Multi-wavelength properties and SMBH's masses of the isolated AGNs in the Local Universe

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Garching, June 27 - July 1, 2016

A study of the isolated galaxies with active nuclei is a very important to get a response to the internal evolution of galaxy activity. Wherein, their multi-wavelength properties, including in the X-ray range, are not fully analyzed as concerns with the influence of halo matter (baryonic/dark) on the formation and productivity of AGN's engine.

The sample of 36 nearest isolated AGNs was cross-matched by 2MIG and Veron-Cetty catalogues and limited to $V_r < 15\,000$ km/s, $K_s \leq 12.0^m$ in the northern sky (δ ≥ -15°). These objects were in isolation during at least 3 Gyrs.

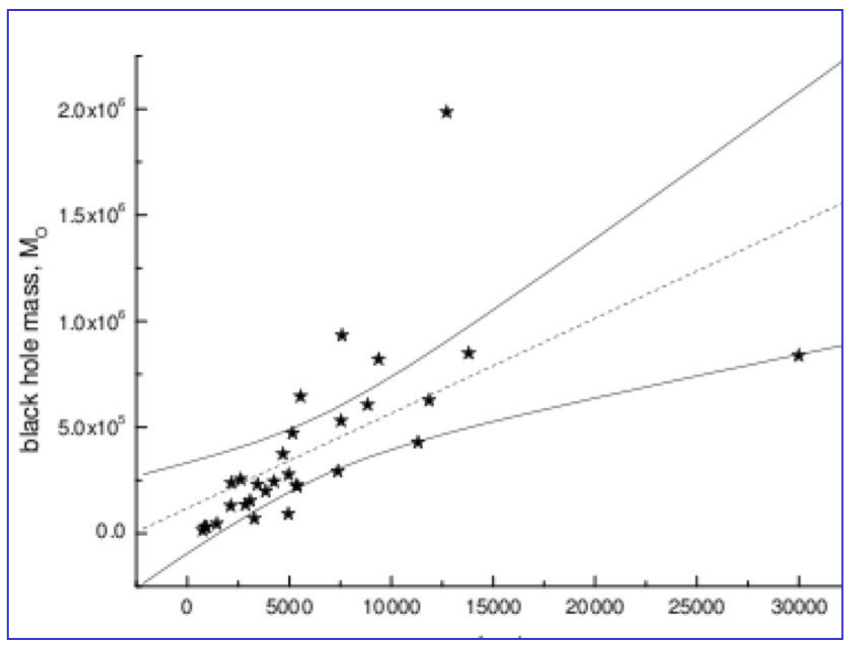
For revealing their multi-wavelength properties we used all the available databases obtained with ground-based and space observatories (from radio to X-ray ranges). It is allowed us to separate the internal evolution mechanisms from the environment influence and consider them as two separate processes related to fueling nuclear activity and accretion on the SMBHs outside of the environment.

The main results were summarized in our paper (*Pulatova N., Vavilova I., Sawangwit U. et al. The 2MIG isolated AGNs - I. General and multi-wavelength properties of AGNs and host galaxies in the northern sky, MNRAS, 447, Is. 3, p. 2209-2223 (2015)*).

We accentuate that for the first time we revealed that the host isolated galaxies with AGNs of Sy1 type (without faint companions) appear to possess the bar morphological features (e.g., the interaction with neighboring galaxies is not necessary condition for broad-line region formation). We found that most of the 2MIG northern isolated host galaxies with AGNs belongs to S0-Sc types (about 40 % are of Sb type), and a half of them are Sy2-type galaxies; the 2MIG isolated AGNs are mostly faint sources from radio to X-ray ranges (see Table below).

We give also current results as concerns with more detail X-ray analysis, emission features and spectral models for several AGNs for which a cumulative soft and hard energy spectrum was reconstructed (see Table and Figures on the right).

The estimates of SMBH masses show that are systematically lower than the SMBH masses of AGNs located in a dense environment (see Figure below).



Velocity vs. SMBH mass plane

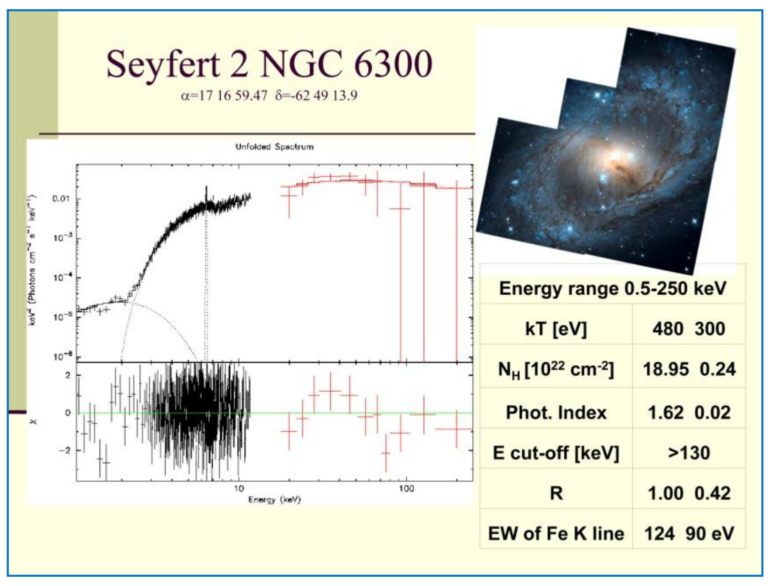
Multi-wavelength properties of the isolated AGNs at z < 0.1

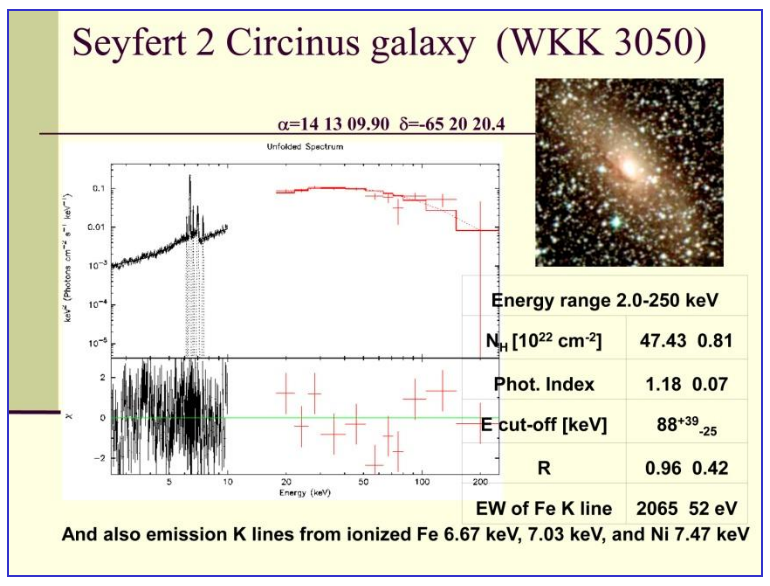
Name	RA hh:mm:ss	DEC dd:mm:ss	v (km/s)	Morph.	r (″)	N	Radio (mJy)	IR	O (mJy)	UV	X-ray	R	Spec. Type
A: Faint AGNs													
IC1529	00:05:13.22	-11:30:09.3	6751	(R)SA0(r)	21.9	–	3.4	-	11.4	16.7	-	0.3	AGN
NGC0773	01:58:52.01	-11:30:52.6	5437	SAB(r)a	31.3	1[1]	4.9	1.6	11.5	-	-	0.4	Sy3
NGC0918	02:25:50.22	+18:29:56.1	1508	SAB(rs)c	73.1	1[2]	-	6.9	1.8	14	-	-	AGN
PGC989455	14:29:33.27	-09:33:40.5	12879	S0-a	18.9	–	5.8	-	2.4	-	-	2.4	Sy3
UGC10244	16:09:55.47	+43:07:44.3	9785	Sbc	26.1	–	2.2	1.9	1.9	-	-	-	Sy3
B: Composites galaxies													
IC0009	00:19:44.00	-14:07:18.4	12622	Sb(r)	15.3	–	8.8	1.3	4.5	-	-	1.9	Sy2, HII
NGC0157	00:34:46.75	-08:23:47.3	1673	SAB(rs)bc	95.5	–	136	-	453	13.4	-	0.3	Sy2, HII
PGC89963	03:56:00.88	-13:42:32.7	8793	-	18.7	–	8.6	3.5	2.7	-	-	3.2	Sy2, HII
MCG-02-27-009	10:35:27.35	-14:07:47.6	4529	SB0(rs)	38.8	–	4.3	1.6	11.4	-	-	0.4	Sy2, HII
MCG-02-37-004	14:26:12.28	-11:54:16.3	12422	SABb	20.2	–	6.0	1.2	4.5	-	-	1.8	Sy2, HII
UGC10774	17:14:09.07	+58:49:06.7	8873	SBAbc	17.3	1[3]	1.5	-	0.08	-	-	-	Sy3, HII
C: Isolated galaxies with small nearest or distant similar physical companions (according to the NED database)													
NGC1050	02:42:35.57	+34:45:48.4	3904	(R)SB(s)a	37	1	31.9	8.9	14.9	-	-	-	Sy2, HII
CGCG248-019	14:43:31.25	+49:23:35.3	9032	Sa	18.1	3	3.8	1.01	3.9	-	-	0.9	Sy1, HII
UGC01757	02:17:23.07	+38:24:49.9	5060	S0-a	28.6	2	16.3	-	5.8	-	-	2.8	Sy2
NGC4395	12:25:48.92	+33:32:48.2	319	SAB(sr)m	37.6	> 215	1.2, 0.5[7]	6.3	251	11.7	0.6	-	Sy2
MCG-02-57-008	22:29:55.37	-08:16:45.5	10577	SBAc	25.4	2	6	3.2	8	-	-	0.8	AGN
NGC5231	13:35:48.25	+02:59:55.6	6523	SBa	20.7	5	11.7	1.3	9	17.1	1.8[4]	1.3	Sy1
UGC10120	15:59:09.67	+35:01:47.3	9438	SB(r)b	22.9	2	5.9	1.37	2.4	14.5	0.3	2.5	Sy1n
NGC7479	23:04:56.66	+12:19:22.3	2381	SB(s)c	87.9	4	101, 41[7]	25.8	104	14.8	0.023	0.9	Sy1.9
IC2227	08:07:07.17	+36:14:00.1	9673	Sa	17	2	5.1	1.1	5.5	-	-	0.9	Sy2
UGC06398	11:23:11.44	+29:35:53.9	14137	Sbc	30.1	1	4.1	-	1.9	-	-	2.1	Sy2
UGC06769	11:47:43.69	+01:49:34.3	8539	SB(r)b	18.1	1	-	0.6	0.3	-	-	-	Sy2
D: Pure isolated AGNs													
MCG-02-09-040	03:25:04.94	-12:18:28.5	4495	S0-a	21.7	–	18.1	3.52	4.1	-	1.1[4]	4.4	Sy2
UGC02936	04:02:48.25	+01:57:56.6	3814	SB(s)d	74.7	–	37.4	11.2	6.5	-	1[4]	5.2	Sy2
CGCG179-005	08:25:10.24	+37:59:20.2	6362	Sb	16.5	1[1]	4.8	-	3.6	-	-	1.4	Sy2
NGC3035	09:51:55.02	-06:49:22.5	4350	SB(rs)bc	32	2[1]	6.2	1.61	14.6	-	0.54[6]	0.4	Sy1.5
UGC06087	11:00:32.50	+02:06:57.3	11824	SBb	26.6	–	-	-	4.7	16.9	-	-	Sy1
CGCG243-024	11:53:41.76	+46:12:42.6	7385	SB(r)a	15.2	–	-	0.9	1.5	15.6	0.12[5]	-	Sy1n
NGC5347	13:53:17.85	+33:29:26.7	2384	(R)SB(rs)ab	41.3	2[1]	4.1, 3.1[7]	2.6	18.7	16.9	0.03[5]	0.32	Sy2
NGC5664	14:33:43.60	-14:37:10.9	4544	Sa	24.8	–	66	4.1	4.5	-	-	14.7	Sy2
MCG+09-25-022	15:07:45.04	+51:27:09.6	13801	SABb	21.1	–	3.8	0.8	0.4	-	-	8.6	Sy1
PGC86291	18:51:59.48	+11:52:33.7	2603	SB(r)c	44	–	8.4	5.9	4.1	-	-	2.1	Sy1
NGC6951	20:37:14.07	+66:06:20.3	1424	SAB(rs)bc	15.6	–	70.4, 36[7]	37.5	100	17.5	0.005	0.7	Sy2
2MFGC17245	22:55:59.94	-12:22:11.7	7552	Sc	20.8	3[1]	10.3	-	2.2	-	-	4.7	AGN
UGC12282	22:58:55.28	+40:55:55.9	5097	SABa	57.8	2[1]	11.8	3.8	5.9	-	2.1[4]	-	Sy1.5
IC5287	23:09:20.28	+00:45:23.0	9715	(R)SB(r)b	22.8	–	-	< 0.3	5.8	17.1	-	-	Sy1
IC1495	23:30:47.73	-13:29:07.6	6384	SAB(r)b	26.8	1[1]	18.9	< 4.3	28.6	-	-	0.7	Sy2

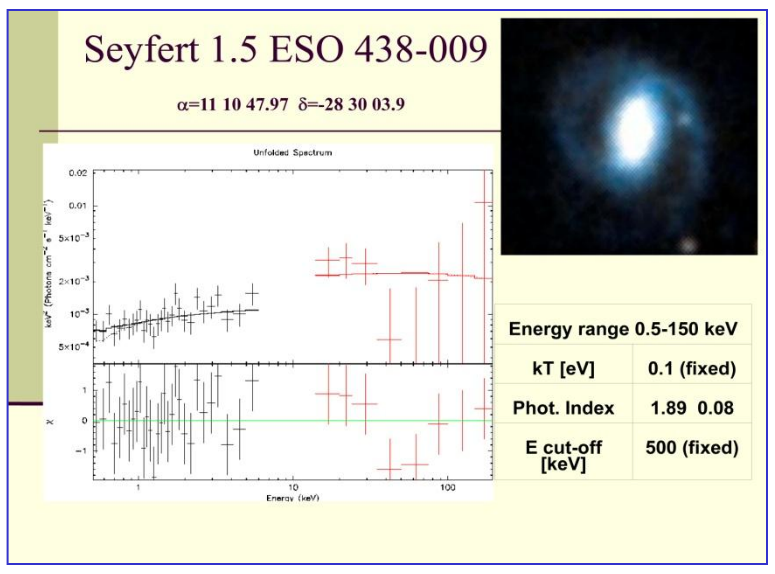
[1] distance to the NED neighbor galaxy satisfies 2MIG, [2] Neighbor center of Galaxies Group, [3] Starforming region, [4] 15-150 keV (Swift)
[5] 2-10 keV (ASCA), [6] 0.1-2.4 keV (ROSAT), [7] 5 GHz flux

X-ray properties of selected AGNs

Name	z	Type	Instrument	Luminosity, (2-10 keV) ergs/s
Circinus galaxy	0.001	Sy2	XMM-Newton+INTEGRAL	**$1.21 \cdot 10^{41}$**
NGC 1050	0.013	Sy2	XMM-Newton	**$2.15 \cdot 10^{40}$** (0.5-2.0 keV)
NGC 2989	0.014	AGN	Swift/XRT	**$4.65 \cdot 10^{40}$**
NGC 3035	0.015	Sy1.8	Swift/XRT+BAT	**$3.30 \cdot 10^{44}$**
NGC 5347	0.008	Sy2	NuStar	**$2.49 \cdot 10^{40}$**
NGC 6300	0.004	Sy2	XMM-Newton+ INTEGRAL + Chandra	**$5.96 \cdot 10^{41}$**
IC 2227	0.032	Sy2	Swift/XRT	**$1.02 \cdot 10^{43}$**
ESO 317-038	0.015	AGN	Swift/XRT+BAT	**$1.13 \cdot 10^{42}$**
ESO 438-009	0.024	Sy1.5	Swift/XRT+BAT	**$5.41 \cdot 10^{42}$**
CGCG 179-005	0.021	BLAGN	XMM-Newton+Chandra	**$2.13 \cdot 10^{42}$**



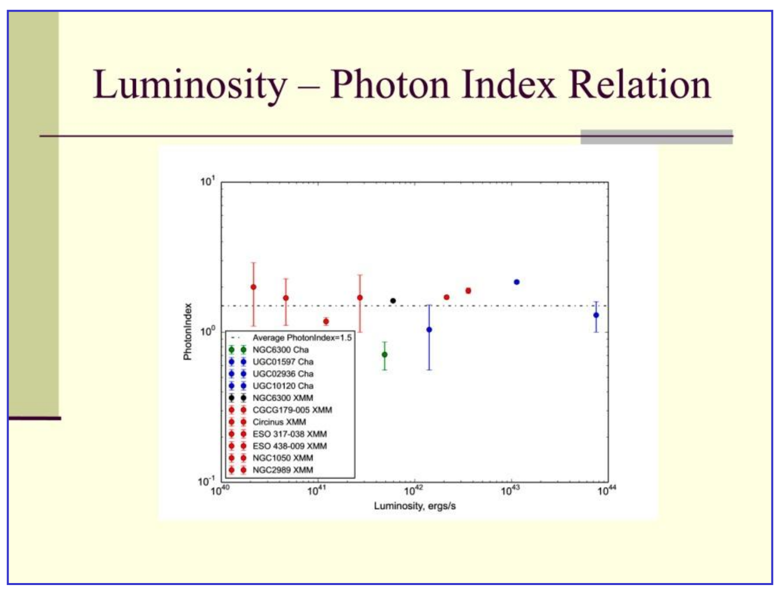


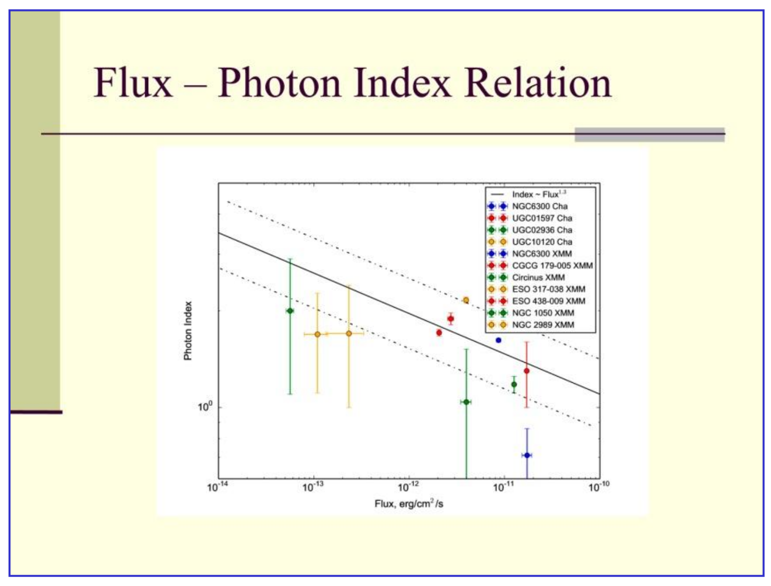


X-ray software and models

XMM-Newton: SAS v.14.0 Swift: HEAsoft v.6.16 INTEGRAL: OSA 10.1
Chandra: CIAO 4.3 (latest CalDB)
Spectral modeling: Xspec 12.8.2q

We used spectral models as follows: neutral absorption (phabs/zphabs,tbabs/ztbabs), ionized absorpiton (zxipcf), power-law (powerlaw), powerlaw with high energy exponential cutoff (cutoffpl), sum of exponentially cut off power law and reflected spectrum from neutral material (pexrav/pexmon), blackbody spectrum (zbbody), comptonized blackbody model (compbb), and gaussian emission line profile (zgauss).





There is a correlation between X-ray flux of AGNs and their spectral photon index as Index ~ $Flux^{1.3}$.