SPACE EXPLORATION SYMPOSIUM (A3)
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NEA TARGET SELECTION AND CLOSE ENCOUNTERS

Abstract

Near Earth Asteroids (NEA) represent increasingly attractive targets. The US mandate to discover all objects larger than 140m before the end of this decade [1] has fostered the improvement of ground-based surveys in terms of both, detection and follow-up performances; after the success of the WISE mission which has been able to observe at small solar elongations, orbiting observatories devoted to NEO detection have been or will be launched soon (e.g. NEOSSAT, AsteroidFinder); future all-sky surveys, such as the one proposed within the framework of the ESA Space Situational Awareness NEO Segment [2], will improve faint objects detection; space missions toward a NEA for both, science and mitigation, are under study (e.g. Don Quijote, Marco Polo) or in an advanced phase of realization (OSIRIS-Rex) and are expected to complement ground based observations for NEA physical characterization. Finally, the possibility of sending a manned mission toward a Near Earth asteroid has become a high priority for exploration, as an affordable step beyond the Moon.

Within this framework, it appears that small to intermediate size objects with low eccentricity and inclination orbits and semimajor axis close to 1 AU are a potential source of interesting targets for both, ground/space based observations and human exploration. Their peculiar dynamical characteristics (e.g long synodic periods, unstable horseshoe/Trojan patterns) can lead to repeated Earth approaching geometries at relatively low encounter velocity, which, in turn, might be fruitfully exploited for performing astronomical observations and mission analysis. In this paper a dynamical characterization of these objects is carried out, their accessibility for space missions is evaluated and, when possible, case studies are presented.

[1] National Research Council : "Defending Planet Earth: Near Earth Object Surveys and Hazard Mitigation Strategies", Jan 22, 2010.

[2] E. Perozzi, E. Bassano, M. Gloria, F. Pagano, L. Reboa, A. Milani, F. Bernardi, D. Farnocchia, G.B. Valsecchi, G. D'Abramo, R. Franco, G. Drolshagen, D. Koschny. "Designing the Space Situational Awareness NEO Segment", Planetary Defence Conference, $P14_2163024, 2011$.