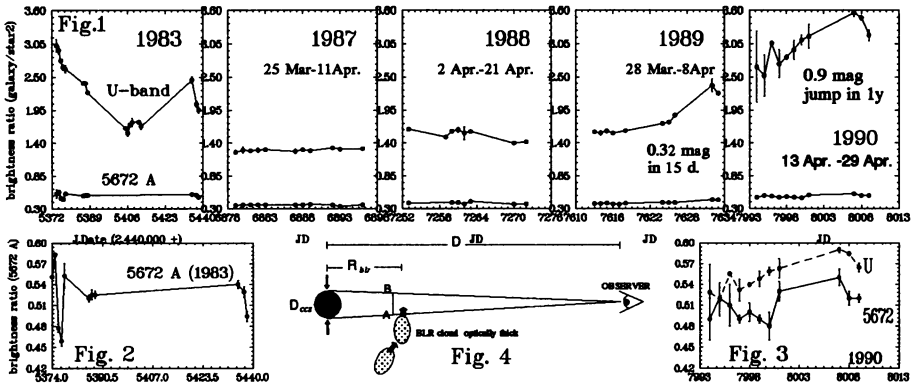


# NGC 4151: AN ACCURATE UPPER LIMIT TO THE DIMENSIONS OF THE CENTRAL CONTINUUM SOURCE ?

NICOLAOS H. SOLOMOS

*Physics Dept., Hellenic Naval Academy, Piraeus- 17503, Greece*

**Abstract.** Simultaneous (5672 Å and 3400-3900 Å) optical continuum photometric observations of the Seyfert galaxy NGC4151, were carried out within  $\leq 4$  week periods, down to a time resolution of  $< 1$  hr. A new active phase (1990) is detected with onset and slope captured in 1989, [3]. Implications of the variability record from 1983 [2], to 1990 (Fig-1), are discussed.



**UV/Opt. variations decoupled?** The close correlation between the variations of the 5672 Å and near-UV continua that appears well established during low states of activity (1987-1988), turned to at least a 5d episode of anticorrelation while on the passage to the new 1990 maximum (overlay Fig-3). Such interesting aspects of the variability are very difficult to be explained within the framework of the current accretion disk models. Instead, if the UV emission is partly originated in shocks created by the motion of supersonic clouds, then the independent rise of U could be of 'meteorological' nature, reflecting fluctuations in the cloud formation rate.

**A size estimation of the central continuum source.** As pointed out by Ulrich [4] rapid UV/Opt. variability cannot be attributed to corresponding changes in the infall rate of the accreted gas. Therefore, variations like the rapid (20% level) transient decrease of the 5672 Å continuum flux ( $\sim 2$  days) (Fig.2), need to find alternative explanations. A passage of a rotating opaque BLR cloud moving with velocity  $V_c$  could cause the observed feature in the 5672 Å lightcurve. If the proposed picture is correct then the geometry of the very simple occultation model of Fig-4, gives the diameter of the central source in NGC 4151 as:  $D_{ccs} = D \cdot AB(D - R_{blr})^{-1}$  where  $D$  is its distance,  $R_{blr}$  the BLR radius,  $AB = V_c \cdot t$ , with  $t$  the duration of the transition to the diminution ( $\sim 1$  day). If  $R_{blr}$  is considered to be

the luminosity weighted radius estimated by the line-continuum cross-correlation studies (9  $ld$  for NGC4151, [1]) and for a typical  $V_c$  of  $5 \cdot 10^3$  Km/sec, then the upper limit of the size of the central source is 2.8 AU ( $4.2 \times 10^{13}$  cm) implying a black hole mass of  $1.4 \times 10^7 M_\odot$ .

### References

1. Maoz, D. et al. (1990): *Ap.J.* 351, 75.
2. Meaburn et.al. (1985): in '*Active Galactic Nuclei*', Ed. J. Dyson, Manchester Univ. Press.
3. Solomos et. al. (1990): *A&A* 229, 80.
4. Ulrich M. (1991): in '*Variability of Active Galaxies*', Eds. W.J. Duschl et. al., LNP vol.377, Heidelberg.