

## Spectral optical monitoring of 3C390.3 in 1995-2007

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In this lecture we present the results of the long-time variability (1995-2007, 13 years) of the continuum flux and broad emission line profiles of the Seyfert radio galaxy - 3C 390.3, a well known AGN with double-peaked broad emission lines. High quality spectra ( $S/N > 50$  in continuum near  $H\alpha$  and  $H\beta$ ) were obtained in the spectral range  $\sim 4000$  to  $7500 \text{ \AA}$ , with a resolution between  $5$  and  $15 \text{ \AA}$ , using the 6-m and 1-m SAO's telescopes (Russia), and the GHAO's 2.1-m telescope (Cananea, México).

During the monitoring period the broad emission component of the  $H\alpha$  and  $H\beta$  lines, and the continuum flux varied by a factor of  $\approx 4-5$ . We found that in the  $H\beta$  and continuum light curve a quasi-periodical oscillations (QPOs) exist, that are usual observed in stellar mass black holes. Also, the QPOs variations of the observed flux ratio of the blue and red  $H\beta$  wings, with period of  $\sim 10$  years ( $P \sim 10 \text{ yr}$ ), that were also detected by Veilleux and Zheng (1991), probably really exist.

The  $H\alpha$  and  $H\beta$  line fluxes and parts of lines are well correlated to the continuum flux, indicating that the ionizing continuum was a good extrapolation of the optical one.

The  $H\alpha$  and  $H\beta$  profiles varied, corresponding to a Sy 1 type in the maximum activity state and to a Sy1.8 type in the minimum activity state. Also, we detected different structures in the line profiles of  $H\alpha$  and  $H\beta$ . It seems that an additional central component is present and superposed to the disk emission. In the period of high activity (after 2002),  $H\beta$  became broader than  $H\alpha$  and red wing of  $H\beta$  was higher than the one of  $H\alpha$ . We found time lags of  $\sim 95$  days between the continuum and  $H\beta$  flux, and more than 100 days between the continuum and  $H\alpha$  flux. This difference in lags as well as in FWHM of  $H\alpha$  and  $H\beta$  may indicate stratification in the BLR (disk) of 3C 390.3. There is no significant lag between the blue and red wings and core relative to each other indicating a predominantly circular motions in the BLR of 3C390.3 .

Variation in the line profiles, as well as correlation between the line and continuum flux during the monitoring period is in the favor of the disk origin of the broad lines with the possible contribution of some additional region and/or some kind of perturbation in the disk.