

RADAR OBSERVATIONS OF POTENTIALLY HAZARDOUS ASTEROID 68950 (2002 QF15). M. K. Shepard¹, L. A. M. Benner², S. J. Ostro², M. C. Nolan³, J. D. Giorgini², C. Magri⁴, and B. D. Warner⁵, ¹Dept. of Geography and Geosciences, Bloomsburg University, 400 E. Second St., Bloomsburg, PA 17815, mshepard@bloomu.edu, ²Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, ³Arecibo Observatory, National Astronomy and Ionosphere Center, HC03 Box 53995, Arecibo PR 00612, ⁴University of Maine at Farmington, 173 High St-Preble Hall, Farmington, ME 04938, ⁵Palmer Divide Observatory/Space Science Institute, Colorado Springs, CO 80908.

Introduction: We observed the near-Earth asteroid (NEA) 68950 (2002 QF15) with the Arecibo S-band radar in 2003 and 2006. We obtained numerous continuous wave (CW) and delay-Doppler images sufficient to constrain this object's size and spin state and to generate a three-dimensional (3D) shape model.

Physical Properties: Lightcurves indicate a slow rotation period; observations are consistent with either a 23.5 h or 47 h period and a relatively low lightcurve amplitude of ~ 0.3 magnitudes [1]. Visible and near-infrared spectra from the MMT Observatory and NASA Infrared Telescope Facility (IRTF) show 1 and 2 micron absorption features consistent with mafic silicates and a tentative S-classification [2]. More recent work indicates a significant clinopyroxene component and classifies it as a V-type [3].

Radar Data: Below we summarize the radar data sets available for our analysis.

2003 Observations. Observations were acquired from 5-9 November and consist of 36 CW runs and 94 delay-Doppler images. The latter have a range resolution of 75m and show a spheroidal target with some asymmetry and surface structure evident. The target was located at RA 191°, DEC 13° during the middle of the observations.

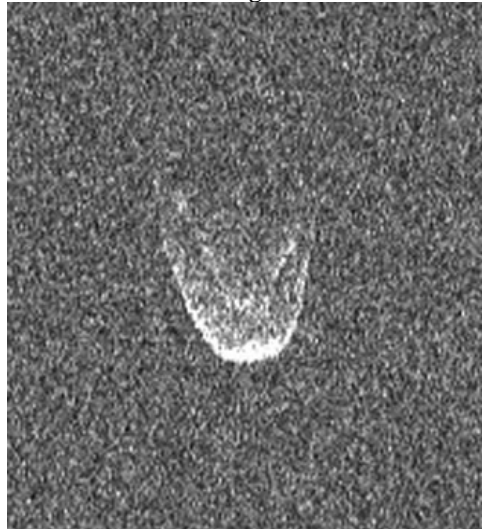
2006 Observations. Observations were acquired on 17 and 20 May. We obtained a total of 5 CW runs and 14 delay-Doppler images with a range resolution of up to 7.5m. Considerably more surface structure is visible at this level of resolution. The target was located at RA 297°, DEC 7° during the middle of these observations, 104° away from those in 2003, giving excellent leverage for the determination of a spin pole.

Preliminary Results: Figures on the right show images from two days. Doppler frequency increases to right, delay from bottom to top. Target delay depths in all images range from 0.8-1.0 km, suggesting an effective diameter of ~ 2 km. These results favor the 47 h rotation period but cannot completely rule out the 23.5 h period without shape modeling.

References: [1] Warner B. D. (2006) *Minor Planet Bull.*, 33, 85-88. [2] Abell P. et al. (2006) *DPS XXXVIII*, Abstract #59.04. [3] Gietzen, K. M. et al. (2007) *DPS XXXIX*, Abstract #33.11.



2003 Nov 08. 75m range resolution. 3Hz wide.



2006 May 20. 30m range resolution. 3Hz wide.

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