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Detection of jet precession in the active nucleus of M81

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(See the complete and formatted abstract in the paper). We report on VLBI monitoring of the low-luminosity AGN (LLAGN) in M81 at 1.7, 2.3, 5, and 8.4GHz. These observations are phase-referenced to the supernova SN1993J (located in the same galaxy) and cover from late 1993 to late 2005. The source consists at all frequencies of a slightly resolved core and a small jet extension towards the north-east direction (position angle of ~65 degrees) in agreement with previous publications. We find that the position of the intensity peak in the images at 8.4GHz is very stable in the galactic frame of M81 (proper motion upper limit about 0.010 mas per year). We confirm previous reports that the peaks at all frequencies are systematically shifted among them, possibly due to opacity effects in the jet as predicted by the standard relativistic jet model. We use this model to estimate the magnetic field in the jet and the mass of the central black hole. We obtain a black-hole mass of ~2.e+7 solar masses, comparable to estimates previously reported, but the magnetic fields obtained are thousands of times lower than previous estimates. We find that the positions of the cores at 1.7, 2.3, and 5GHz are less stable than that at 8.4GHz and evolve systematically, shifting southward at a rate of several tens of micro-arcsec per year. The evolution in the jet orientation seems to be related to changes in the inclination of the cores at all frequencies. These results can be interpreted as due to a precessing jet. The jet precession also seems to be related to a flare in the flux densities at 5.0 and 8.4GHz, which lasts ~4 years. A continued monitoring of the flux density and the jet structure evolution in this LLAGN will be necessary to further confirm our jet precession model.

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