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☒ **NEO Characterization**

Binary systems among near-Earth asteroids observed within the NEOROCKS project.

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ABSTRACT

The “NEO Rapid Observation, Characterization and Key Simulations" (NEOROCKS) project is a European Union’s Horizon 2020 research and innovation programme running from the year 2020. One of its several goals is a physical characterization of near-Earth asteroids through photometric observations performed by large and small ground-based telescopes.

From February 2020 to December 2022 we performed photometric lightcurve observations of more than 100 near-Earth asteroids. The observations were done with the 1.54-m Danish telescope on ESO La Silla Observatory in Chile and the 0.65-m telescope at Ondřejov Observatory in Czechia. Among them, we found 9 binary systems: (31346) 1998 PB1, (85628) 1998 KV2, (143649) 2003 QQ47, (326732) 2003 HB6, (350751) 2002 AW, (539940) 2017 HW1, 1999 RM45, 2013 PY6 and 2020 AZ2. We analyzed the photometric data using the methods described in (Pravec et al., 2022, Planetary Science Journal 3, 175; Scheirich and Pravec, 2022, Planetary Science Journal 3, 163; and references therein) and determined or estimated basic parameters of the binary systems (e.g., the secondary-to-primary mean diameter ratio, the semimajor axis of the mutual orbit, the orbital period, the primary rotation period). We also obtained spectral or colour observations for 7 of the 9 binary systems, from which we determined or constrained their compositions.

This also provided constraints on their geometric albedos and hence improved estimates of their sizes.

The estimated parameters of the 9 binary systems are similar to the parameters of previously studied binary near-Earth asteroids (e.g., Pravec et al., 2016, Icarus 267, 267, and references therein). In particular, their diameter ratios are in the range from 0.21 to 0.53, the semimajor axes are from 1.6 to 4.3 primary diameters, the orbit periods are from 13.06 to 55.4 h, and the primary spin periods are from 2.36 to 4.65 h. We will present our results for the 9 binaries and show how they enlarge the known sample of binary near-Earth asteroids. We will also present how a binary asteroid lightcurve can be distinguished from a lightcurve of an asteroid in non-principal rotation state, which also has a complex but distinctly different character (e.g., Pravec et al., 2005, Icarus 173, 108).

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