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THE CHANGING LOOK AGNS MONITORING PROJECT

V. L.Oknyanskij [1], N.A.Huseynov [2], V.M.Lipunov [1], A.M.Tatarnikov [1], N.I.Shatsky, S.S.Tsygankov [3], V.G.Metlov [1], I.R.Salmanov [2], C.M.Gaskell [4]

[1] Sternberg Astronomical Institute, Moscow M.V. Lomonosov State University, Moscow, Russian Federation, *oknyan@mail.ru*

[2] Shamakhy Astrophysical Observatory, National Academy of Sciences, Azerbaijan

[3] Tuorla Observatory, Department of Physics and Astronomy, University of Turku, Väisäläntie 20, FI-21500, Piikkiö, Finland

[4] Department of Astronomy and Astrophysics, University of California, Santa Cruz, USA

ABSTRACT. The Changing Look AGNs (CL AGNs) are objects which undergo dramatic variability of the emission line profiles and classification type of which can move from one spectral class to another within very short time interval (from days to years).

We start the project of spectral and photometric multiwavelength (from IR to X-ray) monitoring which include the selected set of AGNs also known as the CL AGNs.

We are going to use 2-m Zeiss telescope (ShAO) for optical spectral observations, 2.5-m telescope of SAI for IR *JHK* photometry and spectrophotometery, small telescopes Zeiss-600, AZT-5 for *BVRI* photometry.

We are also going to search for the new CL AGNs using the *MASTER* data. Furthermore, we can get historical light curves for the known and the new discovered objects using the MASTER opportunities.

We are planning to apply for X-ray and UV observations of some CL AGNs with the *SWIFT*.

We present some results of such monitoring of the transient object NGC2617.

The main goal of the project is to investigate the possibilities for the repeating cases of the strong changes of spectral type at the CL AGNs. Investigation of such type of objects can be very informative for understanding the nature of these fast variations as well as physics of the AGNs.

1. Introduction

The Changing Look AGNs (CL AGNs) are objects which undergo dramatic variability of the emission line profiles and classification type of which can move from one spectral class to another within very short time interval (from days to years). There are currently only some tens of cases of CL AGNs known. However, the small number of known CL AGNs is comparable to the number of AGNs which able to suspect, therefore, that perhaps every strongly variable AGN could be found to be a CL AGN if it is observed long enough. This assumption is supported by recent investigations (Runco et al., 2016) which show that about 38% of 102 Seyferts changed type and about 3% of the objects demonstrate disappearance of H_β on time scale of 3-9 years. Also (MacLeod et al., 2016) estimate >15% for strongly variable luminous quasars have changing-look behavior on rest-frame timescales of 3000–4000 days. There different types of the CL cases:

1. Vanishing or strong decreasing of broad line components for some relatively short time from several months to several years (NGC 3616 (Andrillat, 1968), NGC 4151 (Lyutyj, Oknyanskij, Chuvaev 1984; Penston and Perez, 1984; Oknyansky, Lyuty and Chuvaev, 1991)), NGC7603, Mrk 372, 3C390.3. Mrk993, NGC7469 (Chuvaev, Lyutyi and Doroshenko, 1990), NGC6814 (Sekiguchi and Menzies, 1990), NGC5548 (Shapovalova et al., 2004)). It is known that type of change for 2 quasars SDSS J015957.64+003310.5 and the SDSS J101152.98+544206.4. (See more references at Shappee et al., 2014; Koay et al., 2016).

2. Appearing of broad line components in AGNs which are usually Sy2 for long time (Mrk 6, Mrk 1018, NGC 1097, NGC7582, Mrk 590, NGC 2617). In Some of these cases, there were registered returns to the usual low state with narrow type of lines after few years as it was in NGC7582 or after very long time as it happen for Mrk6 and Mrk590. For part of these objects changing look is connected with appearance of some blue shifted broad emission components (Mrk 6, 3C390.3) .

3. More than 20 AGNs are changing look at X-ray spectral properties (see references at Richi et al., 2016). Some of these AGNs were also noted before as the changing look in optical spectral region (NGC4151 and Mrk 6).

4. Other CL AGNs which can not be from 1-3 type of cases. Those are objects with strong variation of continuum in hundreds of times without significant variations of lines. For example changing from QSO to BLac state (QSO 1256+295 Wills et. al., 1983).

5. Tidal disruption of stars (TDE) observed in not AGN galaxies. These objects obtain AGN properties temporally.

Table 1: The CL AGNs selected for our project.

N	Galaxy	α	δ	V	Type	z
1	NGC 863	02 14 33	-00 45 58	13,80	Sa	0,0261
2	NGC 2617	08 35 38	-04 05 16	14,50	S0	0,0143
3	NGC 3227	10 23 30	+19 51 58	10,30	SBa	0,0039
4	NGC 3516	11 06 47	+72 34 09	11,30	SB0	0,0088
5	NGC 4151	12 10 32	+39 24 24	10,30	SBa	0,0033
6	NGC 4941	13 04 13	-05 33 05	11,20	SBa	0,0037
7	NGC 5548	14 17 59	+25 08 12	12,30	S0	0,017
8	NGC 6814	19 42 40	+10 19 28	11,30	SBb	0,0052
9	NGC 7469	23 03 15	+08 52 26	12,00	SBa	0,01639
10	3C 273	12 29 06	+02 03 08	12,90	QSO	0,158
11	3C 390.3	18 42 08	+79 46 17	15.38	S0	0,056

2. The list of selected objects

The main goal of the project is to investigate the possibilities for the repeating of cases of the strong changes of spectral type at the CL AGNs. Investigation of such type of objects can be very informative for understanding the nature of this fast variations as well as physics of the AGNs. So we were selecting the objects which have already known as CL cases in the past and are attractive for our observational opportunities (see Table 1).

3. Spectral and photometric multiwavelength monitoring

We are going to use 2-m Zeiss telescope (ShAO) for optical spectral observations, 2.5-m telescope of SAI for IR *JHK* photometry and spectrophotometery, small telescopes Zeiss-600, AZT-5 for *BVRI* photometry. We are also going to search for the new CL AGNs using the *MASTER* data (Lipunov et al. 2010). Moreover, we can get historical light curves for the known and the new discovered objects using the *MASTER* opportunities. We are planning to apply for X-ray and UV observations of some CL AGNs with the *SWIFT*. We have already got first results of such monitoring for the NGC 2617 during 2016.

4. NGC2617

Optical and near-infrared photometry, optical spectroscopy, and soft X-ray and UV monitoring of the changing look active galactic nucleus NGC 2617 show that it continues to have the appearance of a type 1 Seyfert galaxy (Oknyansky et al., 2016a,b,c). An optical light curve for 2010–2016 indicates that the change of type probably occurred between October 2010 and February 2012 and was unconnected with the brightening in 2013. In 2016 NGC 2617 brightened again to the level of activity close to that of April 2013. We found variations in all passbands and in both the intensities and profiles of the broad Balmer lines. X-ray variations are well correlated with UV–optical variability and possibly lead by 1-3 days. The *K* band lags the *J* band by about 22±2 days but lags H by ~10 days. *J* lags *B* by about 3 days. This could be because *J*-band variability arises from the outer edge of the accretion disc while *K*-band variability comes from thermal re-emission by dust. We found an increase in the K-band lag from 2013 to 2016 which could be due to dust sublimation. We propose that type changes are a result of increasing central luminosity causing sublimation of the innermost dust in the hollow bi-conical outflow.

5. Summary

We start the project of spectral and photometric multiwavelength (from IR to X-ray) monitoring which include the selected set of AGNs known already as the CL AGNs. We obtain first results for NGC2617.

The project is open for all interested in collaborations in these investigations.

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