005820792
52825	221.8905	-14.8536	28.3	2083	93	2176	0.007270978
52324	219.6114	-22.3675	28.4	2428	270	2698	0.00901521
50587	212.5537	-2.5759	28.5	1612	-98	1514	0.005058943
52665	221.2334	1.9547	28.5	1699	-83	1616	0.00539977
52159	218.8886	12.908	28.5	1852	-21	1831	0.00611818

53463	224.4084	29.9686	29.3	1796	-92	1704	0.005693817
51780	217.3942	-0.0181	29.4	1557	-151	1406	0.004698067
53035	222.8014	-20.4407	29.6	3265	701	3966	0.013252159
52193	219.0362	28.4502	30.7	1909	-77	1832	0.006121522
51445	216.0546	-16.7232	30.8	2691	323	3014	0.010071106
51105	214.6241	26.2879	31.5	4455	1405	5860	0.01958085
53415	224.1608	-16.4878	32.7	2422	94	2516	0.008407068
52563	220.7335	-18.4447	33.1	3949	631	4580	0.015303804
51984	218.223	11.5949	33.1	2209	-8	2201	0.007354514
51291	215.3428	-3.7588	33.3	2737	249	2986	0.009977546
52824	221.8905	-19.7642	33.8	2571	132	2703	0.009031917
52016	218.3398	6.8773	33.8	2153	-52	2101	0.007020369
52212	219.1706	11.577	33.9	1787	-199	1588	0.00530621
52802	221.7795	-13.3203	35.1	1982	-158	1824	0.00609479
51782	217.4185	4.0626	35.9	2369	-23	2346	0.007839023
49939	210.3929	-23.1385	36.4	3027	290	3317	0.011083563
52521	220.5996	-17.253	37.2	2920	185	3105	0.010375177
52811	221.857	-13.7161	38.9	2662	2	2664	0.008901601
51229	215.0601	-29.7475	39.8	3885	607	4492	0.015009757
50120	210.9699	-10.1406	40	3297	292	3589	0.011992435
53303	223.6693	-17.4056	40.6	3042	112	3154	0.010538908
50176	211.1535	27.9017	41.2	4568	943	5511	0.018414686
52587	220.8528	28.301	41.2	3776	447	4223	0.014110909
50323	211.6456	-5.453	42.9	2894	-5	2889	0.009653426
51851	217.6804	-27.4542	43.1	4421	768	5189	0.017338742
51471	216.1783	-3.2122	43.5	2748	-94	2654	0.008868187
50613	212.6468	19.6123	43.9	2258	-290	1968	0.006575958
51404	215.903	-5.9827	45.2	2728	-149	2579	0.008617579
51253	215.1921	21.9357	45.4	4652	792	5444	0.01819081
51103	214.606	25.5017	46.2	4457	636	5093	0.017017964
53093	223.0433	-10.7404	48	2581	-289	2292	0.007658585
51912	217.9686	8.9329	48	2177	-408	1769	0.005911011
49882	210.1908	2.0219	48.2	3593	138	3731	0.01246692
51921	217.9891	6.2503	48.3	2363	-362	2001	0.006686225
51982	218.2204	-12.9756	48.6	4145	382	4527	0.015126707
50488	212.2374	16.4416	49.5	5079	871	5950	0.019881579
52795	221.7892	24.836	49.5	4451	477	4928	0.016466626
50599	212.6018	16.1125	49.6	2347	-393	1954	0.006529177
53456	224.3745	-18.4533	49.8	3801	152	3953	0.01320872
51332	215.5446	13.9179	50	2291	-420	1871	0.006251838
50236	211.319	10.4311	50.6	5371	1009	6380	0.021318399
50252	211.3798	12.4465	51.1	4208	324	4532	0.015143415
53183	223.2826	-19.7369	51.6	3977	173	4150	0.013866984
52488	220.4291	5.9526	51.9	4588	478	5066	0.016927745
53519	224.7058	-26.148	53.3	2536	-435	2101	0.007020369
52411	220.0473	-25.7766	53.6	3477	-107	3370	0.011260659
49838	210.0603	8.9671	53.8	4106	182	4288	0.014328103
51621	216.8707	29.9519	53.8	4369	274	4643	0.015514315
50024	210.6864	23.8402	54.3	4824	512	5336	0.017829934
51520	216.4142	25.3783	56.1	4994	518	5512	0.018418028
52151	218.8917	22.7327	56.3	6077	1131	7208	0.024085113

52383	219.9052	24.5384	56.9	4482	219	4701	0.015708118
51144	214.7558	24.9435	57.4	5362	671	6033	0.020158919
52224	219.1912	-27.8461	57.9	4761	337	5098	0.017034671
51059	214.4524	-13.8729	59	4688	277	4965	0.016590259
51428	215.9793	-28.688	60.1	4366	77	4443	0.014846026
50463	212.1475	11.951	60.4	5810	819	6629	0.022150418
50294	211.5272	11.7891	60.6	4772	257	5029	0.016804111
50596	212.5956	16.3359	60.9	5154	432	5586	0.018665294
51254	215.2044	25.9589	60.9	4464	79	4543	0.015180171
51758	217.3191	28.8218	61.5	4162	-78	4084	0.013646449
50776	213.2862	20.4163	61.8	4835	234	5069	0.016937769
51450	216.0954	24.614	62.1	5062	325	5387	0.018000348
51090	214.5621	0.891	63.2	7790	1927	9717	0.032468791
49887	210.2186	6.4863	63.2	4341	-22	4319	0.014431688
50590	212.5782	5.5761	63.8	5905	731	6636	0.022173808
50889	213.7097	15.1467	63.9	4660	85	4745	0.015855142
50939	213.8913	-20.6624	64.1	4621	69	4690	0.015671363
51805	217.4949	-26.8102	64.5	6438	991	7429	0.024823572
52363	219.803	15.8774	64.5	5497	455	5952	0.019888262
50462	212.1364	3.0245	64.7	5263	358	5621	0.018782245
50713	213.0663	15.8796	64.7	5250	340	5590	0.01867866
53243	223.4686	15.1878	65.3	6351	882	7233	0.024168649
52218	219.186	21.073	65.6	5436	380	5816	0.019433826
52514	220.5531	-18.79	65.9	4208	-175	4033	0.013476035
52012	218.3356	26.2077	65.9	4788	56	4844	0.016185945
52006	218.316	-1.1401	66.2	4131	-211	3920	0.013098452
50495	212.2596	14.3169	66.5	5227	266	5493	0.01835454
52390	219.9389	23.3966	66.5	4473	-100	4373	0.014612125
50014	210.6474	14.5351	67.1	4002	-280	3722	0.012436847
51483	216.2358	25.0247	67.1	4455	-121	4334	0.014481809
51002	214.1964	23.0026	67.7	4601	-73	4528	0.015130049
50474	212.1594	-29.572	68	4732	-11	4721	0.015774947
51717	217.162	10.205	68	8087	1849	9936	0.033200567
50098	210.9009	15.2734	68	4120	-262	3858	0.012891283
53075	222.9472	-7.2326	68.7	4593	-105	4488	0.014996391
49976	210.5148	9.9292	68.7	4236	-231	4005	0.013382475
50915	213.7987	15.7421	69.1	5323	215	5538	0.018504905
51706	217.1324	27.4089	69.1	4313	-238	4075	0.013616376
50314	211.593	16.4835	69.2	4126	-293	3833	0.012807747
52989	222.6422	24.8215	69.3	6193	619	6812	0.022761902
51670	217.0419	26.9358	69.3	4422	-202	4220	0.014100885
50558	212.4888	17.5454	69.5	5050	77	5127	0.017131573
51317	215.4676	23.517	70.4	5125	67	5192	0.017348766
51603	216.799	-2.2624	70.6	7132	1134	8266	0.027620359
53439	224.2947	17.1878	70.6	6261	608	6869	0.022952364
53069	222.9354	-22.6779	70.9	4527	-200	4327	0.014458419
52821	221.8896	-20.4675	71.1	6820	917	7737	0.025852736
53124	223.1269	29.8073	71.1	6889	923	7812	0.026103344
53412	224.139	-24.5021	71.3	6851	920	7771	0.025966345
53546	224.8437	-20.0192	71.3	4157	-352	3805	0.012714186
50455	212.1213	7.0578	71.3	5941	455	6396	0.021371862

50897	213.7167	14.1258	71.3	4970	-15	4955	0.016556845
52805	221.8353	23.9503	71.3	4467	-246	4221	0.014104226
51201	214.9179	17.8546	71.4	5633	280	5913	0.019757946
49995	210.5544	8.0369	71.7	4742	-117	4625	0.015454169
52553	220.7001	-19.8976	72.1	6012	444	6456	0.021572349
52258	219.3354	18.2493	72.6	5830	324	6154	0.020563233
50045	210.7672	28.0334	72.6	4621	-209	4412	0.014742442
51321	215.4702	24.1073	72.9	5252	43	5295	0.017692935
52239	219.2716	24.9781	74.3	4359	-365	3994	0.013345719
52829	221.9032	-19.3875	74.6	6891	810	7701	0.025732444
52339	219.6951	7.6174	74.6	5512	110	5622	0.018785586
50121	210.9996	-14.6169	74.8	4887	-145	4742	0.015845117
50074	210.8382	-26.56	75	6642	683	7325	0.024476062
52906	222.2538	-20.8474	75	6107	382	6489	0.021682616
53320	223.7484	18.0374	75.1	6064	337	6401	0.02138857
50980	214.0598	25.5457	75.3	5197	-56	5141	0.017178353
53490	224.5347	3.4234	75.6	6455	524	6979	0.023319923
50464	212.1375	11.8163	76	5707	167	5874	0.01962763
50946	213.9134	14.2827	76.7	5525	56	5581	0.018648587
52949	222.4152	23.5608	77.4	5285	-97	5188	0.017335401
52774	221.7219	-27.7151	77.8	4780	-296	4484	0.014983025
50016	210.6744	1.8898	77.8	7063	802	7865	0.026280441
51569	216.6549	11.4038	77.8	7561	1060	8621	0.028806571
50378	211.8337	-28.9698	77.9	6804	647	7451	0.024897084
51197	214.9162	19.9449	77.9	5454	-23	5431	0.018147371
51997	218.3106	13.8426	79.2	5235	-156	5079	0.016971183
52832	221.927	9.6594	79.6	8586	1576	10162	0.033955733
53524	224.7326	11.6507	79.8	8605	1569	10174	0.03399583
50382	211.8549	14.9195	79.9	7661	1033	8694	0.029050496
51958	218.1362	5.6709	81.4	6998	602	7600	0.025394958
49924	210.3555	-0.6238	82	7421	829	8250	0.027566896
52630	221.0297	18.0127	82.2	9638	2112	11750	0.039261942
50028	210.7026	9.3413	82.3	6258	215	6473	0.021629153
52059	218.5186	-7.6756	82.4	6878	508	7386	0.02467989
50882	213.6705	13.3781	82.9	4956	-362	4594	0.015350584
53470	224.437	6.6269	83.7	6437	223	6660	0.022254003
49913	210.2937	7.482	83.7	7107	589	7696	0.025715737
52093	218.6324	19.7416	83.7	5533	-173	5360	0.017910129
52049	218.4846	-16.5809	83.9	6714	370	7084	0.023670774
52280	219.4609	5.0112	84.1	7549	788	8337	0.027857601
50215	211.2508	13.1318	85.1	5191	-328	4863	0.016249432
50318	211.6345	12.712	85.3	6604	274	6878	0.022982437
51498	216.3047	13.7446	85.7	5564	-209	5355	0.017893421
50722	213.0678	29.9075	85.7	4369	-639	3730	0.012463578
51699	217.1073	17.9243	85.9	5711	-159	5552	0.018551685
51756	217.317	-27.138	86.1	5058	-411	4647	0.015527681
50987	214.0986	-21.3309	86.1	6412	159	6571	0.021956615
52710	221.4289	-22.458	86.9	5636	-217	5419	0.018107274
52279	219.4489	21.3586	86.9	5427	-309	5118	0.0171015
52833	221.9261	18.502	87.3	5969	-104	5865	0.019597557
52823	221.8889	-19.3299	87.7	5978	-100	5878	0.019640995

50567	212.5167	10.1653	87.7	7630	705	8335	0.027850918
50784	213.3171	27.0079	87.7	5290	-377	4913	0.016416504
52190	219.0385	21.7935	88.2	5632	-266	5366	0.017930177
50652	212.8221	-25.0363	88.5	6561	148	6709	0.022417734
51768	217.3416	-22.9287	88.5	7800	757	8557	0.028592718
51406	215.9109	-13.338	88.5	6470	104	6574	0.021966639
50762	213.2337	-28.7741	88.7	7886	801	8687	0.029027106
50459	212.1279	8.9319	88.8	7151	420	7571	0.025298057
52635	221.0616	22.7477	89.7	5274	-446	4828	0.016132481
52667	221.2535	26.3012	90.3	9248	1464	10712	0.035793526
51883	217.8251	7.9446	90.5	8060	810	8870	0.02963859
50648	212.8056	11.3727	90.5	7238	396	7634	0.025508567
51890	217.8438	-28.7496	90.9	6568	58	6626	0.022140394
51113	214.6482	14.2784	90.9	7714	614	8328	0.027827528
52624	221.0362	1.1953	91.4	8410	963	9373	0.031319335
50341	211.7129	9.3211	91.4	7206	354	7560	0.025261301
51900	217.8738	-22.3672	92.2	7226	325	7551	0.025231228
51423	215.961	6.5759	92.2	7223	325	7548	0.025221203
53143	223.1825	6.9023	92.2	8718	1090	9808	0.032772862
51834	217.6065	11.9281	92.7	7927	654	8581	0.028672913
53376	223.9683	24.7197	93.1	4845	-678	4167	0.013923788
53430	224.2458	-2.1144	94.9	6958	94	7052	0.023563848
53453	224.3636	-21.6653	95	7853	520	8373	0.027977893
51205	214.9267	11.6246	95.9	7226	199	7425	0.024810206
50630	212.7387	6.3648	96.1	5895	-365	5530	0.018478174
51107	214.6107	-27.3788	96.3	6862	24	6886	0.023009169
51557	216.6279	5.9762	96.6	7695	401	8096	0.027052314
51638	216.9168	6.0414	96.6	7311	216	7527	0.025151033
51437	216.0378	12.2584	96.6	7864	482	8346	0.027887674
52139	218.849	9.4649	97	8140	600	8740	0.029204202
52103	218.6797	-25.4437	97.5	6817	-39	6778	0.022648293
50354	211.7668	10.6429	97.5	6867	-7	6860	0.022922291
50115	210.9469	15.7284	97.5	6886	-1	6885	0.023005827
49917	210.3173	15.7768	97.5	7851	452	8303	0.027743992
51633	216.8988	8.1248	97.9	7728	368	8096	0.027052314
50639	212.7688	25.698	98.6	9448	1241	10689	0.035716672
53291	223.6463	23.6433	98.8	5318	-666	4652	0.015544388
52752	221.6301	1.2748	99	8235	571	8806	0.029424737
51573	216.6693	-3.4228	99.3	7104	37	7141	0.023861237
50343	211.7148	-1.5407	99.5	8806	878	9684	0.032358523
50017	210.6595	18.5232	99.7	7048	-4	7044	0.023537117
53135	223.158	6.2607	100.2	8422	617	9039	0.030203293
53418	224.1507	9.3698	100.2	8620	715	9335	0.03119236
50696	212.9546	21.3764	100.6	8474	638	9112	0.030447219
52014	218.3373	0.8373	100.9	10223	1604	11827	0.039519233
51703	217.1388	3.262	101.1	8088	433	8521	0.028472426
51327	215.4995	11.1001	101.1	7728	258	7986	0.026684755
50478	212.175	-21.5972	102	8735	741	9476	0.031663503
52033	218.4317	-14.6197	102	4541	-937	3604	0.012042557
53216	223.356	-4.6979	102.5	7001	-124	6877	0.022979096
52866	222.0393	14.1337	102.5	6476	-342	6134	0.020496405

50222	211.2773	15.7746	103	6398	-367	6031	0.020152236
51272	215.2476	6.2027	103.2	7565	116	7681	0.025665615
50764	213.2439	9.9211	103.5	7051	-116	6935	0.0231729
50534	212.4181	-0.6558	103.9	7134	-87	7047	0.023547141
51416	215.9205	2.0725	104.4	7632	108	7740	0.02586276
51818	217.5756	21.7466	104.9	5314	-799	4515	0.01508661
50070	210.8577	29.8668	104.9	8193	338	8531	0.028505841
52063	218.5167	3.7475	105.1	7299	-69	7230	0.024158625
51345	215.6178	13.4301	105.4	12048	2522	14570	0.048684808
52192	219.0642	29.9084	105.6	10464	1504	11968	0.039990377
51865	217.7549	5.9792	105.9	7500	-4	7496	0.025047448
50662	212.8591	1.2865	106.8	7597	22	7619	0.025458446
52457	220.2822	6.0433	107.1	8376	354	8730	0.029170788
50192	211.1904	14.3821	107.3	7445	-66	7379	0.0246565
52676	221.2906	9.2747	107.6	7185	-200	6985	0.023339972
52601	220.9022	-5.1761	108.1	7055	-262	6793	0.022698415
49876	210.1769	14.9307	108.3	7480	-81	7399	0.024723329
50609	212.6342	15.4465	108.3	7716	18	7734	0.025842712
52121	218.7375	-8.8412	108.8	6686	-423	6263	0.020927451
50089	210.8825	6.77	108.8	7367	-139	7228	0.024151942
52890	222.1773	8.7746	108.8	8769	478	9247	0.030898313
51610	216.826	4.8029	109.3	8146	180	8326	0.027820845
53449	224.3466	27.4165	109.6	9371	732	10103	0.033758588
50518	212.3574	-27.4755	109.8	8303	242	8545	0.028552621
50671	212.8867	-3.2199	110.4	8872	503	9375	0.031326018
51047	214.4043	7.0549	110.9	8635	362	8997	0.030062953
51634	216.8814	-0.9224	111.1	9107	583	9690	0.032378572
51043	214.3917	1.8125	111.4	7449	-186	7263	0.024268893
51878	217.7988	5.3072	111.4	8236	150	8386	0.028021332
52248	219.308	8.6459	111.4	8420	230	8650	0.028903472
51683	217.0885	5.0429	111.9	7591	-148	7443	0.024870352
50751	213.165	20.3871	112.2	8577	281	8858	0.029598492
49897	210.2466	29.5624	112.4	8204	94	8298	0.027727285
53056	222.877	6.0631	112.9	8699	302	9001	0.030076319
51010	214.2489	9.1059	114.8	7430	-296	7134	0.023837847
53252	223.524	12.4935	115.6	8899	302	9201	0.030744607
50130	211.0318	6.4859	116.1	7436	-325	7111	0.023760993
50004	210.6081	10.4057	116.1	10175	959	11134	0.037203614
52582	220.7993	18.88	117.6	9267	410	9677	0.032335133
52441	220.1784	3.4654	117.7	8037	-140	7897	0.026387367
50450	212.1165	13.5983	117.7	7948	-169	7779	0.025993077
51676	217.0584	-23.8729	118.2	7195	-487	6708	0.022414392
49990	210.5475	-18.7542	118.2	9021	305	9326	0.031162287
50189	211.1799	-9.7137	118.2	8619	119	8738	0.029197519
53318	223.7322	17.6124	118.2	9838	664	10502	0.035091823
52959	222.489	0.5584	118.5	11938	1826	13764	0.045991606
50234	211.3199	21.0442	118.5	8399	-5	8394	0.028048063
51454	216.1044	-28.6341	119.9	7023	-594	6429	0.02148213
50156	211.1319	-15.2038	120.4	8713	90	8803	0.029414713
51784	217.4106	10.5841	120.4	10178	779	10957	0.036612179
51536	216.5096	8.1113	121.8	7776	-364	7412	0.024766767

53421	224.1912	5.5836	122.1	8930	102	9032	0.030179903
51790	217.443	11.767	122.7	7413	-531	6882	0.022995803
51303	215.374	5.0732	123.8	8112	-283	7829	0.026160149
52031	218.4225	28.0542	124.1	9326	212	9538	0.031870673
52320	219.5948	18.1113	124.4	9084	100	9184	0.030687802
50583	212.5417	11.9343	125	8391	-200	8191	0.027369751
50930	213.8501	8.0111	126.1	7460	-597	6863	0.022932316
52305	219.5427	9.3361	127.7	9360	125	9485	0.031693576
52902	222.2436	-29.4715	128.5	6333	-1031	5302	0.017716325
52670	221.2636	0.527	129.1	8634	-232	8402	0.028074795
53063	222.9118	2.7137	129.7	10083	394	10477	0.035008287
49968	210.4955	-22.3631	130.9	10866	769	11635	0.038877676
52602	220.9142	11.1392	130.9	10940	776	11716	0.039148333
52153	218.8726	22.4065	130.9	8904	-182	8722	0.029144056
50720	213.0651	-0.633	131.5	7673	-655	7018	0.023450239
51065	214.4688	26.7575	131.5	9138	-97	9041	0.030209976
53081	222.9724	3.3633	132.7	9241	-89	9152	0.030580876
51867	217.7934	2.4018	133	10077	291	10368	0.03464407
53552	224.8651	16.645	133	10016	235	10251	0.034253121
52065	218.5243	0.6202	133.4	9116	-152	8964	0.029952685
53386	224.0175	-27.7678	134.5	7048	-959	6089	0.02034604
50994	214.1469	9.9854	134.5	11157	770	11927	0.039853378
52498	220.4792	9.3827	135.1	9202	-176	9026	0.030159855
52921	222.3004	29.7449	135.1	9081	-250	8831	0.029508273
53301	223.669	25.7108	136.4	9578	-75	9503	0.031753722
50900	213.7526	-0.797	136.7	11433	839	12272	0.041006175
53025	222.7595	11.9886	137	9071	-294	8777	0.029327836
51429	215.9869	28.985	138.6	11629	837	12466	0.041654415
52211	219.1465	11.9384	138.9	8567	-540	8027	0.026821754
51266	215.2219	15.0005	139.6	7944	-779	7165	0.023941431
52632	221.0588	20.6139	140.9	9140	-380	8760	0.029271031
53563	224.9241	27.3261	141.5	9636	-209	9427	0.031499773
52882	222.1527	-4.7362	142.1	12628	1244	13872	0.046352482
53363	223.9083	-21.5923	142.5	12366	1084	13450	0.044942394
51560	216.633	21.5571	142.5	9197	-397	8800	0.029404689
51418	215.9418	9.2363	143.5	8966	-505	8461	0.02827194
51007	214.2396	2.1776	143.8	7808	-922	6886	0.023009169
52915	222.3016	17.021	144.3	11273	458	11731	0.039198455
53106	223.0687	12.2865	145.2	9373	-409	8964	0.029952685
51752	217.2944	2.287	146.2	7993	-922	7071	0.023627336
52879	222.1578	6.8145	147.4	10398	-40	10358	0.034610655
53558	224.864	25.5839	147.5	9778	-325	9453	0.03158665
51394	215.8031	-10.851	148.5	13110	1273	14383	0.048059959
52444	220.1902	8.4508	148.9	9085	-614	8471	0.028305354
52104	218.7003	10.0255	150.2	10308	-159	10149	0.033912294
52567	220.7609	25.1523	150.2	9334	-570	8764	0.029284397
53145	223.1733	7.932	151.3	10686	-36	10650	0.035586356
52069	218.5457	10.212	151.6	9290	-609	8681	0.029007057
51438	216.037	26.6363	151.6	11475	310	11785	0.039378893
51486	216.2624	27.7574	151.6	10952	69	11021	0.036826031
52109	218.7035	8.1657	152.3	9889	-393	9496	0.031730332

50995	214.1537	24.5025	152.3	11583	344	11927	0.039853378
50167	211.1167	25.7982	152.3	9927	-379	9548	0.031904087
50976	214.0548	26.4736	152.3	10796	-17	10779	0.036017402
53528	224.7412	20.0527	153	12823	912	13735	0.045894704
53258	223.5548	4.8414	153.4	10410	-218	10192	0.034055976
51556	216.6234	-20.1944	154.8	13268	1113	14381	0.048053276
51739	217.2626	4.6783	156.6	8056	-1149	6907	0.023079339
50841	213.5097	1.8478	157	11636	237	11873	0.03967294
50697	213.011	10.3754	157.3	9778	-568	9210	0.03077468
50136	211.0383	13.0672	160.3	7443	-1397	6046	0.020202358
51171	214.8492	24.5344	160.3	11659	120	11779	0.039358844
50187	211.1691	28.5885	160.3	11865	216	12081	0.04036796
52449	220.1853	14.3634	161	9108	-923	8185	0.027349702
51099	214.5934	8.0975	161.4	13189	833	14022	0.046853698
52196	219.0556	23.5772	162.9	11691	45	11736	0.039215162
53560	224.9095	28.9543	163.2	9083	-1005	8078	0.026992168
53101	223.1011	20.3342	166.6	13161	603	13764	0.045991606
52870	222.0956	18.3548	169.9	12084	-2	12082	0.040371301
51481	216.2208	27.8835	170.1	11336	-328	11008	0.036782592
50752	213.1581	12.0199	170.4	11320	-321	10999	0.036752519
50305	211.5628	20.1412	170.9	11126	-421	10705	0.035770136
52262	219.3638	4.6095	171.3	12112	-18	12094	0.040411398
52888	222.181	18.2892	174.9	12023	-181	11842	0.039569355
52720	221.4825	28.5259	174.9	9209	-1236	7973	0.026641316
52530	220.6474	28.6553	176.1	13708	541	14249	0.047612206
52979	222.5974	10.3277	177.7	12570	-25	12545	0.041918389
51979	218.1932	14.5882	177.7	12415	-86	12329	0.041196637
49980	210.5246	26.0609	178.2	9877	-1080	8797	0.029394664
50328	211.6584	3.7487	179.8	12175	-232	11943	0.039906841
51040	214.3542	8.0499	184.4	8732	-1563	7169	0.023954797
50444	212.0283	-9.0716	185.4	11422	-692	10730	0.035853672
52905	222.2447	12.4902	185.4	14226	492	14718	0.049179342
50288	211.4992	14.2367	186.8	11876	-563	11313	0.037801732
52915	222.6111	16.7453	187	11564	-712	10852	0.036261327
51854	217.7109	14.5031	189.1	12151	-530	11621	0.038830896
51444	216.0386	27.7112	189.1	10131	-1269	8862	0.029611858
53274	223.5978	16.3552	189.7	13297	-78	13219	0.04417052
53044	222.8233	18.6871	191.9	12941	-297	12644	0.042249191
50922	213.8288	16.888	193.4	13158	-230	12928	0.043198161
53170	223.2551	-15.8826	195.8	14109	106	14215	0.047498597
52562	220.7364	25.0165	196.7	10250	-1411	8839	0.029535005
50723	213.0699	-21.1864	198.5	13775	-106	13669	0.045674169
52565	220.7403	21.4206	199.9	12525	-692	11833	0.039539282

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Plots 16, 17, and 18 RA2-RA14 Distance-Velocity Relation and ΔV

Redshift	D	Velocity	RA2 Dhel	RA14 Dhel	RA2_14hel ΔV	RA2_14hel ΔV Diff/MPC
0.00025	1.06	74.948	649.3273952	-174.7053155	824.0327107	0
0.0005	2.12	149.896	688.3294007	-132.4184855	820.7478862	3.098891027
0.00075	3.18	224.844	711.1441114	-107.6822756	818.826387	1.812735045
0.001	4.24	299.792	727.3314063	-90.13165543	817.4630617	1.286155982
0.00125	5.3	374.74	739.8872476	-76.51833679	816.4055844	0.997620085
0.0015	6.36	449.688	750.146117	-65.39544558	815.5415626	0.81511496
0.00175	7.42	524.636	758.8198674	-55.99117505	814.8110425	0.689169879
0.002	8.48	599.584	766.3334118	-47.84482538	814.1782372	0.596986103
0.00225	9.54	674.532	772.9608277	-40.65923572	813.6200634	0.526579062
0.0025	10.6	749.48	778.8892532	-34.23150675	813.1207599	0.471041022
0.00275	11.66	824.428	784.2521664	-28.41691861	812.669085	0.426108436
0.003	12.72	899.376	789.1481225	-23.10861553	812.2567381	0.389006524
0.00325	13.78	974.324	793.6519656	-18.22545006	811.8774157	0.357851313
0.0035	14.84	1049.272	797.821873	-13.70434501	811.526218	0.331318566
0.00375	15.9	1124.22	801.7039639	-9.495296896	811.1992608	0.308450206
0.004	16.96	1199.168	805.3354174	-5.557995337	810.8934127	0.288535898
0.00425	18.02	1274.116	808.7466436	-1.859469033	810.6061126	0.271037814
0.0045	19.08	1349.064	811.9628332	1.62759432	810.3352389	0.255541248
0.00475	20.14	1424.012	815.0050876	4.926073288	810.0790144	0.241721285
0.005	21.2	1498.96	817.8912587	8.055323298	809.8359354	0.229319738
0.00525	22.26	1573.908	820.6365837	11.03186484	809.6047188	0.218128857
0.0055	23.32	1648.856	823.2541719	13.86991144	809.3842605	0.207979579
0.00575	24.38	1723.804	825.7553837	16.58178012	809.1736036	0.198732927
0.006	25.44	1798.752	828.1501281	19.17821451	808.9719136	0.190273597
0.00625	26.5	1873.7	830.4471001	21.66864193	808.7784581	0.182505125
0.0065	27.56	1948.648	832.6539712	24.06137998	808.5925912	0.175346188
0.00675	28.62	2023.596	834.7775439	26.36380417	808.4137398	0.168727749
0.007	29.68	2098.544	836.8238785	28.58248504	808.2413935	0.162590817
0.00725	30.74	2173.492	838.7983969	30.72330119	808.0750957	0.156884684
0.0075	31.8	2248.44	840.7059694	32.79153315	807.9144363	0.151565522
0.00775	32.86	2323.388	842.5509872	34.79194187	807.7590453	0.146595255
0.008	33.92	2398.336	844.3374229	36.72883471	807.6085882	0.141940643
0.00825	34.98	2473.284	846.0688826	38.60612129	807.4627613	0.137572538
0.0085	36.04	2548.232	847.7486492	40.42736101	807.3212882	0.133465276
0.00875	37.1	2623.18	849.3797199	42.19580367	807.1839162	0.129596167
0.009	38.16	2698.128	850.9648388	43.91442436	807.0504144	0.125945081
0.00925	39.22	2773.076	852.5065243	45.58595358	806.9205707	0.122494093
0.0095	40.28	2848.024	854.0070932	47.21290333	806.7941899	0.119227191
0.00975	41.34	2922.972	855.4686819	48.79758983	806.671092	0.116130028
0.01	42.4	2997.92	856.8932643	50.34215334	806.5511109	0.113189709
0.01025	43.46	3072.868	858.2826682	51.84857556	806.4340927	0.110394614
0.0105	44.52	3147.816	859.6385892	53.31869489	806.3198944	0.107734242
0.01075	45.58	3222.764	860.9626033	54.75421994	806.2083833	0.105199082
0.011	46.64	3297.712	862.2561775	56.15674148	806.099436	0.102780497
0.01125	47.7	3372.66	863.5206801	57.527743	805.9929371	0.100470626
0.0115	48.76	3447.608	864.7573893	58.86861016	805.8887791	0.098262301
0.01175	49.82	3522.556	865.9675004	60.18063922	805.7868612	0.096148968
0.012	50.88	3597.504	867.1521336	61.46504456	805.6870891	0.094124628
0.01225	51.94	3672.452	868.3123397	62.72296541	805.5893743	0.092183776

0.0125	53	3747.4	869.4491056	63.95547198	805.4936337	0.090321349
0.01275	54.06	3822.348	870.5633599	65.16357086	805.399789	0.088532689
0.013	55.12	3897.296	871.6559767	66.34821003	805.3077667	0.086813499
0.01325	56.18	3972.244	872.7277806	67.51028326	805.2174973	0.085159808
0.0135	57.24	4047.192	873.7795495	68.65063421	805.1289153	0.083567942
0.01375	58.3	4122.14	874.8120188	69.77006012	805.0419587	0.082034498
0.014	59.36	4197.088	875.8258841	70.86931508	804.956569	0.080556318
0.01425	60.42	4272.036	876.8218039	71.94911318	804.8726907	0.079130468
0.0145	61.48	4346.984	877.8004025	73.01013123	804.7902712	0.077754216
0.01475	62.54	4421.932	878.7622721	74.05301133	804.7092607	0.076425019
0.015	63.6	4496.88	879.707975	75.07836319	804.6296118	0.075140503
0.01525	64.66	4571.828	880.6380458	76.08676632	804.5512794	0.073898455
0.0155	65.72	4646.776	881.5529927	77.07877191	804.4742208	0.0726968
0.01575	66.78	4721.724	882.4532999	78.05490474	804.3983952	0.071533602
0.016	67.84	4796.672	883.3394285	79.01566475	804.3237637	0.070407041
0.01625	68.9	4871.62	884.2118181	79.96152866	804.2502894	0.069315415
0.0165	69.96	4946.568	885.0708882	80.89295133	804.1779369	0.068257123
0.01675	71.02	5021.516	885.9170395	81.81036712	804.1066724	0.067230661
0.017	72.08	5096.464	886.7506547	82.71419106	804.0364637	0.066234615
0.01725	73.14	5171.412	887.5721	83.60482001	803.96728	0.065267651
0.0175	74.2	5246.36	888.3817254	84.48263372	803.8990917	0.064328516
0.01775	75.26	5321.308	889.1798665	85.34799574	803.8318707	0.063416024
0.018	76.32	5396.256	889.9668443	86.20125441	803.7655899	0.062529057
0.01825	77.38	5471.204	890.742967	87.04274361	803.7002234	0.06166656
0.0185	78.44	5546.152	891.5085298	87.87278363	803.6357462	0.060827533
0.01875	79.5	5621.1	892.2638163	88.69168183	803.5721345	0.060011031
0.019	80.56	5696.048	893.0090988	89.49973338	803.5093654	0.05921616
0.01925	81.62	5770.996	893.7446386	90.29722186	803.4474168	0.05844207
0.0195	82.68	5845.944	894.4706874	91.08441988	803.3862675	0.057687958
0.01975	83.74	5920.892	895.1874869	91.86158962	803.3258973	0.05695306
0.02	84.8	5995.84	895.8952698	92.62898339	803.2662865	0.05623665
0.02025	85.86	6070.788	896.5942602	93.38684406	803.2074161	0.05553804
0.0205	86.92	6145.736	897.2846738	94.1354056	803.1492682	0.054856574
0.02075	87.98	6220.684	897.9667185	94.87489345	803.091825	0.05419163
0.021	89.04	6295.632	898.6405948	95.60552493	803.0350699	0.053542613
0.02125	90.1	6370.58	899.3064961	96.32750969	802.9789864	0.052908957
0.0215	91.16	6445.528	899.9646088	97.04104999	802.9235588	0.052290125
0.02175	92.22	6520.476	900.6151132	97.74634108	802.8687721	0.051685601
0.022	93.28	6595.424	901.258183	98.44357153	802.8146115	0.051094896
0.02225	94.34	6670.372	901.8939864	99.13292349	802.7610629	0.05051754
0.0225	95.4	6745.32	902.5226857	99.81457304	802.7081126	0.049953086
0.02275	96.46	6820.268	903.1444379	100.4886904	802.6557475	0.049401107
0.023	97.52	6895.216	903.7593948	101.1554402	802.6039546	0.048861194
0.02325	98.58	6970.164	904.3677034	101.8149818	802.5527217	0.048332954
0.0235	99.64	7045.112	904.969506	102.4674693	802.5020367	0.047816014
0.02375	100.7	7120.06	905.5649401	103.113052	802.4518881	0.047310015
0.024	101.76	7195.008	906.1541392	103.7518746	802.4022646	0.046814613
0.02425	102.82	7269.956	906.7372325	104.3840772	802.3531553	0.046329479
0.0245	103.88	7344.904	907.3143453	105.0097955	802.3045498	0.045854297
0.02475	104.94	7419.852	907.8855989	105.6291612	802.2564377	0.045388763
0.025	106	7494.8	908.4511112	106.242302	802.2088092	0.044932586

0.02525	107.06	7569.748	909.0109964	106.8493419	802.1616545	0.044485489
0.0255	108.12	7644.696	909.5653654	107.4504009	802.1149645	0.044047201
0.02575	109.18	7719.644	910.1143259	108.0455959	802.06873	0.043617465
0.026	110.24	7794.592	910.6579823	108.6350401	802.0229422	0.043196034
0.02625	111.3	7869.54	911.1964361	109.2188436	801.9775926	0.042782668
0.0265	112.36	7944.488	911.7297861	109.7971133	801.9326728	0.042377139
0.02675	113.42	8019.436	912.258128	110.3699532	801.8881748	0.041979226
0.027	114.48	8094.384	912.781555	110.9374643	801.8440908	0.041588716
0.02725	115.54	8169.332	913.3001578	111.4997447	801.8004131	0.041205404
0.0275	116.6	8244.28	913.8140244	112.0568902	801.7571342	0.040829094
0.02775	117.66	8319.228	914.3232405	112.6089935	801.7142471	0.040459595
0.028	118.72	8394.176	914.8278897	113.1561451	801.6717445	0.040096724
0.02825	119.78	8469.124	915.3280529	113.6984331	801.6296198	0.039740304
0.0285	120.84	8544.072	915.8238095	114.2359432	801.5878662	0.039390164
0.02875	121.9	8619.02	916.3152362	114.7687588	801.5464773	0.039046141
0.029	122.96	8693.968	916.802408	115.2969613	801.5054468	0.038708075
0.02925	124.02	8768.916	917.2853981	115.8206297	801.4647684	0.038375813
0.0295	125.08	8843.864	917.7642776	116.3398414	801.4244362	0.038049206
0.02975	126.14	8918.812	918.2391159	116.8546714	801.3844444	0.037728112
0.03	127.2	8993.76	918.7099805	117.3651932	801.3447873	0.037412392
0.03025	128.26	9068.708	919.1769376	117.8714783	801.3054593	0.037101912
0.0305	129.32	9143.656	919.6400513	118.3735964	801.2664549	0.036796543
0.03075	130.38	9218.604	920.0993845	118.8716155	801.227769	0.03649616
0.031	131.44	9293.552	920.5549983	119.365602	801.1893963	0.036200641
0.03125	132.5	9368.5	921.0069525	119.8556207	801.1513319	0.03590987
0.0315	133.56	9443.448	921.4553055	120.3417348	801.1135707	0.035623732
0.03175	134.62	9518.396	921.9001141	120.8240061	801.0761081	0.035342119
0.032	135.68	9593.344	922.3414341	121.3024948	801.0389393	0.035064923
0.03225	136.74	9668.292	922.7793195	121.7772598	801.0020597	0.034792041
0.0325	137.8	9743.24	923.2138236	122.2483587	800.9654649	0.034523374
0.03275	138.86	9818.188	923.6449981	122.7158476	800.9291506	0.034258824
0.033	139.92	9893.136	924.0728937	123.1797814	800.8931124	0.033998299
0.03325	140.98	9968.084	924.4975599	123.6402138	800.8573462	0.033741705
0.0335	142.04	10043.032	924.919045	124.0971972	800.8218479	0.033488956
0.03375	143.1	10117.98	925.3373964	124.5507829	800.7866135	0.033239965
0.034	144.16	10192.928	925.7526603	125.0010211	800.7516392	0.03299465
0.03425	145.22	10267.876	926.1648819	125.4479608	800.7169211	0.032752928
0.0345	146.28	10342.824	926.5741055	125.8916501	800.6824555	0.032514723
0.03475	147.34	10417.772	926.9803744	126.3321357	800.6482387	0.032279958
0.035	148.4	10492.72	927.383731	126.7694638	800.6142672	0.032048558
0.03525	149.46	10567.668	927.7842167	127.2036791	800.5805376	0.031820453
0.0355	150.52	10642.616	928.181872	127.6348258	800.5470463	0.031595571
0.03575	151.58	10717.564	928.5767368	128.0629468	800.51379	0.031373846
0.036	152.64	10792.512	928.9688499	128.4880845	800.4807654	0.031155211
0.03625	153.7	10867.46	929.3582494	128.9102799	800.4479695	0.030939602
0.0365	154.76	10942.408	929.7449726	129.3295737	800.4153989	0.030726957
0.03675	155.82	11017.356	930.129056	129.7460053	800.3830506	0.030517216
0.037	156.88	11092.304	930.5105354	130.1596137	800.3509217	0.030310318
0.03725	157.94	11167.252	930.8894459	130.5704368	800.3190091	0.030106206
0.0375	159	11242.2	931.2658219	130.9785119	800.28731	0.029904825
0.03775	160.06	11317.148	931.639697	131.3838755	800.2558215	0.029706121

0.038	161.12	11392.096	932.0111043	131.7865634	800.2245409	0.029510039
0.03825	162.18	11467.044	932.3800761	132.1866108	800.1934654	0.029316529
0.0385	163.24	11541.992	932.7466442	132.5840519	800.1625923	0.029125541
0.03875	164.3	11616.94	933.1108396	132.9789206	800.131919	0.028937025
0.039	165.36	11691.888	933.472693	133.3712499	800.1014431	0.028750933
0.03925	166.42	11766.836	933.8322341	133.7610723	800.0711618	0.02856722
0.0395	167.48	11841.784	934.1894925	134.1484197	800.0410728	0.02838584
0.03975	168.54	11916.732	934.5444968	134.5333232	800.0111737	0.028206748
0.04	169.6	11991.68	934.8972754	134.9158134	799.981462	0.028029902
0.04025	170.66	12066.628	935.247856	135.2959206	799.9519354	0.02785526
0.0405	171.72	12141.576	935.5962658	135.6736741	799.9225916	0.02768278
0.04075	172.78	12216.524	935.9425315	136.049103	799.8934285	0.027512424
0.041	173.84	12291.472	936.2866793	136.4222356	799.8644437	0.027344151
0.04125	174.9	12366.42	936.6287351	136.7931	799.8356351	0.027177924
0.0415	175.96	12441.368	936.968724	137.1617235	799.8070005	0.027013706
0.04175	177.02	12516.316	937.306671	137.528133	799.778538	0.02685146
0.042	178.08	12591.264	937.6426004	137.892355	799.7502454	0.026691152
0.04225	179.14	12666.212	937.9765361	138.2544154	799.7221207	0.026532747
0.0425	180.2	12741.16	938.3085016	138.6143397	799.6941619	0.026376211
0.04275	181.26	12816.108	938.6385202	138.9721531	799.6663671	0.02622151
0.043	182.32	12891.056	938.9666144	139.32788	799.6387344	0.026068614
0.04325	183.38	12966.004	939.2928066	139.6815448	799.6112618	0.025917491
0.0435	184.44	13040.952	939.6171187	140.0331711	799.5839476	0.02576811
0.04375	185.5	13115.9	939.9395723	140.3827824	799.5567899	0.025620441
0.044	186.56	13190.848	940.2601886	140.7304016	799.529787	0.025474455
0.04425	187.62	13265.796	940.5789883	141.0760512	799.5029371	0.025330123
0.0445	188.68	13340.744	940.895992	141.4197535	799.4762384	0.025187417
0.04475	189.74	13415.692	941.2112197	141.7615303	799.4496893	0.02504631
0.045	190.8	13490.64	941.5246912	142.1014031	799.4232882	0.024906776
0.04525	191.86	13565.588	941.8364261	142.4393929	799.3970332	0.024768788
0.0455	192.92	13640.536	942.1464434	142.7755204	799.370923	0.02463232
0.04575	193.98	13715.484	942.454762	143.1098062	799.3449558	0.024497347
0.046	195.04	13790.432	942.7614004	143.4422703	799.3191301	0.024363846
0.04625	196.1	13865.38	943.0663767	143.7729323	799.2934444	0.024231792
0.0465	197.16	13940.328	943.369709	144.1018118	799.2678972	0.024101162
0.04675	198.22	14015.276	943.6714148	144.4289279	799.2424869	0.023971933
0.047	199.28	14090.224	943.9715115	144.7542993	799.2172122	0.023844082
0.04725	200.34	14165.172	944.2700162	145.0779446	799.1920716	0.023717587
0.0475	201.4	14240.12	944.5669457	145.3998821	799.1670636	0.023592428
0.04775	202.46	14315.068	944.8623164	145.7201295	799.1421869	0.023468583
0.048	203.52	14390.016	945.1561448	146.0387046	799.1174401	0.023346031
0.04825	204.58	14464.964	945.4484467	146.3556248	799.0928219	0.023224752
0.0485	205.64	14539.912	945.7392381	146.6709072	799.0683309	0.023104727
0.04875	206.7	14614.86	946.0285343	146.9845686	799.0439658	0.022985936
0.049	207.76	14689.808	946.3163508	147.2966255	799.0197253	0.02286836
0.04925	208.82	14764.756	946.6027026	147.6070944	798.9956082	0.022751982
0.0495	209.88	14839.704	946.8876044	147.9159912	798.9716132	0.022636781
0.04975	210.94	14914.652	947.171071	148.2233319	798.9477391	0.022522741

Plots 19, and 20 RA8 Distance-Velocity/Redshift Relation

1PGC	RA	DE	D	Vhel	Vpwf	Vhel+Vpwf	HelioRS
24171	129.0633	-26.4093	8.1	873	326	1199	0.00399944
24781	132.2749	-26.3215	8.4	761	236	997	0.003325639
22746	121.5461	-27.528	11.7	1004	199	1203	0.004012782
24425	130.3827	4.9806	20.7	1939	357	2296	0.007658643
22721	121.4083	-11.427	21.6	1544	89	1633	0.00544711
23222	124.2747	-27.4583	22.3	1619	103	1722	0.005743982
24489	130.8154	-20.6625	22.3	1703	160	1863	0.006214309
23997	128.345	-22.9736	23.9	1772	69	1841	0.006140924
24479	130.7379	-20.0511	25.9	1687	26	1713	0.005713962
24429	130.4117	-20.7442	26.7	1911	100	2011	0.006707984
25146	134.2546	-24.6736	28.8	3033	315	3348	0.011167743
24236	129.3921	-16.9325	29.4	1972	34	2006	0.006691306
23262	124.4868	22.4362	29.4	2135	82	2217	0.007395127
23852	127.507	17.2599	29.6	2094	70	2164	0.007218338
24310	129.6925	-14.6808	30.1	4264	1417	5681	0.018949805
24111	128.8221	28.4734	30.1	2086	35	2121	0.007074905
23701	126.7836	25.9703	30.8	2164	48	2212	0.007378449
25067	133.9023	-3.1839	31.2	1823	-62	1761	0.005874073
24913	133.0764	-17.7444	32	1983	-87	1896	0.006324385
23266	124.5061	24.7362	32.1	2090	-29	2061	0.006874767
24374	130.0596	5.6342	32.6	1925	-85	1840	0.006137589
23214	124.2267	24.1769	32.9	2104	-46	2058	0.00686476
23658	126.4919	-11.7792	34.4	2786	246	3032	0.010113679
23723	126.892	-12.7566	34.9	2780	225	3005	0.010023616
23579	126.042	-18.7755	35.2	2448	50	2498	0.008332444
24567	131.1813	10.4721	35.2	4078	978	5056	0.016865026
23483	125.5811	19.4159	36.2	2058	-155	1903	0.006347734
24355	129.9384	-23.4588	36.3	3008	34	3042	0.010147035
22712	121.3716	-22.925	36.9	1584	-319	1265	0.004219592
23498	125.6811	22.553	37	2097	-164	1933	0.006447804
23646	126.4354	27.8745	37.2	2074	-183	1891	0.006307707
23643	126.4484	28.1182	37.2	2197	-138	2059	0.006868095
25221	134.6925	-3.71	37.6	2762	133	2895	0.009656695
23485	125.6198	-1.0456	37.9	4487	1098	5585	0.018629583
24490	130.8165	13.0857	38.1	2072	-188	1884	0.006284357
24778	132.2517	-7.8298	39.3	2929	147	3076	0.010260447
24840	132.6064	-19.5295	39.5	3380	368	3748	0.012502001
25007	133.6696	20.5835	39.6	3787	575	4362	0.014550088
25077	133.9707	13.563	40.3	4186	794	4980	0.016611517
24898	132.9678	-24.3137	41.2	2525	-97	2428	0.008098949
23362	124.9514	22.0314	41.7	3537	331	3868	0.012902279
24854	132.6895	-21.9633	42.9	2522	-147	2375	0.007922159
23465	125.476	22.6414	43.3	3733	369	4102	0.01368282
24643	131.5631	27.3452	44.3	5612	1484	7096	0.023669744
24893	132.9326	-2.134	45.4	3319	121	3440	0.011474622
24573	131.2148	1.1556	46.9	3626	212	3838	0.01280221
24012	128.4273	27.7121	46.9	2263	-358	1905	0.006354406

24402	130.238	-23.9135	47.3	3737	246	3983	0.013285878
22630	120.9589	10.5484	48	4605	662	5267	0.017568848
24178	129.0642	28.0602	49.7	3507	28	3535	0.011791509
24328	129.769	-14.74	50.2	4098	323	4421	0.014746891
24894	132.9389	-14.9041	50.8	5343	1010	6353	0.021191359
24244	129.429	20.5038	51.1	4682	578	5260	0.017545498
24789	132.3291	-19.0042	51.7	3204	-328	2876	0.009593318
23418	125.2006	-8.9184	51.9	2865	-273	2592	0.008645995
25085	133.9809	13.2296	52	4034	223	4257	0.014199845
25198	134.5533	-19.1917	52.4	4513	462	4975	0.016594839
23447	125.3666	3.1693	52.6	2684	-354	2330	0.007772055
25161	134.3354	2.9213	53.9	3821	66	3887	0.012965656
23256	124.4727	23.4723	54.8	4142	147	4289	0.014306586
24417	130.344	-20.2633	55.1	4578	385	4963	0.016554811
24558	131.1291	-20.3504	55.6	3544	-112	3432	0.011447937
22655	121.0626	8.732	55.6	4704	406	5110	0.017045151
23729	126.9416	24.8507	55.6	3739	-55	3684	0.01228852
23816	127.3299	2.6446	55.8	4116	124	4240	0.014143139
24737	132.0783	-3.0196	56.6	3948	32	3980	0.013275871
23420	125.2054	22.6578	56.9	4132	75	4207	0.014033063
23753	127.0601	28.0571	57.1	5893	998	6891	0.022985937
22677	121.1724	24.8706	57.4	4961	453	5414	0.018059188
23486	125.6217	-11.4177	57.9	4612	288	4900	0.016344666
23616	126.2583	-0.5914	57.9	4895	431	5326	0.017765651
24910	133.0596	19.0552	58.2	4192	76	4268	0.014236537
24152	128.9521	1.7216	58.7	3987	-25	3962	0.01321583
25197	134.5502	-6.1992	60.9	4869	323	5192	0.017318674
24121	128.8716	25.0275	61.5	5240	456	5696	0.01899984
23513	125.7441	27.7077	61.5	5948	833	6781	0.022619016
23983	128.2712	-12.3555	62.2	6029	886	6915	0.023065992
24235	129.3862	28.7052	62.3	3469	-351	3118	0.010400544
25231	134.7355	-4.9019	62.6	3641	-269	3372	0.011247798
24595	131.3157	9.6457	62.9	4129	-96	4033	0.013452661
23910	127.8531	27.5798	63.2	5877	724	6601	0.0220186
23469	125.5151	8.7526	63.7	4147	-120	4027	0.013432647
22883	122.3162	-0.3666	63.8	5398	458	5856	0.019533543
23734	126.952	4.6556	63.8	8835	2643	11478	0.038286545
22596	120.7827	23.3919	63.8	4704	96	4800	0.016011101
23725	126.925	21.4791	64.1	4498	9	4507	0.015033757
24156	128.9732	0.7071	64.2	4036	-171	3865	0.012892272
24790	132.3413	19.0749	64.3	4180	-122	4058	0.013536052
22459	120.1564	13.6974	65.2	4521	-22	4499	0.015007072
25080	133.9686	18.1565	65.4	4240	-129	4111	0.013712841
24400	130.2241	19.3549	65.6	4363	-89	4274	0.014256551
23748	127.0314	20.2621	65.6	4414	-74	4340	0.014476704
24566	131.1777	9.8007	65.9	4074	-206	3868	0.012902279
22807	121.8534	6.8632	66.2	4478	-64	4414	0.014723542
22873	122.2643	16.6762	66.5	2839	-627	2212	0.007378449
24431	130.4218	18.86	66.5	4621	-6	4615	0.015394007
22565	120.652	27.4374	66.5	5212	237	5449	0.018175935
22755	121.6002	1.0359	66.8	4604	-26	4578	0.015270588

23086	123.5589	21.3555	66.8	3430	-475	2955	0.009856834
24308	129.6813	7.8066	67	8850	2468	11318	0.037752842
24509	130.9198	22.0941	67.1	3710	-383	3327	0.011097694
24056	128.5727	14.5478	67.4	4518	-78	4440	0.014810268
24982	133.5021	18.6822	67.7	4340	-158	4182	0.013949672
23014	123.1848	22.9073	67.7	4304	-192	4112	0.013716177
22830	121.9906	26.0292	67.7	4197	-239	3958	0.013202487
23380	125.0284	17.3587	68	4398	-155	4243	0.014153146
23404	125.1487	21.0678	68	4797	10	4807	0.016034451
23385	125.0529	26.0226	68.4	4668	-62	4606	0.015363986
25264	134.9744	-7.4168	68.7	5792	505	6297	0.021004563
22448	120.1162	7.8158	69.3	4063	-322	3741	0.012478652
22555	120.6025	9.4135	69.4	4424	-186	4238	0.014136468
23021	123.2146	-20.2719	69.6	5259	179	5438	0.018139243
25180	134.474	17.0912	69.6	6167	649	6816	0.022735763
23002	123.0933	-21.5311	70.3	4335	-239	4096	0.013662806
24395	130.185	-4.1216	70.4	4346	-225	4121	0.013746197
23316	124.7606	3.634	70.4	9046	2394	11440	0.038159791
22880	122.308	16.9876	71.6	4849	-80	4769	0.015907696
24557	131.1348	9.1659	71.9	4078	-369	3709	0.012371911
22778	121.7442	8.0038	72.2	4602	-195	4407	0.014700192
24967	133.416	-26.5107	72.6	4652	-167	4485	0.014960373
25053	133.8381	-25.0923	72.6	5117	32	5149	0.017175242
24591	131.2926	25.9616	72.6	7639	1350	8989	0.029984122
22980	122.9689	-18.3005	72.9	4645	-192	4453	0.014853632
23978	128.2509	26.0139	73.1	5278	59	5337	0.017802343
24685	131.8208	-20.0356	73.7	4644	-202	4442	0.01481694
23669	126.5794	2.9256	73.9	9279	2364	11643	0.038836927
24189	129.1242	-11.8312	74.3	5888	334	6222	0.02075439
22693	121.2727	25.0624	74.3	5009	-104	4905	0.016361344
23125	123.7345	-22.018	74.6	5161	-28	5133	0.017121871
23787	127.192	22.0535	74.6	6103	403	6506	0.021701713
24454	130.6353	-19.8722	75	6825	798	7623	0.02542763
23869	127.6343	19.7397	75.3	4637	-268	4369	0.014573438
23544	125.8754	18.7494	75.5	7968	1414	9382	0.031295031
24844	132.6317	-3.0992	76	4487	-324	4163	0.013886294
23017	123.1935	26.3615	76.3	6275	413	6688	0.022308801
24177	129.0825	-20.2853	76.4	5718	176	5894	0.019660298
22511	120.4145	10.7327	76.7	4855	-228	4627	0.015434034
24024	128.4435	-4.6531	77.1	4757	-257	4500	0.015010407
24427	130.3971	-20.3149	77.8	5696	121	5817	0.019403453
24259	129.5057	-9.8194	78.3	4340	-441	3899	0.013005684
24649	131.6171	-11.9743	78.8	5715	99	5814	0.019393446
24071	128.6391	-2.5469	78.8	4425	-427	3998	0.013335913
22998	123.0579	-19.3229	79.9	4627	-394	4233	0.01411979
23328	124.7995	25.5317	80.3	5620	-25	5595	0.01866294
23018	123.198	9.3866	80.7	8832	1704	10536	0.035144367
23992	128.3204	-17.9588	81.1	4584	-430	4154	0.013856274
24467	130.6515	27.2701	81.1	7651	976	8627	0.028776618
23663	126.5547	4.5953	81.4	8506	1480	9986	0.033309761
24548	131.0908	9.5374	82.2	4044	-632	3412	0.011381224

23531	125.8531	24.6734	82.2	4656	-453	4203	0.01401972
23173	124.0091	28.6247	82.2	5968	64	6032	0.020120617
24288	129.6	25.7541	83.1	5493	-155	5338	0.017805679
22965	122.8626	8.9411	83.7	5863	-14	5849	0.019510194
23942	128.064	-24.4384	84.1	5926	13	5939	0.019810402
23632	126.3103	25.0161	84.1	6577	292	6869	0.022912553
24669	131.7049	28.1714	84.1	6316	173	6489	0.021645007
23129	123.7686	25.6087	84.3	6242	122	6364	0.021228051
23784	127.1698	-21.7365	84.9	5739	-93	5646	0.018833058
22770	121.7171	18.7377	85.5	4631	-545	4086	0.01362945
23705	126.8201	22.8777	86	5680	-168	5512	0.018386081
23564	125.9945	-6.8949	87.3	6502	171	6673	0.022258766
24394	130.1607	27.2411	87.7	5553	-266	5287	0.017635561
24902	132.9863	16.9448	88.7	8550	1185	9735	0.032472514
23556	125.9646	9.8467	89.3	7938	811	8749	0.029183567
24485	130.7815	18.2227	89.3	6292	4	6296	0.021001228
23878	127.6688	20.5997	90.5	6009	-163	5846	0.019500187
23605	126.1798	22.7483	91.4	7546	514	8060	0.026885307
24629	131.4801	12.7812	91.8	8973	1297	10270	0.034257085
24034	128.4721	-21.3819	92.6	4717	-672	4045	0.013492688
24484	130.7764	-17.8807	92.6	5767	-303	5464	0.01822597
25181	134.4692	12.4952	93.5	5741	-338	5403	0.018022496
25111	134.103	12.4119	93.9	8900	1169	10069	0.03358662
24960	133.3863	4.7822	94.4	6191	-181	6010	0.020047233
23477	125.5677	21.0926	94.6	6677	-8	6669	0.022245423
23575	126.0483	12.1159	94.8	9666	1560	11226	0.037445963
24752	132.1041	23.8372	94.8	8402	840	9242	0.030828041
22554	120.5897	6.8783	97	9289	1233	10522	0.035097668
24698	131.9173	25.8934	97	6533	-139	6394	0.021328121
22892	122.3417	-17.9395	97.9	6162	-311	5851	0.019516865
23603	126.1353	-4.8881	97.9	6743	-64	6679	0.02227878
24726	132.0383	17.6115	97.9	6180	-299	5881	0.019616934
24301	129.6404	7.2083	98.4	8947	1008	9955	0.033206356
23118	123.702	25.9213	98.4	6269	-298	5971	0.019917143
24771	132.2103	29.8698	98.8	5955	-424	5531	0.018449458
24525	130.9858	-12.8475	99.3	5737	-493	5244	0.017492128
24797	132.3546	-6.6804	99.5	9343	1193	10536	0.035144367
23986	128.2953	-20.8989	100.2	6929	-53	6876	0.022935902
24977	133.4675	5.2482	100.2	8515	714	9229	0.030784677
25209	134.6324	-22.4885	100.4	9848	1443	11291	0.03766278
24980	133.4727	18.1803	100.6	8414	632	9046	0.030174254
24495	130.8529	8.0797	101.1	8903	876	9779	0.032619283
23714	126.8605	17.2842	102.2	6238	-404	5834	0.019460159
23503	125.7312	13.6228	103	8897	784	9681	0.032292389
24551	131.125	11.1825	103.2	8898	789	9687	0.032312403
24631	131.5052	12.7867	103.5	8975	820	9795	0.032672653
24989	133.5363	17.4301	103.7	6106	-485	5621	0.018749666
23676	126.5879	22.8997	104.4	5371	-761	4610	0.015377328
24169	129.0306	25.1128	104.4	6957	-188	6769	0.022578988
24368	130.0151	11.0104	105.4	8931	722	9653	0.032198991
24895	132.9525	29.2796	105.4	8083	283	8366	0.027906015

23995	128.3358	-3.5068	105.9	6975	-204	6771	0.022585659
23589	126.0843	20.5333	105.9	5961	-605	5356	0.01786572
24883	132.8907	3.1007	106.1	8431	454	8885	0.029637215
24251	129.4724	12.7804	106.6	9025	722	9747	0.032512542
23700	126.7749	21.6453	107.3	7539	-27	7512	0.025057373
25083	133.983	3.7584	107.8	8265	315	8580	0.028619843
22990	123.0066	19.3647	109.3	8517	350	8867	0.029577174
23789	127.1964	-6.9401	110.1	6467	-521	5946	0.019833751
23512	125.7405	25.739	110.5	8340	226	8566	0.028573144
24515	130.9627	2.7139	110.9	7748	-26	7722	0.025757859
22445	120.0874	26.6135	110.9	8098	89	8187	0.027308934
24901	132.9816	-18.5425	115.3	12341	2270	14611	0.048737124
24011	128.4171	9.9636	115.9	9240	492	9732	0.032462507
25058	133.8816	7.5984	116.4	8538	155	8693	0.028996771
22722	121.4195	10.7075	116.6	10251	969	11220	0.037425949
24129	128.892	-1.85	116.9	9196	442	9638	0.032148957
24233	129.3675	24.9466	120.2	8516	-4	8512	0.028393019
24830	132.5739	3.4976	120.4	8458	-12	8446	0.028172867
23147	123.871	8.3451	120.4	8980	205	9185	0.030637909
25223	134.7084	-26.9443	122.1	9413	371	9784	0.032635961
24286	129.5994	17.6314	122.1	8219	-180	8039	0.026815259
23415	125.1885	19.3623	122.7	5745	-1059	4686	0.015630837
23689	126.6717	17.8386	123.8	8671	-45	8626	0.028773283
23033	123.2653	24.567	125.5	6128	-1022	5106	0.017031809
23918	127.8871	-1.1977	126	9268	167	9435	0.03147182
24988	133.5195	-7.1833	126.7	9271	157	9428	0.031448471
24873	132.7908	0.2537	127	12255	1696	13951	0.046535598
23668	126.5746	11.5031	127.9	9517	211	9728	0.032449165
22796	121.8221	8.8691	128.5	8876	-101	8775	0.029270294
24839	132.5985	25.9541	128.5	8286	-345	7941	0.026488365
23058	123.4211	22.0704	130.3	6697	-960	5737	0.019136601
23678	126.5902	20.2704	130.9	7564	-685	6879	0.022945909
24991	133.5356	0.4986	132.1	8471	-352	8119	0.02708211
24101	128.7689	-2.9656	132.4	9558	96	9654	0.032202327
25068	133.925	4.9947	133	8439	-392	8047	0.026841944
23441	125.3526	19.1478	133.3	7961	-606	7355	0.024533677
22542	120.5338	7.6728	133.9	10003	228	10231	0.034126995
23285	124.591	11.6262	135.5	9592	-2	9590	0.031988846
23198	124.1175	11.8536	136.1	10455	373	10828	0.036118375
22494	120.3314	29.1793	141.2	12334	1109	13443	0.04484109
24257	129.4974	-18.8335	143.3	10478	162	10640	0.035491274
25210	134.6365	28.2672	143.5	8001	-851	7150	0.023849869
22646	121.0257	9.8144	144.8	10231	-18	10213	0.034066953
23249	124.4213	-0.8813	145.5	10252	-18	10234	0.034137002
23881	127.7023	24.6152	145.8	13021	1322	14343	0.047843171
22791	121.8192	14.9509	146.3	8685	-687	7998	0.026678497
22733	121.4618	12.4799	147.5	10959	223	11182	0.037299194
23227	124.3095	12.9911	150	9681	-402	9279	0.03095146
22994	123.0452	11.2643	151.6	9902	-359	9543	0.03183207
25190	134.522	22.7761	151.7	11114	171	11285	0.037642766
22773	121.7201	19.844	154	11250	142	11392	0.03799968

24188	129.1225	19.4299	154.6	11106	70	11176	0.03727918
22913	122.5104	22.8616	156.2	12102	463	12565	0.041912393
24330	129.7701	-2.2802	157.6	11767	292	12059	0.040224556
22672	121.1288	15.4838	159.1	13441	1035	14476	0.048286812
24013	128.4202	19.4061	162.9	10747	-336	10411	0.034727411
23614	126.2555	13.5373	163.2	13242	799	14041	0.046835806
24851	132.6753	-5.0096	167.6	13134	614	13748	0.045858462
24180	129.0873	23.7623	169	12752	358	13110	0.04373032
23016	123.1856	16.8882	169.8	13322	599	13921	0.046435529
24173	129.039	-7.055	169.9	11193	-341	10852	0.036198431
22602	120.8188	24.6767	171.6	12759	258	13017	0.043420105
23830	127.4269	15.0577	171.7	9499	-1038	8461	0.028222901
24608	131.3692	-2.4783	173.7	12015	-102	11913	0.039737551
23482	125.5962	15.5191	175.9	13206	347	13553	0.045208011
23209	124.1868	27.5918	177.7	11995	-265	11730	0.039127128
22606	120.8333	3.0522	187.4	10299	-1156	9143	0.030497812

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Plots 21 and 22 RA20 Distance-Velocity/Redshift Relation

RA	DE	D	Vhel	Vpwf	Vhel+Vpwf	Redshift
314.3142	25.9649	20.7	1525	-121	1404	0.00468325
305.2401	-19.4572	24.5	3337	720	4057	0.01353272
310.8096	-29.8534	27	2716	234	2950	0.00984016
304.3712	-10.8474	27.2	1858	-161	1697	0.00566059
301.0785	-19.0654	30.3	2183	-116	2067	0.00689478
305.9124	-28.2779	33.2	3058	179	3237	0.01079749
301.9053	-21.1252	33.6	2314	-160	2154	0.00718498
306.2776	-24.8094	34.5	3205	199	3404	0.01135454
306.2211	-18.3453	34.6	3394	283	3677	0.01226517
306.5614	1.103	35.2	3565	332	3897	0.01299901
305.6088	0.2929	38.4	3820	342	4162	0.01388296
305.937	-19.3254	39.6	2965	46	3011	0.01004363
311.1558	-1.7202	40.4	4150	427	4577	0.01526725
305.1904	-24.1283	41	3105	-67	3038	0.01013369
309.9368	2.0314	42.7	3916	217	4133	0.01378623
302.9556	5.7637	45.6	5257	859	6116	0.02040081
301.4853	-9.0409	45.9	4759	564	5323	0.01775564
307.0119	4.9619	46.4	3096	-244	2852	0.00951326
307.5313	3.0517	48.4	3976	52	4028	0.01343598
313.3526	0.652	50	3820	-75	3745	0.01249199
307.7061	20.2971	50.4	3705	-126	3579	0.01193828
311.8295	0.3209	53.8	3961	-130	3831	0.01277886
307.7113	8.0913	54.3	4400	48	4448	0.01483695
306.9149	10.7571	54.3	5294	491	5785	0.01929671
304.3866	0.003	54.6	5485	592	6077	0.02027072
308.7693	1.9392	55.8	4010	-165	3845	0.01282556

301.8394	6.4456	56.3	5719	653	6372	0.02125474
305.5625	-29.8575	56.9	3099	-472	2627	0.00876274
311.2625	-11.1043	57.3	5674	577	6251	0.02085112
310.0257	-4.3353	57.4	4006	-211	3795	0.01265878
305.7387	8.115	57.7	4725	88	4813	0.01605446
309.1409	11.4946	57.7	4444	-43	4401	0.01468018
313.8651	-1.2252	57.9	3792	-310	3482	0.01161472
314.3782	14.2435	57.9	4852	123	4975	0.01659484
308.209	9.9265	58.3	4655	31	4686	0.01563084
307.5559	-23.0378	58.5	6105	791	6896	0.02300262
300.0258	18.4659	59.3	4030	-239	3791	0.01264543
307.0777	10.7557	59.5	4515	-65	4450	0.01484362
308.0513	-9.0561	60.8	6073	656	6729	0.02244556
305.768	9.5435	60.9	7122	1265	8387	0.02797606
304.0563	-14.3628	62.6	5678	387	6065	0.02023069
306.149	12.4437	62.9	4529	-160	4369	0.01457344
305.8914	6.4436	63.6	4822	-60	4762	0.01588435
303.0849	-17.5917	64.2	5735	362	6097	0.02033743
303.9534	-2.9006	64.4	5577	265	5842	0.01948684
312.4153	29.6081	64.4	4789	-101	4688	0.01563751
302.2506	7.7922	65.3	5452	174	5626	0.01876634
301.1438	12.7393	65.3	4419	-263	4156	0.01386294
307.353	-0.174	65.4	5429	150	5579	0.01860957
314.7724	11.2814	65.6	4592	-227	4365	0.01456009
302.149	5.9545	65.9	7398	1208	8606	0.02870657
301.2092	-21.7142	66	5892	384	6276	0.02093451
310.9739	12.512	66.1	4588	-236	4352	0.01451673
304.6589	-0.1505	66.2	5486	156	5642	0.01881972
314.7437	17.6738	68	5319	1	5320	0.01774564
310.9138	14.2981	68.4	5132	-84	5048	0.01683834
310.4162	19.2036	68.4	4368	-376	3992	0.0133159
303.4767	-1.1575	68.7	5499	81	5580	0.0186129
310.0226	7.2606	69	5479	47	5526	0.01843278
311.5661	6.712	69.3	4844	-230	4614	0.01539067
312.115	7.74	69.6	4662	-309	4353	0.01452007
308.2754	-2.0274	69.8	5946	244	6190	0.02064765
310.6797	-2.7667	70	3838	-579	3259	0.01087087
308.3241	-11.271	70.9	6008	239	6247	0.02083778
314.4554	25.6379	72.6	4772	-346	4426	0.01476357
312.8619	-15.9153	72.9	5825	82	5907	0.01970366
306.0858	-11.0463	72.9	6022	181	6203	0.02069101
305.449	-10.4902	73.2	5680	15	5695	0.0189965
306.4233	-17.4425	73.8	6273	277	6550	0.02184848
307.8263	-19.0488	73.9	6348	307	6655	0.02219872
313.2606	7.1597	75.6	5718	-65	5653	0.01885641
303.0768	1.9575	76	6595	349	6944	0.02316273
309.2784	14.5164	76.7	5622	-130	5492	0.01831937
309.1421	9.4537	77.1	4496	-549	3947	0.01316579
304.5945	-27.4548	78.8	6163	68	6231	0.02078441
310.132	14.2748	81.4	5431	-342	5089	0.0169751
303.6801	-7.0096	81.6	4332	-689	3643	0.01215176

310.9698	-1.8773	82	6539	101	6640	0.02214869
303.7134	-18.0217	84.5	7033	273	7306	0.02437023
308.3358	-27.0978	84.9	6158	-130	6028	0.02010727
304.3019	5.2778	85.3	7003	217	7220	0.02408336
303.5043	-10.6788	86.1	5692	-355	5337	0.01780234
305.8739	15.9597	86.5	8523	952	9475	0.03160525
300.4933	-18.0617	88.3	7222	240	7462	0.02489059
303.9162	-13.6219	90.1	5678	-467	5211	0.01738205
302.1301	-25.4588	90.9	8244	657	8901	0.02969059
305.8379	-18.3224	91.2	7948	481	8429	0.02811616
307.9574	1.5449	92.2	5355	-640	4715	0.01572757
308.8493	-6.2445	93.5	5798	-524	5274	0.0175922
306.666	-5.0749	95.2	5685	-603	5082	0.01695175
304.611	2.3159	95.2	8055	376	8431	0.02812283
312.4677	-7.0218	95.7	6025	-506	5519	0.01840943
309.4803	-6.3001	97	7946	257	8203	0.0273623
301.7117	5.6598	97.9	7445	8	7453	0.02486057
309.6495	-15.4651	99	8520	471	8991	0.02999079
306.466	-22.1453	100	6106	-569	5537	0.01846947
303.3996	7.2816	100.2	5737	-704	5033	0.01678831
306.8755	-21.4289	100.6	5951	-639	5312	0.01771895
311.8653	16.4221	101.6	9516	874	10390	0.03465736
310.2169	0.6528	102.5	8023	104	8127	0.0271088
314.4813	-17.9428	102.6	8537	348	8885	0.02963722
311.1644	-20.535	103.2	11063	1705	12768	0.04258953
303.1005	19.2911	103.9	9315	697	10012	0.03339649
300.2615	-17.0526	104.1	7831	-4	7827	0.0261081
305.6624	9.5852	105.9	7854	-71	7783	0.02596133
312.9342	-9.313	106.3	7290	-321	6969	0.02324612
314.527	13.5149	106.4	8905	380	9285	0.03097147
312.4018	16.8654	107	5643	-894	4749	0.01584098
310.3821	-20.4407	107.1	9894	883	10777	0.03594826
301.4078	-25.1451	108.3	8275	66	8341	0.02782262
301.4324	-10.5781	110.5	8222	-38	8184	0.02729893
312.9366	-18.3315	111.9	8658	96	8754	0.02920025
305.0142	-14.9939	112.2	8182	-111	8071	0.026922
306.4733	-8.1549	112.2	10579	1048	11627	0.03878356
307.3455	14.3074	114	7481	-459	7022	0.02342291
314.6189	-19.9815	115	8601	-30	8571	0.02858982
314.5258	-27.8016	115.8	8716	6	8722	0.0290935
308.1142	-21.1662	115.8	8095	-257	7838	0.02614479
306.1062	-7.072	115.8	5659	-1067	4592	0.01531729
302.8737	-8.5094	116.1	8175	-233	7942	0.0264917
313.55	17.7797	117.2	8006	-353	7653	0.0255277
308.6505	12.9463	117.7	8068	-338	7730	0.02578454
309.4211	-21.6067	118.2	8321	-237	8084	0.02696536
304.4932	-21.9491	118.5	11573	1359	12932	0.04313657
313.397	-14.5095	119.1	7562	-566	6996	0.02333618
307.8404	-26.9842	119.3	5947	-1058	4889	0.01630797
311.5625	-14.0233	119.7	8450	-236	8214	0.027399
309.738	-22.7367	120.2	7563	-583	6980	0.02328281

306.897	-18.8351	120.3	7903	-461	7442	0.02482388
310.4615	11.5088	122.7	8110	-464	7646	0.02550435
314.115	12.0413	123.8	9066	-115	8951	0.02985737
310.3758	13.0731	123.8	8218	-454	7764	0.02589796
314.4818	-7.3901	125.2	7540	-737	6803	0.0226924
310.3582	26.4348	126.1	7272	-842	6430	0.0214482
307.9766	-1.5091	127	9449	-36	9413	0.03139844
305.9889	-9.2814	127.6	8370	-487	7883	0.0262949
305.3775	-20.4252	127.9	8517	-429	8088	0.02697871
308.6864	7.9862	127.9	8050	-624	7426	0.02477051
313.5264	-28.6822	128.5	10641	485	11126	0.0371124
301.9524	-20.2531	130	10068	174	10242	0.03416369
310.0715	-22.7816	132.4	9885	2	9887	0.03297953
312.0885	16.338	132.7	9185	-325	8860	0.02955382
312.9246	-12.2064	133.6	10063	27	10090	0.03365667
303.729	-19.7347	134.2	8407	-641	7766	0.02590463
312.5581	-18.7858	136.1	12703	1256	13959	0.04656228
309.8934	-28.4888	136.4	10049	-44	10005	0.03337314
312.0319	16.3833	138.3	9085	-522	8563	0.02856314
314.8448	-21.3138	145.8	12630	848	13478	0.04495784
300.2337	-18.8314	147.1	13048	1044	14092	0.04700592
304.9765	-3.2408	149.2	11619	240	11859	0.03955743
310.4875	-19.6331	149.6	10978	-57	10921	0.03642859
305.1441	-12.3736	157	8658	-1123	7535	0.02513409
300.3605	-21.3444	160.6	9151	-1041	8110	0.02705209
301.355	-7.7808	163.6	8262	-1382	6880	0.02294924
314.0303	-8.2302	172.1	11018	-704	10314	0.03440385
312.0396	-23.2498	175.3	12643	-119	12524	0.04177563
300.6141	-10.2997	178.6	14358	574	14932	0.04980787
304.819	-10.7676	190.5	14300	148	14448	0.04819341
307.8279	14.7981	194.4	13400	-377	13023	0.04344012
308.3609	19.0952	199.9	14122	-232	13890	0.04633212
301.4429	-1.018	206	13209	-763	12446	0.04151545
307.262	18.3754	211.3	13823	-678	13145	0.04384707
300.6313	-10.7582	213.7	14648	-395	14253	0.04754296
312.5331	-11.5067	216.7	10982	-1774	9208	0.03071463
314.4558	-16.1915	223.8	12807	-1373	11434	0.03813978
308.512	-1.5785	269	16123	-1331	14792	0.04934088
300.7569	-12.4016	281.7	15452	-1852	13600	0.04536479
306.505	-22.0094	288.3	16446	-1676	14770	0.04926749
309.4254	-1.739	289.6	16260	-1787	14473	0.04827681
302.1396	-20.2678	295	15476	-2143	13333	0.04447417

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Plots 23, 24, and 25 RA8-RA20 Distance-Velocity Relation and ΔV

Redshift	D	Velocity	RA8 D _{hel}	RA20 D _{hel}	RA8_20 _{hel} ΔV	RA8_20 _{hel} ΔV Diff/MPC
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0.004	16.96	1199.168	-1.7525456	-55.36949856	53.61695296	0
0.00425	18.02	1274.116	1.652981906	-49.80306703	51.45604894	2.038588698
0.0045	19.08	1349.064	4.863798645	-44.55489579	49.41869443	1.92203255
0.00475	20.14	1424.012	7.900970733	-39.59055167	47.4915224	1.818086825
0.005	21.2	1498.96	10.78232025	-34.88090396	45.66322421	1.724809609
0.00525	22.26	1573.908	13.52305893	-30.40108867	43.9241476	1.640638313
0.0055	23.32	1648.856	16.13627429	-26.12971387	42.26598816	1.564301356
0.00575	24.38	1723.804	18.6333076	-22.04824194	40.68154954	1.49475342
0.006	25.44	1798.752	21.02405138	-18.14050326	39.16455464	1.431127261
0.00625	26.5	1873.7	23.3171861	-14.39230937	37.70949547	1.372697333
0.0065	27.56	1948.648	25.52037044	-10.79114193	36.31151237	1.318851981
0.00675	28.62	2023.596	27.64039563	-7.325900492	34.96629612	1.269071935
0.007	29.68	2098.544	29.68331167	-3.98669614	33.67000781	1.222913499
0.00725	30.74	2173.492	31.65453147	-0.764681337	32.41921281	1.179995286
0.0075	31.8	2248.44	33.55891723	2.348091335	31.2108259	1.139987649
0.00775	32.86	2323.388	35.40085274	5.358787287	30.04206546	1.102604193
0.008	33.92	2398.336	37.18430412	8.273889268	28.91041485	1.067594908
0.00825	34.98	2473.284	38.91287127	11.09928142	27.81358985	1.034740567
0.0085	36.04	2548.232	40.58983163	13.84032079	26.74951083	1.003848131
0.00875	37.1	2623.18	42.21817752	16.50189845	25.71627907	0.974746947
0.009	38.16	2698.128	43.80064837	19.08849204	24.71215633	0.947285602
0.00925	39.22	2773.076	45.33975834	21.60421105	23.73554729	0.921329279
0.0095	40.28	2848.024	46.83782045	24.05283616	22.78498429	0.896757546
0.00975	41.34	2922.972	48.29696743	26.43785337	21.85911406	0.873462488
0.01	42.4	2997.92	49.71916997	28.76248386	20.95668611	0.851347121
0.01025	43.46	3072.868	51.10625279	31.02971017	20.07654263	0.830324041
0.0105	44.52	3147.816	52.45990865	33.24229916	19.2176095	0.810314272
0.01075	45.58	3222.764	53.78171082	35.40282237	18.37888845	0.791246273
0.011	46.64	3297.712	55.07312401	37.51367395	17.55945006	0.773055083
0.01125	47.7	3372.66	56.33551422	39.57708663	16.75842759	0.755681579
0.0115	48.76	3447.608	57.57015732	41.59514589	15.97501144	0.739071841
0.01175	49.82	3522.556	58.7782469	43.56980264	15.20844426	0.723176584
0.012	50.88	3597.504	59.9609011	45.50288456	14.45801654	0.707950677
0.01225	51.94	3672.452	61.11916894	47.39610628	13.72306267	0.69335271
0.0125	53	3747.4	62.25403582	49.25107846	13.00295737	0.679344622
0.01275	54.06	3822.348	63.36642861	51.06931609	12.29711252	0.665891365
0.013	55.12	3897.296	64.45722016	52.8522459	11.60497427	0.652960615
0.01325	56.18	3972.244	65.52723347	54.60121306	10.92602041	0.640522511
0.0135	57.24	4047.192	66.57724535	56.31748733	10.25975802	0.628549424
0.01375	58.3	4122.14	67.60798986	58.00226855	9.605721317	0.617015753
0.014	59.36	4197.088	68.62016139	59.65669169	8.963469707	0.605897745
0.01425	60.42	4272.036	69.61441744	61.28183146	8.332585981	0.595173327
0.0145	61.48	4346.984	70.59138119	62.87870649	7.712674704	0.58482196
0.01475	62.54	4421.932	71.55164389	64.44828317	7.103360721	0.574824512
0.015	63.6	4496.88	72.49576696	65.99147916	6.504287796	0.565163137
0.01525	64.66	4571.828	73.42428396	67.50916661	5.915117357	0.555821169
0.0155	65.72	4646.776	74.33770246	69.00217511	5.335527351	0.546783024
0.01575	66.78	4721.724	75.23650564	70.47129445	4.765211184	0.53803412
0.016	67.84	4796.672	76.12115384	71.91727709	4.203876749	0.529560788
0.01625	68.9	4871.62	76.99208602	73.34084049	3.651245524	0.521350212
0.0165	69.96	4946.568	77.849721	74.74266925	3.107051747	0.513390355

0.01675	71.02	5021.516	78.69445872	76.12341707	2.571041646	0.505669906
0.017	72.08	5096.464	79.52668135	77.48370862	2.042972728	0.498178224
0.01725	73.14	5171.412	80.34675431	78.82414118	1.522613122	0.490905289
0.0175	74.2	5246.36	81.15502724	80.14528628	1.009740964	0.483841658
0.01775	75.26	5321.308	81.95183493	81.4476911	0.504143835	0.476978424
0.018	76.32	5396.256	82.73749809	82.73187986	0.005618226	0.470307178
0.01825	77.38	5471.204	83.51232416	83.99835511	-0.486030948	0.463819976
0.0185	78.44	5546.152	84.27660806	85.24759887	-0.97099081	0.457509304
0.01875	79.5	5621.1	85.03063281	86.48007375	-1.449440947	0.451368054
0.019	80.56	5696.048	85.77467017	87.69622398	-1.921553809	0.445389493
0.01925	81.62	5770.996	86.50898128	88.89647637	-2.387495085	0.439567241
0.0195	82.68	5845.944	87.23381715	90.08124119	-2.847424047	0.433895247
0.01975	83.74	5920.892	87.94941918	91.25091306	-3.301493882	0.428367769
0.02	84.8	5995.84	88.65601969	92.40587169	-3.749851995	0.422979352
0.02025	85.86	6070.788	89.35384233	93.54648263	-4.192640297	0.417724814
0.0205	86.92	6145.736	90.04310251	94.67309799	-4.629995478	0.412599227
0.02075	87.98	6220.684	90.72400782	95.78605707	-5.062049253	0.407597901
0.021	89.04	6295.632	91.39675838	96.88568698	-5.488928606	0.402716371
0.02125	90.1	6370.58	92.0615472	97.97230321	-5.910756015	0.397950385
0.0215	91.16	6445.528	92.71856054	99.04621019	-6.327649656	0.393295888
0.02175	92.22	6520.476	93.36797817	100.1077018	-6.73972361	0.388749013
0.022	93.28	6595.424	94.00997373	101.1570618	-7.147088043	0.38430607
0.02225	94.34	6670.372	94.64471495	102.1945643	-7.549849391	0.379963535
0.0225	95.4	6745.32	95.27236394	103.2204745	-7.948110517	0.375718044
0.02275	96.46	6820.268	95.89307744	104.2350483	-8.341970878	0.371566378
0.023	97.52	6895.216	96.50700704	105.2385337	-8.731526669	0.367505462
0.02325	98.58	6970.164	97.11429945	106.2311704	-9.116870962	0.363532352
0.0235	99.64	7045.112	97.71509662	107.2131905	-9.498093847	0.359644231
0.02375	100.7	7120.06	98.30953603	108.1848186	-9.875282552	0.355838401
0.024	101.76	7195.008	98.89775082	109.1462724	-10.24852156	0.352112276
0.02425	102.82	7269.956	99.47987002	110.0977628	-10.61789275	0.348463378
0.0245	103.88	7344.904	100.0560187	111.0394941	-10.98347544	0.344889332
0.02475	104.94	7419.852	100.626318	111.9716645	-11.34534657	0.341387857
0.025	106	7494.8	101.1908855	112.8944663	-11.70358074	0.337956765
0.02525	107.06	7569.748	101.7498354	113.8080858	-12.05825033	0.334593956
0.0255	108.12	7644.696	102.3032783	114.7127039	-12.40942558	0.33129741
0.02575	109.18	7719.644	102.8513217	115.6084964	-12.75717468	0.328065188
0.026	110.24	7794.592	103.3940699	116.4956337	-13.10156384	0.324895427
0.02625	111.3	7869.54	103.9316242	117.3742816	-13.44265735	0.321786332
0.0265	112.36	7944.488	104.4640832	118.2446009	-13.7805177	0.318736179
0.02675	113.42	8019.436	104.9915425	119.1067481	-14.1152056	0.315743307
0.027	114.48	8094.384	105.5140951	119.9608752	-14.44678009	0.312806117
0.02725	115.54	8169.332	106.0318315	120.80713	-14.77529854	0.30992307
0.0275	116.6	8244.28	106.5448396	121.6456564	-15.10081679	0.307092683
0.02775	117.66	8319.228	107.053205	122.4765942	-15.42338912	0.304313526
0.028	118.72	8394.176	107.5570111	123.3000795	-15.7430684	0.30158422
0.02825	119.78	8469.124	108.0563388	124.1162449	-16.05990604	0.298903436
0.0285	120.84	8544.072	108.5512672	124.9252193	-16.37395212	0.296269891
0.02875	121.9	8619.02	109.0418729	125.7271283	-16.68525541	0.293682348
0.029	122.96	8693.968	109.5282309	126.5220943	-16.9938634	0.291139612
0.02925	124.02	8768.916	110.0104141	127.3102365	-17.29982236	0.288640528

0.0295	125.08	8843.864	110.4884936	128.091671	-17.60317738	0.286183984
0.02975	126.14	8918.812	110.9625386	128.866511	-17.90397242	0.2837689
0.03	127.2	8993.76	111.4326167	129.634867	-18.20225031	0.281394237
0.03025	128.26	9068.708	111.8987936	130.3968465	-18.49805284	0.279058988
0.0305	129.32	9143.656	112.3611337	131.1525544	-18.79142075	0.27676218
0.03075	130.38	9218.604	112.8196995	131.9020933	-19.08239379	0.274502872
0.031	131.44	9293.552	113.2745522	132.6455629	-19.37101075	0.272280152
0.03125	132.5	9368.5	113.7257514	133.3830609	-19.65730948	0.27009314
0.0315	133.56	9443.448	114.1733554	134.1146823	-19.94132692	0.26794098
0.03175	134.62	9518.396	114.6174209	134.84052	-20.22309914	0.265822848
0.032	135.68	9593.344	115.0580036	135.5606649	-20.50266136	0.263737941
0.03225	136.74	9668.292	115.4951575	136.2752055	-20.78004797	0.261685485
0.0325	137.8	9743.24	115.9289357	136.9842283	-21.05529258	0.259664727
0.03275	138.86	9818.188	116.35939	137.687818	-21.32842802	0.25767494
0.033	139.92	9893.136	116.7865707	138.3860571	-21.59948636	0.255715416
0.03325	140.98	9968.084	117.2105274	139.0790264	-21.86849895	0.253785469
0.0335	142.04	10043.032	117.6313084	139.7668049	-22.13549646	0.251884437
0.03375	143.1	10117.98	118.0489609	140.4494698	-22.40050883	0.250011673
0.034	144.16	10192.928	118.4635311	141.1270964	-22.66356538	0.248166551
0.03425	145.22	10267.876	118.875064	141.7997588	-22.92469475	0.246348465
0.0345	146.28	10342.824	119.283604	142.467529	-23.18392498	0.244556824
0.03475	147.34	10417.772	119.6891942	143.1304777	-23.4412835	0.242791055
0.035	148.4	10492.72	120.091877	143.7886741	-23.69679714	0.241050603
0.03525	149.46	10567.668	120.4916936	144.4421858	-23.95049216	0.239334926
0.0355	150.52	10642.616	120.8886847	145.0910789	-24.20239427	0.237643499
0.03575	151.58	10717.564	121.2828898	145.7354184	-24.45252863	0.235975811
0.036	152.64	10792.512	121.6743478	146.3752677	-24.70091988	0.234331367
0.03625	153.7	10867.46	122.0630968	147.0106889	-24.94759214	0.232709684
0.0365	154.76	10942.408	122.4491739	147.6417429	-25.19256905	0.231110292
0.03675	155.82	11017.356	122.8326156	148.2684894	-25.43587375	0.229532735
0.037	156.88	11092.304	123.2134578	148.8909867	-25.67752891	0.227976569
0.03725	157.94	11167.252	123.5917353	149.5092921	-25.91755676	0.226441361
0.0375	159	11242.2	123.9674825	150.1234616	-26.15597905	0.224926692
0.03775	160.06	11317.148	124.3407331	150.7335502	-26.39281713	0.223432152
0.038	161.12	11392.096	124.7115199	151.3396118	-26.62809191	0.221957341
0.03825	162.18	11467.044	125.0798753	151.9416992	-26.8618239	0.220501873
0.0385	163.24	11541.992	125.445831	152.5398642	-27.09403319	0.219065368
0.03875	164.3	11616.94	125.809418	153.1341575	-27.3247395	0.217647459
0.039	165.36	11691.888	126.1706669	153.724629	-27.55396215	0.216247788
0.03925	166.42	11766.836	126.5296074	154.3113275	-27.78172011	0.214866003
0.0395	167.48	11841.784	126.8862689	154.8943009	-28.00803199	0.213501765
0.03975	168.54	11916.732	127.2406802	155.4735962	-28.23291601	0.212154742
0.04	169.6	11991.68	127.5928694	156.0492595	-28.4563901	0.21082461
0.04025	170.66	12066.628	127.9428643	156.6213361	-28.67847181	0.209511052
0.0405	171.72	12141.576	128.2906921	157.1898705	-28.8991784	0.208213762
0.04075	172.78	12216.524	128.6363793	157.7549061	-29.11852679	0.206932438
0.041	173.84	12291.472	128.9799522	158.3164858	-29.33653358	0.205666788
0.04125	174.9	12366.42	129.3214366	158.8746517	-29.5532151	0.204416527
0.0415	175.96	12441.368	129.6608575	159.4294449	-29.76858736	0.203181374
0.04175	177.02	12516.316	129.9982399	159.980906	-29.98266608	0.201961058
0.042	178.08	12591.264	130.3336081	160.5290748	-30.19546671	0.200755313

0.04225	179.14	12666.212	130.6669859	161.0739904	-30.40700442	0.19956388
0.0425	180.2	12741.16	130.9983969	161.615691	-30.61729412	0.198386505
0.04275	181.26	12816.108	131.3278641	162.1542146	-30.82635044	0.197222941
0.043	182.32	12891.056	131.6554103	162.689598	-31.03418776	0.196072947
0.04325	183.38	12966.004	131.9810575	163.2218778	-31.24082022	0.194936286
0.0435	184.44	13040.952	132.3048279	163.7510896	-31.44626171	0.193812727
0.04375	185.5	13115.9	132.6267428	164.2772687	-31.65052588	0.192702047
0.044	186.56	13190.848	132.9468235	164.8004496	-31.85362615	0.191604023
0.04425	187.62	13265.796	133.2650906	165.3206663	-32.0555757	0.190518442
0.0445	188.68	13340.744	133.5815647	165.8379522	-32.25638749	0.189445093
0.04475	189.74	13415.692	133.8962658	166.3523401	-32.45607429	0.188383771
0.045	190.8	13490.64	134.2092137	166.8638623	-32.65464862	0.187334273
0.04525	191.86	13565.588	134.5204278	167.3725506	-32.85212281	0.186296405
0.0455	192.92	13640.536	134.8299272	167.8784361	-33.04850898	0.185269973
0.04575	193.98	13715.484	135.1377307	168.3815497	-33.24381906	0.18425479
0.046	195.04	13790.432	135.4438568	168.8819215	-33.43806477	0.183250672
0.04625	196.1	13865.38	135.7483236	169.3795813	-33.63125766	0.182257439
0.0465	197.16	13940.328	136.0511492	169.8745582	-33.82340907	0.181274914
0.04675	198.22	14015.276	136.352351	170.3668811	-34.01453017	0.180302926
0.047	199.28	14090.224	136.6519463	170.8565783	-34.20463195	0.179341306
0.04725	200.34	14165.172	136.9499523	171.3436776	-34.39372523	0.178389888
0.0475	201.4	14240.12	137.2463857	171.8282064	-34.58182066	0.177448513
0.04775	202.46	14315.068	137.5412631	172.3101918	-34.7689287	0.17651702
0.048	203.52	14390.016	137.8346005	172.7896602	-34.95505967	0.175595256
0.04825	204.58	14464.964	138.1264142	173.2666379	-35.14022372	0.174683069
0.0485	205.64	14539.912	138.4167197	173.7411506	-35.32443085	0.17378031
0.04875	206.7	14614.86	138.7055327	174.2132236	-35.50769089	0.172886834
0.049	207.76	14689.808	138.9928684	174.6828819	-35.69001354	0.172002498
0.04925	208.82	14764.756	139.2787418	175.1501501	-35.87140834	0.171127164
0.0495	209.88	14839.704	139.5631677	175.6150524	-36.05188467	0.170260693
0.04975	210.94	14914.652	139.8461607	176.0776125	-36.2314518	0.169402953

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