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3C 120: RELATION BETWEEN OPTICAL VARIABILITY AND SUPERLUMINAL MOTIONS

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3C 120 (z=0.033) is usually classified as a Sey– fert 1 galaxy, although its morphology in the optical band is not as simple as a typical galaxy of that class. Indeed, photometric and spectroscopic studies seem to indicate that 3C 120 either passed, or is still passing through a merger process (e.g., Soubeyran et al. 1989; Hjorth et al. 1995). The detection of a radio jet (from pc to kpc scales) reveals 3C 120 as a peculiar galaxy, since Seyferts are considered in general radio-quiet objects.

From VLBI observations between 5 and 43 GHz (Walker et al. 1982, 1987; Gómez et al. 1999, 2000; Fomalont et al. 2000; Homan et al. 2001; Walker et al. 2001), we determined the apparent velocity, position angle and formation epoch of each jet component, assuming ballistic motions (constant velocity and position angle on the plane of the sky). Adopting $q_0 = 0.5$, we found that their apparent velocities varied between 3.1 and 4.6 $h^{-1}c$, where c is the light speed and $h = H_0/100$ (H_0 is the Hubble constant in units of km s^{-1} Mpc^{-1}). Their position angles are also different, ranging between -90 and -125 degrees.

The detection of superluminal components with different velocities and position angles, besides the periodic variability in the B-band (Webb 1990), suggests that the parsec-jet of 3C 120 is precessing. To test this assumption, we used the precession model described in Abraham (2000), whose parameters are Lorentz γ factor, associated with the jet bulk motion, half-opening angle of the precession cone and angle between the cone axis and the line of sight, as well as its projection on the plane of the sky. The model constraints were the apparent velocity, formation epoch and position angle of the jet components, and a precession period of 12.43 years, related to the periodic variability seen in the B-band (Webb 1990). We can fit the model with $\gamma = 6.6$ and an angle between the jet and the line of sight ranging from 3.2 to 6.9 degrees. We were able to associate the short time scale optical variability with the formation of jet components, since their emergence epoch coincided with the occurrence of the flares. In addition, if we assume that the secular optical variability is the result of the decrease in the accretion rate (Webb 1990) and the periodic variability is due to the variability in the underlying jet boosting induced by jet precession, we can describe satisfactorily the variations of its optical luminosity.

Concluding, we can understand the kinematic properties of the superluminal components of 3C 120, as well as its optical variability, whether the parsec-jet is precessing with a period of about 12.4 years and forms small angles with the line of sight.

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