RevMexAA (Serie de Conferencias), **14**, 68–68 (2002)

VARIABILITY AND PARAMETER CORRELATIONS IN QUASARS

A. Garcia-Rissmann[1] and L. Sodré Jr.

Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP, Brazil

Variability can be a very powerful tool for constraining models for AGN. Also, the search for general correlations among line and continuum parameters can help in this task, giving some insight on which and how line production processes are occurring in those objects. The comparison between properties of radio-loud (RL) and radio-quiet (RQ) objects is very important for understanding their still unsolved dichotomy.

A photometric monitoring (in the V band) of a sample of 63 QSOs ($0.15 \leq z \leq 2.0$) was carried out during 3-7 years at the Observatório do Pico dos Dias (OPD), Brazil. We confirm from the analysis of these data that (1) the relative variability is anti-correlated with the source luminosity, both in the RL and RQ sub-samples, but in a relation not as steep as the simple sub-units model predictions (see Garcia et al. 1999); (2) the RL objects have a higher amplitude of variability than the RQ ones. Optical spectra of a sub-sample of 11 of those objects (6 RQ and 5 RL) were also acquired as part of a spectroscopic monitoring program of 1-2 years, also conducted at the OPD and at the ESO-La Silla Observatory, Chile[2]. We fitted simultaneously the spectra with the continuum (a power-law form) and the FeII multiplets (using the I Zw 1's template, as Boroson & Green 1992, BG92) in some spectral "windows" believed to be free of other emission lines. This fitting procedure allowed us to obtain parameters such as spectral indices (α_ν, where $f_\nu \propto \nu^{\alpha_\nu}$), fluxes, equivalent widths (EW) and velocities (FWHM) of lines such as Hγ, FeII λ4570, Hβ and [OIII] $\lambda\lambda$4959, 5007 for all the objects, in all epochs. Combining the several epochs, we obtained the median of each parameter for each object. The most important results are the following:

- Our RQ objects have, on average, higher FeII λ4570/Hβ flux ratios and FeIIλ4570 EWs than our RL objects. This corroborates previous results (e.g. Joly 1991).
- We find a significant anti-correlation ($P_{rS} \leq$ 4%) of α_ν with the EW of Hβ, Hγ and [OIII] $\lambda\lambda$4959, 5007 for the RL sub-sample, and no correlation for the RQ one. This might indicate that, for the RL sub-sample, there is a higher dilution of the EWs of these lines by a non-thermal continuum in objects with flatter spectra. On the other hand, the EW of FeIIλ4570 seems to be positively correlated with α_ν, if we consider the whole sample ($P_{rS} \approx 1\%$). This could confirm that the formation of FeII lines is connected to the non-thermal emission of the objects, corroborating Joly (A&A, 242,49,1991).
- The FeII λ4570/Hβ and [OIII] $\lambda\lambda$4959,5007/Hβ flux ratios are positively and negatively correlated with α_ν, respectively, both with $P_{rS} \leq$ 1%. Notice that the correlation between the FeIIλ4570/Hβ EW ratio and the soft X-ray spectral index has been known for a while (see Sulentic et al. 2000). Could this result help clarify the origin of the eigenvector 1 (BG92)?
- The [OIII]$\lambda\lambda$4959,5007/Hβ flux ratio is anti-correlated with the source luminosity. This could indicate a difference in covering factor of the BLR for objects with different luminosities, or less amount of low-density gas in higher luminosity objects (Véron-Cetty & Véron, A&AR, 10, 81,2000).
- The FWHM(Hβ) is positively correlated with the relative V photometric variability, and with the EW of Hβ.

Data used in this work was partially obtained at CNPq/LNA. AGR and LSJ acknowledge support from FAPESP, CNPq and Pronex.

REFERENCES

Boroson, T.A. & Green, R.F. 1992, ApJSS, 80, 109

Garcia, A., Sodré Jr., L., Jablonski, F.J., & Terlevich, R.J. 1999, MNRAS, 309, 803

Sulentic, J.W., Marziani, P., & Dultzin-Hacyan, D. 2000, ARA&A, 38, 521

[1] aurea@iagusp.usp.br

[2] Under the collaboration of Drs. P. Pellegrini, M. Maia and C. Willmer, from Observatório Nacional (RJ, Brazil).