

GHRST-XV

Inter-comparison Technical Advisory Group (IC-TAG)

Breakout session

Chair:
Alexey Kaplan

3 June 2014
16:00-18:00

AGENDA

- **16:00-16:10** Introduction
- **16:10-17:15** Talks and discussion on inter-comparison of L4 SST products and their validation: *Talks (10 min + 2.5 min for questions each) followed by a discussion (15 min total)*
- **17:15-17:45** Discussion of major IC-TAG issues
- **17:45-18:00** General discussion and plans for the next year

TALKS

- ~~16:10-16:20~~ ~~*Biases between In Situ and Remotely Sensed Data Sets around the Coast of South Africa (Albertus Smit)*~~ Presented in AUSTAG
- 16:20-16:30 *REMO SST GROUP: Status & Updates (Gutemberg Franca)*
- 16:30-16:40 *Validation of Sea Surface Temperature Analyses in the Arctic Ocean Using UpTempO Buoys (Sandra Castro)*
- 16:40-16:50 *A Review on the Application of High Resolution SSTs in a Coastal Upwelling Region: The test case off Peru (Jorge Vazquez)*
- 16:50-17:00 *An intercomparison of long-term SST reanalyses using the GHRSSST multi-product ensemble (GMPE) system (Jonah Roberts-Jones)*
- 17:00-17:15 *Discussion*

Introduction

Terms of reference

1. To coordinate existing inter-comparison activities for L4 analyses within GHRSSST, including the GHRSSST Multi-Product Ensemble (**GMPE**), and the comparison of L4 analyses and lower level data including the SST Quality Monitor (**SQUAM**) and the High Resolution Diagnostic Data Set (**HRDDS**); *the latter currently is not functional and is being replaced by the system called **Felyx**, under development in the ESA.*
2. To coordinate the development of the existing inter-comparison systems, including the **development of links between those systems.**
3. To **develop standardised metrics** for use in routine inter-comparison of L4 analyses, and advise on the content and form of automatic reports from the inter-comparison systems.
4. To **improve the documentation** of the inter-comparison systems, and to provide high level information on the contributing L4 analysis systems.
5. To **promote the use of inter-comparison tools** for use by the other TAGs (e.g. Re-analysis TAG) where appropriate and make use of validation tools developed by other TAGs.
6. To **assess and improve the specification of error** in the L4 analyses.
7. To regularly review the IC-TAG chair/vice-chair and membership.

Current Membership

- Alexey Kaplan, Columbia University, USA (Chair)
- Mike Chin, NASA JPL, USA (Vice-Chair)
- Ed Armstrong, JPL, USA
- Viva Banzon, NOAA/NCDC, USA
- Ian Barton, Australia
- Helen Beggs, BoM, Australia
- Bruce Brasnett, Canada
- Dudley Chelton, OSU, USA
- Jim Cummings, NRL, USA
- Prasanjit Dash (SQUAM), NOAA/NESDIS, USA
- Dave Foley, NOAA/NMFS & University of California, Santa Cruz, USA
- Chelle Gentemann, RSS, USA
- Robert Grumbine, NWS, USA
- Jacob Hoeyer, DMI, Denmark
- Alexander Ignatov (SQUAM), NOAA/NESDIS, USA
- Shiro Ishizaki, JMA, Japan
- Eileen Maturi, NOAA/OSPD, USA
- Bruce McKenzie, NAVOCEANO, USA
- Jean-François Piollé (Felyx), IFREMER, France
- Nick Rayner, Met Office, Hadley Centre, UK
- Jonah Roberts-Jones (GMPE), Met Office, UK
- Martin Rutherford, Australia
- Jorge Vazquez, JPL, USA

David G Foley

1966 - 2013



Major IC-TAG Discussion Topics

- *Conversion of inter-comparisons to user recommendations (i.e., answering questions: “Why do all these products differ?” and “Which SST should I use?”)*
- *Inter-comparison results to date and **uncertainty** in L4 products*
- *Inter-comparison systems (**GMPE, SQUAM, FELYX**)*
- *Suggestions/Recommendations for **further** inter-comparisons*

9:45-10:00: General discussion and plans for the next year

[including *Action Items*]

APPENDIX

Table 1
Summary of the various L4 SST analysis systems.

<i>Name of system</i>	<i>Institute, country</i>	<i>Reference</i>	<i>Date of availability of NRT data</i>	<i>Reanalysis period</i>
CMC	Canadian Meteorological Center, Canada	Brasnett (2008), Brasnett (1997)	April 2008	September 1991
FNMOG	Fleet Numerical Meteorology and Oceanography Center, USA	Cummings (2005), Cummings (2011)	2005	N/A
GAMSSA	Bureau of Meteorology, Australia	Beggs et al. (2011), Zhong and Beggs (2008)	October 2008	N/A
MGDSST	Japan Meteorological Agency, Japan	Kurihara et al. (2006)	September 2002	September 1981
NAVO K10	Naval Oceanographic Office, USA	–	July 2004	N/A
OISST.v2:AVHRR, AVHRR+AMSR	NCDC/NOAA, USA	Reynolds et al. (2007)	November 2008 (V1 started 2006 and was discontinued in 2009)	September 1981 (AVHRR), June 2002 (AVHRR+AMSR)
OSTIA	Met Office, UK	Donlon et al. (2011)	November 2006	January 1985
POES/GOES	NESDIS/NOAA, USA	Maturi et al. (2008)	June 2007	N/A
RSS MW, MW/IR	Remote Sensing Systems, USA	Gentemann et al. (2006)	2007	June 2002, January 2002
RTG	NWS/NCEP/NOAA, USA	Gemmill et al. (2007)	September 2005	N/A

Table 2
Summary of the data types used by the various L4 SST analyses in NRT. Note that AMSR-E data are not available since 5th October 2011.

<i>Name of system</i>	<i>In situ</i>	<i>AATSR/Envisat</i>	<i>AVHRR/NOAA</i>	<i>AVHRR/MetOp</i>	<i>MODIS/Aqua,Terra</i>	<i>AMSR-E/Aqua</i>	<i>TMI/TRMM</i>	<i>SEVIRI/MSG</i>	<i>GOES</i>	<i>MTSAT-2</i>
CMC	X	X	X	X		X				
FNMOG	X		X	X					X	
GAMSSA	X	X	X	X		X				
MGDSST	X		X	X		X				
NAVO K10			X	X		X			X	
OSTIA	X	X	X	X		X	X	X		
POES/GOES		X	X	X		X		X	X	X
OISST.v2:AVHRR	X		X	X						
OISST.v2:AVHRR+AMSR	X		X	X		X				
RSS-MW						X	X			
RSS-MW/IR					X	X	X			
RTG	X		X	X						

Table 3

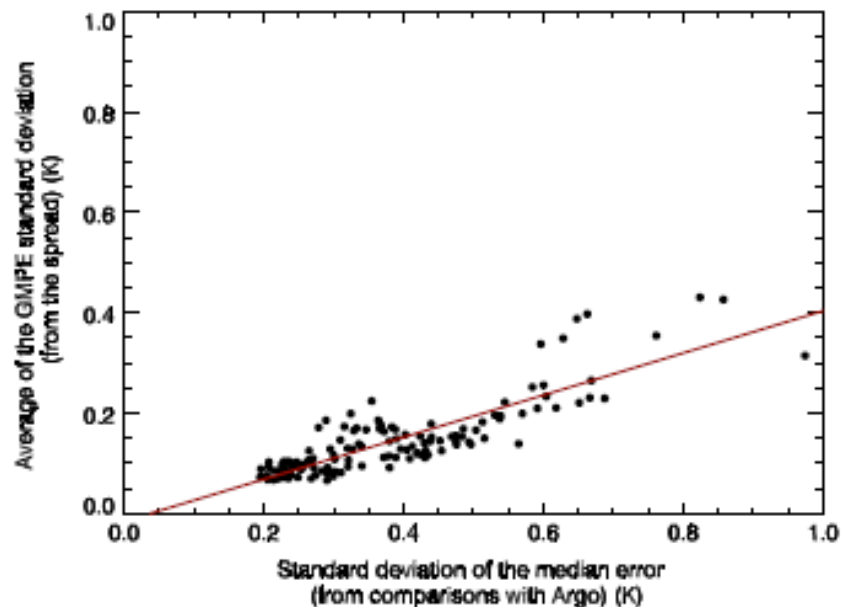
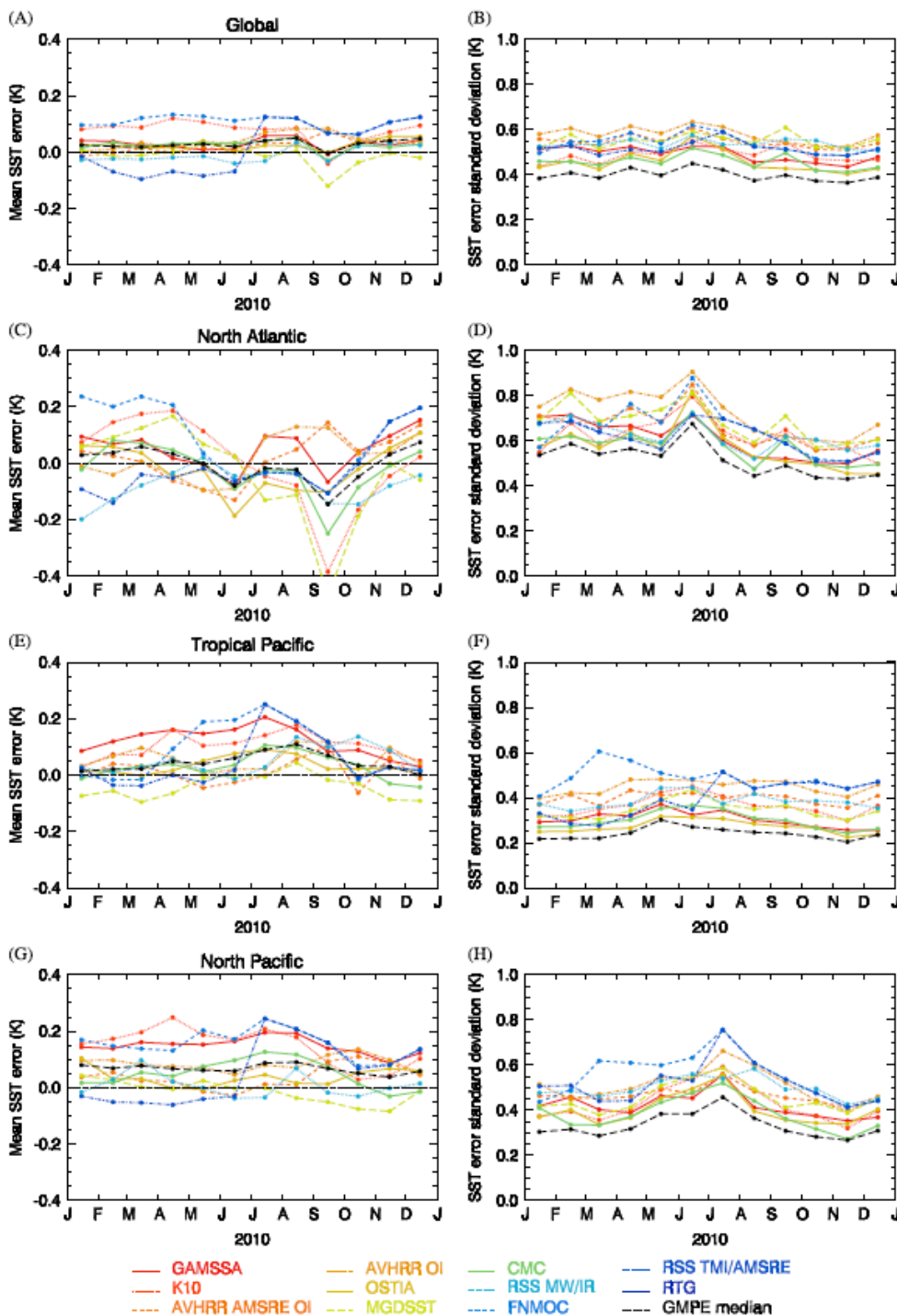
Summary of the characteristics contributing to the horizontal and temporal scales resolved by each L4 analysis.

<i>Name of system</i>	<i>Horizontal grid resolution</i>	<i>Minimum horizontal correlation scale</i>	<i>Highest input data resolution (after thinning)</i>	<i>Temporal correlation scale</i>	<i>Update cycle</i>
CMC	0.2° lat/lon	43 km	44 km	None	Daily by 09:15 UTC for analysis of previous day
FNMOC	~9 km	~10 km	~9 km	None	6 hourly with 7 h delay on each analysis
GAMSSA	0.25° lat/lon	50 km	17 km	0.5 days	Daily by 03:30 UTC for analysis of previous day
MGDSST	0.25° lat/lon	50 km	25 km	5 days	Daily by 00:30 UTC for analysis of previous day
NAVO K10	10 km	10 km	2 km	4 days	Daily by 03:00 UTC for analysis of previous day
OISST.v2:AVHRR, AVHRR+AMSR	0.25° lat/lon	50 km	25 km	3 days	Daily by 12:30 UTC for analysis of previous day
OSTIA	0.05° lat/lon	10 km	~3.5 km	5 days	Daily by 06:30 UTC for analysis of previous day
POES/GOES	0.1° lat/lon	11 km	4 km	None	Daily
RSS MW, MW/IR	25 km, 9.76 km	1°, 1.5°	25 km, ~10 km	4 days, 3 days	Daily
RTG	1/12° lat/lon	50 km	8 km	None	Daily by 21:30 UTC for analysis of day

Table 1

List of L4 SST products monitored or considered in L4-SQUAM. Note that AMSR-E data was an input to most of the L4 SSTs listed here but its production has been suspended on 04 October 2011.

Product	Space/time res. & type	Abbreviation & mode	Reference	Availability period, data format, and ftp source,	Input data				Ice mask
					Infrared	Microwave	Insitu	Other	
Products fully implemented in L4-SQUAM									
Optimal interpolation SST	0.25° Daily depth (bulk)	AVHRR_OI NRT; delayed reanalysis AVHRR_AMSR_OI NRT; delayed reanalysis	Reynolds et al., 2007	1981 to present, netCDF ftp://eclipse.ncdc.noaa.gov/pub/OI-daily-v2/NetCDF 01-Jun-2002 to 04-Oct-2011, netCDF ftp://eclipse.ncdc.noaa.gov/pub/OI-daily-v2/NetCDF	AVHRR (PF until 2005, then NAVO) AVHRR	-NA- AMSR-E* (*suspended on 04-Oct-2011)	✓ ✓	NCEP ice NCEP ice	✓ ✓
Operational SST & Sea Ice analysis	0.05° Daily foundation	OSTIA NRT OSTIA_RAN reanalysis	Stark et al., 2007;2008; Donlon et al., 2011	Apr-2006 to present, netCDF ftp://podaac-ftp.jpl.nasa.gov/allData/ghrsst/data/L4/GLOB/UKMO/OSTIA 1985-2007, netCDF ftp://data.ncf.co.uk/ostia_reanalysis/ (passwd)	AVHRR, AATSR, SEVIRI AVHRR PF, (A)ATSR	TMI, AMSR-E -none-	✓ ✓	O&SI SAF ice O&SI SAF ice	✓ ✓
Real time global SST	0.50° Daily depth (bulk) 1/12° Daily depth (bulk)	RTG_LR NRT RTG_HR NRT	Thiébaux et al., 2003 Gemmill, Katz, & Li, 2007	Dec-2000 to present, gridded binary (grib) ftp://polar.ncep.noaa.gov/pub/history/sst Feb-2007 to present, grib ftp://polar.ncep.noaa.gov/pub/history/sst/ophi (rotated for a year)	AVHRR AVHRR physical retrievals	-none- -none-	✓ ✓	NCEP ice NCEP ice	X X
NAVOCEANO K10 Analysis	0.10° Daily depth	K10 NRT	http://podaac.jpl.nasa.gov/dataset/NAVO-L4HR1m-GLOB-K10_SST	Apr-2008 to present, netCDF ftp://podaac-ftp.jpl.nasa.gov/allData/ghrsst/data/L4/GLOB/NAVO/K10_SST	AVHRR, GOES	AMSR-E	X	JPL climate	X
NESDIS multi-SST analysis (formerly called POES-GOES)	0.10° Daily depth	GOESPOES NRT	Maturi et al., 2008; http://www.nesdis.noaa.gov/mecb/blended_validation/	Feb-2009 to present, HDF ftp://dds.nesdis.noaa.gov/pull/ (passwd)	AVHRR, GOES, MTSAT, SEVIRI	Planned: AATSR, AMSR-2	X	NCEP ice (since May 2010)	✓
JPL ultra high resolution G1SST	0.01° Daily, ± 80°lat foundation	G1SST NRT	Chao et al., 2009	Jun-2010 to present, netCDF ftp://podaac-ftp.jpl.nasa.gov/allData/ghrsst/data/L4/GLOB/JPL_OUROCEAN/G1SST/	AVHRR, AATSR, MODIS, GOES, SEVIRI, MTSAT	TMI, AMSR-E	✓	Some ice	✓
Canadian met. center analysis	0.2° Daily foundation	CMC 0.2° NRT	Brasnett, 1997; 2008	Jan-2002 to present, netCDF (contact CMC for data access)	AVHRR, AATSR	AMSR-E, WindSat	✓	CMC ice	✓ from Sep., 2011
Australian BoM GAMMSA	0.25° Daily foundation	GAMSSA NRT	Beggs et al., 2011; Zhong & Beggs, 2008	Oct-2008 to present, netCDF ftp://podaac-ftp.jpl.nasa.gov/allData/ghrsst/data/L4/GLOB/ABOM/GAMSSA_28km	AVHRR, AATSR	AMSR-E, WindSat	✓	NCEP ice	✓
Ocean data analysis, MyOcean/GMES	0.10° Daily foundation	ODYSSEA NRT	Autret & Piollé, 2011	Reinstated Sep-2010 to present, netCDF ftp://eftp.ifremer.fr/cersat-rt/project/myocean/sst-tac/l4/glob/odyssea/ (passwd)	AVHRR, AATSR, GOES, SEVIRI	TMI, AMSR-E	X	O&SI SAF ice	✓
GHRSSST multi prod. ensemble	0.25° Daily ensemble	GMPE NRT	Martin et al., this issue	Sep-2009 to present, netCDF ftp://data.ncf.co.uk/ (passwd via MyOcean)	-NA-	-NA-	-NA-	O&SI SAF ice	X
Products currently being tested									
JPL multi-scale ultra-high res. SST	0.01° Daily foundation	MUR being tested	http://mur.jpl.nasa.gov/multi_resolution_analysis.php	Jan-2009 to present, netCDF ftp://podaac-ftp.jpl.nasa.gov/allData/ghrsst/data/L4/GLOB/JPL/MUR/	MODIS (Terra, Aqua), AVHRR (GAC)	AMSR-E	X	O&SI SAF ice	✓
RSS MW OI	0.25° Daily minimum	RSS MISST NRT	http://www.remss.com/	Jun-2002 to present, netCDF ftp://ftp.discover-earth.org/sst/misst/l4/tmi_amsre/nc	-NA-	TMI, AMSR-E	X	-	✓
Products potentially being considered to be included									
RSS IR+MW	0.25° Daily foundation	mw_ir_oi NRT	http://www.remss.com/	netCDF ftp://ftp.discover-earth.org/sst/	MODIS	AMSR-E, TMI	X	-	✓
JMA merged SST	0.25° Daily foundation	MGDSST NRT; delayed reanalysis	Kurihara et al., 2006	1985 to present, Plain binary http://goos.kishou.go.jp/rtdb/usr/pub/JMA/mgdsst/ (passwd)	AVHRR (GAC, HRPT)	AMSR-E	✓	JMA sea-ice	✓
DMI OI SST analysis	0.05° Daily foundation	DML_OI NRT	Hoyer and She, 2007	Jan-2011 to present, netCDF ftp://ftpserver.dmi.dk/GBL005/ (passwd)	AVHRR (GAC, HRPT), SEVIRI, AATSR, MODIS	AMSR-E, TMI	X	O&SI SAF ice	✓
Naval res. lab. NCODA analysis	~0.08° 6 hourly depth	NCODA NRT	Cummings, 2005	Jun-2009 to present, IEEE binary, direct access, http://www.usgodae.org/cgi-bin/data/list.pl?summary=Go&dsset=fnmoc_ghrsst	AVHRR (GAC, LAC), SEVIRI, GOES, MTSAT-2	AMSR-E, Windsat (coming)	✓	6-h SSM/I & SSMIS ice	X



GMPE ensemble median is more **accurate** than individual members (left); GMPE ensemble spread can be used as a **proxy** for the error in its median (up). Suppose we've reduced the number of L4 products to 1 or 2: **GMPE ensemble will disappear!**