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NEAR-EARTH ASTEROID 341843 (2008 EV5), TARGET OF ESA'S MARCOPOLO-R MISSION

Abstract

The near-Earth asteroid 341843 (2008 EV5) was discovered on 2008 March 4 by the Catalina Sky Survey, and observed extensively during and after an 8.4 lunar distance (0.022 AU) Earth approach on 2008 December 23. EV5 is on a particularly accessible orbit and has been selected as the primary target of ESA's proposed MarcoPolo-R sample-return mission. MarcoPolo-R is currently in the assessment and phase A stage for the M3 medium-class mission of ESA's Cosmic Vision program.

We will review the radar, optical, and infrared observations of EV5 and what they tell us about the asteroid. EV5 is a 400 m spheroid, with an equator-aligned ridge broken by a prominent 150 m concavity (Busch et al. 2011). This shape suggests a prior episode of rapid rotation and reconfiguration, in contrast to the asteroid's current 3.725-h spin period. Its spin rate and retrograde pole direction have both been influenced by YORP radiation-pressure torques. EV5's relatively low optical albedo (0.12 0.04) and optical and near-IR spectrum imply a composition close to that of CI chondrite meteorites (Reddy et al. 2012). The combination of radar and optical astrometry allows us to predict EV5's position to within a few hundred kilometers during its next Earth approach in late 2023/early 2024.

EV5 offers an efficient mission profile for MarcoPolo-R, with a complete mission time (round-trip) of 4.5 years with optimal launch windows in 2022 - 2024. The baseline mission scenario is for a single primary spacecraft, carrying the Earth re-entry capsule and sample acquisition system and potentially a detachable lander. MarcoPolo-R would be launched by a Soyuz-Fregat rocket from Kourou. The scientific payload contains state-of-the-art instruments, including a camera system for high resolution imaging from orbit and on the surface, spectrometers covering visible, near-infrared and mid-infrared wavelengths, and radio science experiments. Mission analyses performed by ESA and by industrial consultants show EV5 is a nearly optimum target in terms of launch opportunities and has lower mission cost as compared to other potential targets. The short mission duration brings the time of sample return from EV5 close to the expected returns of other sample return missions (OSIRIS-REx and Hayabusa 2). MarcoPolo-R will contribute to the international effort to return and study samples from near-Earth asteroids. The final decision on the M3 mission selection is scheduled for December 2013.

References:

Busch, M.W., et al. 2011, Icarus 212, 649-660. Reddy, V., et al. 2012, Icarus 221, 678-681.