

Shape and spin-state modelling of the NEA (85990) 1999 JV₆ from radar and optical observations

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The asteroid (85990) 1999 JV₆ is an object of the Apollo group, classified as spectral type Xk [1] with an estimated diameter of 498_{-88}^{+134} m [2]. Here we present results from an observational campaign conducted at optical and radar wavelengths in order to constrain the shape and spin state of this asteroid.

We obtained optical photometric measurements in 2007, 2008, and 2016 with the 2.5 m Isaac Newton Telescope in La Palma (Spain), in January 2015 with JPL's Table Mountain Observatory 0.6 m telescope (USA), and in February 2013 with the ESO 3.6 m New Technology Telescope at La Silla (Chile). We also include published lightcurves from 2014 and 2015 [3, 4], available via the MPC.

We obtained radar echo power spectra and delay-Doppler images with a ranging resolution of 30 m/pixel at the Arecibo 305 m radio telescope in January 2015 and at resolutions as fine as 7.5 m/pixel at Arecibo, Goldstone 70 m, and Green Bank 100 m telescopes in January 2016. The echoes revealed a pronounced bi-lobed shape.

We used the convex lightcurve inversion method to constrain the rotation pole orientation. This approach indicates an ecliptic latitude of the pole below -40° . By combining the radar and lightcurve data we were able to produce several possible solutions for the spin state and corresponding shape. The dimensions of all models are similar, with a contact-binary configuration. The object has a sidereal rotation period of 6.53679 ± 0.00006 h, and maximum extents along principal axes of the best-fit model are 700 m, 360 m and 330 m.

References:

- [1] Binzel et al, 2001, *Icarus* 151, 139
- [2] Mueller et al., 2011, *Astron. J.* 141, 109
- [3] Warner 2014, *MPBu* 41, 157
- [4] Warner 2015, *MPBu* 42, 172