ON VARIABILITY IN OBSCURED AND UNOBSCURED AGNs

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Abstract

Quasars belong to the most energetic phenomena in the universe. Physical processes at the origin of them can be explained in the framework of the 'AGN unified scenario'. The unified scenario predicts two classes of quasars - obscured and unobscured ones, depending on the orientation of the dusty torus which surrounds the central supermassive black hole.Variability is ubiquitous in AGN, and may be generated by several phenomena that would produce different footprints. Determining the nature and origin of the variability is a key subject to understand the differences between the different types of AGNs.

Introduction

The main idea behind the standard model is that the AGN type depends on the torus inclination with respect to the line of sight. Non-obscured AGNs have typically been identified with objects showing broad permitted lines as well as narrow permitted and forbidden lines in the spectra.These objects are usually referred to as Type 1 AGNs. On the other hand, obscured AGNs show only narrow permitted and forbidden lines and are referred to as Type 2 quasars. There are aspects of Type 2 quasars which don't seem to fit the unified model, like the large fraction of moderate radio emitters with a flat spectrum respect to Type 1 quasars (Vir & Ho 2010).
Assuming that the Unified Model is correct, one would expect that Type 1 quasars have higher variability (and on shorter time-scales) than Type 2 quasars. Since a systematic study is missing; we took on the challenge to prove the AGN unified scenario by observing the variability of Type 1 and Type 2 quasars.

The sample

We have selected 4 Type 2 quasars and 5 Type 1 quasars from the quasar sample of the Sloan Digital Sky Survey (Zakamska et al. 2003; 2004), with $0.3 < z < 1.8$ and $r < 20$. Type 1 quasars are from the 2dF survey (Croom et al. 2001, 2004, 2006). Selected quasars quasars are listed in Table 1.

Type	name	RA.	Dec.	r mag	z
Type I	J1045+0046	10:45:34.30	+ 00:46:17.0	19.16	1.26
	J1211+0049	12:11:18.50	+ 00:49:25.0	19.936	1.47
	J1334-0120	13:34:11.10	- 01:20:53.0	19.94	1.62
	J1449-0120	14:49:48.10	- 01:20:42.0	19.005	0.97
	J1402+0026	14:02:50.60	+ 00:26:07.0	19.57	0.85
Type II	J1157+6003	11:57:18.35	+ 60:03:45.6	19.413	0.49
	J1337-0128	13:37:35.02	- 01:28:15.7	18.6	0.32
	J1430-0056	14:30:27.66	- 00:56:14.9	19.005	0.31
	J1501+5455	15:01:17.96	+ 54:55:18.3	17.67	0.33

Table 1: Sample of quasars selected for the study.

The sample of type 2 quasars is biased towards lower redshifts due to the difficulty in reaching high redshift obscured objects.

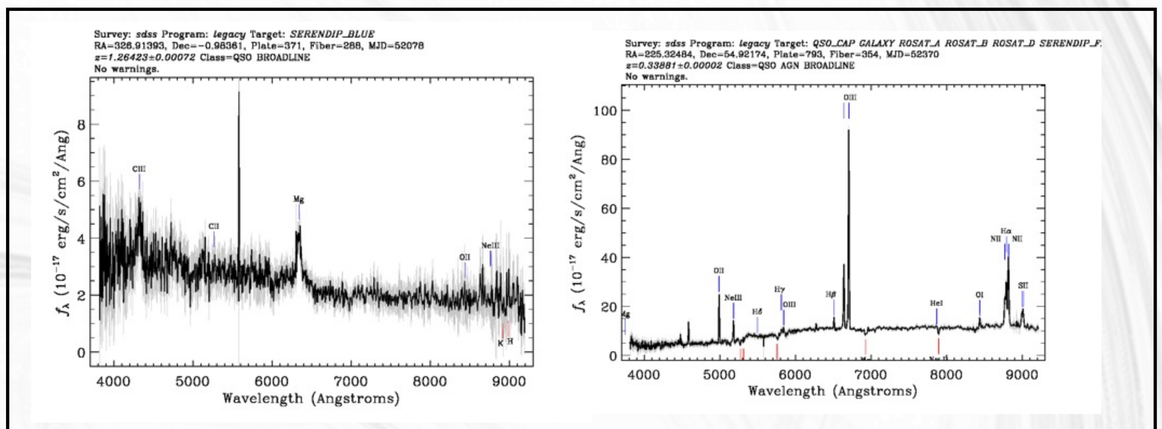

Figure 1: SDSS spectra of type 1 QSO (J2147-0059 z=1.26) on the left panel, type 2 QSO (J1501+5455 z=0.339) on the right panel.

Observations

The objects were observed during a period of three months, since March 2011 till June 2011. Images were taken with 80 cm 'IAC80' telescope at Teide observatory using standard BRI Johnson filters. The spread of the observations allows us to study weekly variability in both types of objects.

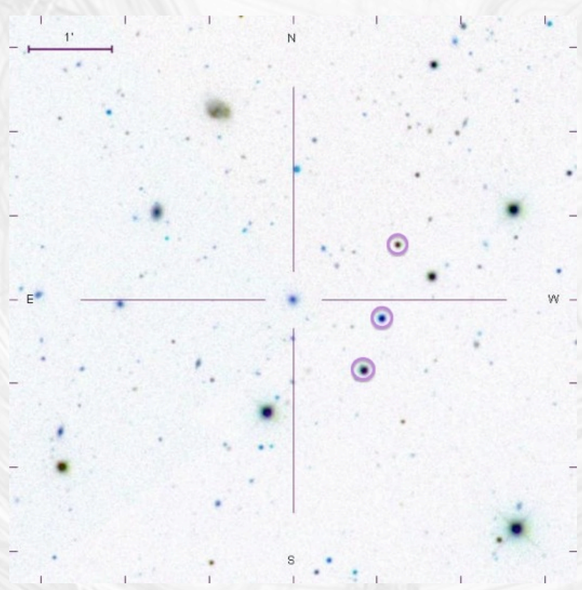

Figure 2: Field of type 2 object J1501+5455 as seen from SDSS. The field is centered onto the object. The circles are marking stars used as comparison stars for differential photometry.

Light curves of the objects were obtained using differential photometry using at least three comparison stars in the quasar field.

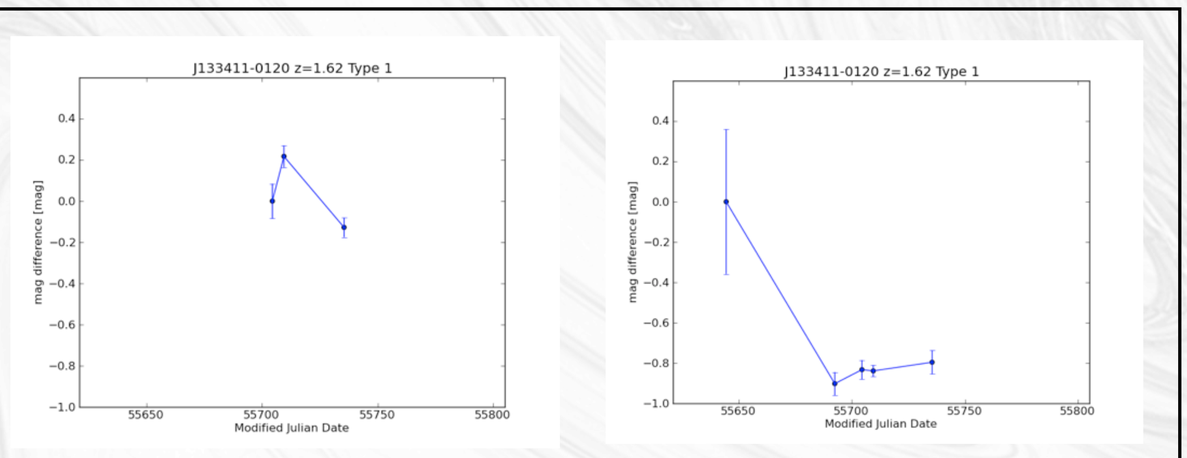

Figure 3: An example of a light curves of an unobscured quasar in I filter (left) and R filter (right).

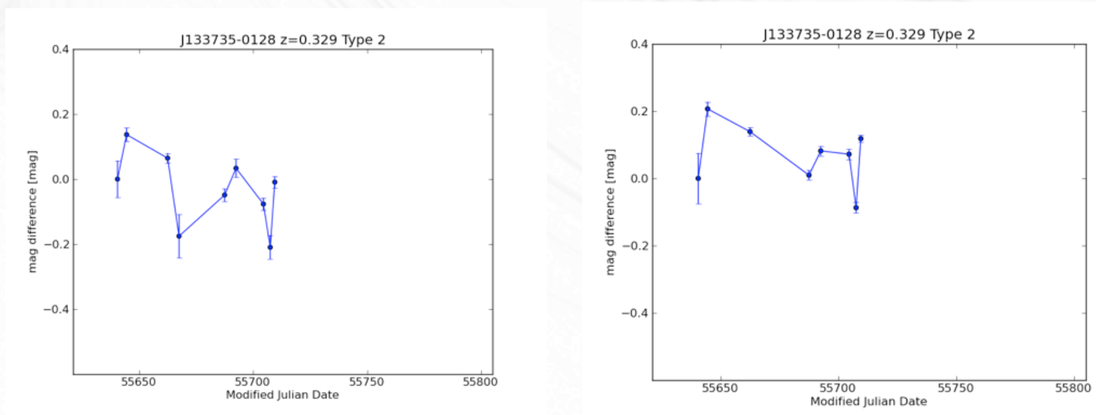

Figure 4: An example of a light curves of an obscured quasar in I filter (left) and R filter(right).

Summary and perspectives

We collected data for light curves of both, Type 1 and Type 2 AGNs in BRI filters during a observing campaign on Teide observatory lasting for three months. The undergoing analysis of the light curses shows prima facie evidence of weekly variability (see Figure 3 and Figure 4) not only in the unobscured type 1 objects but also in the obscured ones. The variability of the Type 2 AGNs is of factor ~7, while in unobscured Type 1 AGNs is of factor ~20 in respect to the comparison stars.
We aim to extend the campaign to more objects in order to increase statistical significance of our study. The project has been already awarded 24 observing hours during the upcoming semester on Teide observatory.

References and acknowledgements

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