RADAR OBSERVATIONS OF ASTEROID 1999 JM8

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We report results of delay-Doppler observations of 1999 JM8 with the Goldstone 8560 MHz (3.5 cm) and Arecibo 2380 MHz (13 cm) radars over 18 days in July-August 1999. The images place thousands of pixels on the asteroid and achieve range resolutions as fine as 15 m/pixel. The images reveal an asymmetric, irregularly shaped object with a typical overall dimension within 20% of 7 km. If we assume that 1999 JM8's effective diameter is 7 km, then the absolute magnitude, 15.15, and the average Goldstone radar cross section, 2.49 km^2, correspond to optical and radar albedos of 0.02 and 0.06, establishing that 1999 JM8 is a dark object at optical and radar wavelengths. The asteroid is in a non-principal axis spin state that, although not yet well determined, has a dominant periodicity of about 7 days. However, images obtained between July 31 and August 9 show apparent regular rotation of features from day to day, suggesting that the rotation state isn't far from principal axis rotation. 1999 JM8 has regions of pronounced topographic relief, prominent facets several kilometers in extent, numerous crater-like features between ~100 m and 1.5 km in diameter, and features whose structural nature is peculiar. Arecibo images provide the strongest evidence to date for a circular polarization ratio feature on any asteroid. Combined optical and radar observations from April 1990-December 2000 permit computation of planetary close approach times to within +/- 10 days over the interval from 293 to at least 2907, one of the longest spans for any Potentially Hazardous Asteroid. Integration of the orbit into the past and future shows close approaches to Earth, Mars, Ceres, and Vesta, but the probability of the object impacting Earth is zero for at least the next nine centuries.