FIRST RESULTS FROM "SMALL BODIES NEAR AND FAR (SBNAF)": A BENCHMARK STUDY FOR THE CHARACTERISATION OF ASTEROIDS AND TNOS

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We conduct an EU Horizon2020-funded benchmark study (2016-2019) that addresses critical points in reconstructing physical and thermal properties of near-Earth, main-belt, and trans-Neptunian objects. The combination of the visual and thermal data from the ground and from astrophysics space missions (like Herschel, Spitzer, Kepler-K2 and AKARI) is key to improving the scientific understanding of these objects. The development of new tools will be crucial for the interpretation of much larger data sets from WISE, Gaia, JWST, or NEOShield-2, but also for the operations and scientific exploitation of the Hayabusa-2 mission. Our approach is to combine different methods and techniques to get full information on selected bodies: lightcurve inversion, stellar occultations, thermo-physical modeling, radiometric methods, radar ranging and adaptive optics imaging. The applications to objects with ground-truth information from interplanetary missions Hayabusa, NEAR-Shoemaker, Rosetta, and DAWN allows us to advance the techniques beyond the current state-of-the-art and to assess the limitations of each method.

The SBNAF project will derive size, spin and shape, thermal inertia, surface roughness, and in some cases even internal structure and composition, out to the most distant objects in the Solar System. Another important aim is to build accurate thermo-physical asteroid models to establish new primary and secondary celestial calibrators for ALMA, SOFIA, APEX, and IRAM, as well as to provide a link to the high-quality calibration standards of Herschel and Planck. The target list comprises recent near-Earth and main-belt interplanetary mission targets, two samples of main-belt objects (Gaia "mass sample" & "asteroid calibrator" sample), representatives of the Trojan and Centaur populations, and all known dwarf planets (and candidates) beyond Neptune.

We present selected results from our first project year: the analysis of combined Herschel-KeplerK2 data and Herschel-occultation data for TNOs; synergy studies for large MBAs from combined high-quality visual and thermal data; first results on NEA properties from combined lightcurve, radar and thermal measurements. We will also present public web-service tools for studies of small bodies.

Figure 1. The SBNAF logo.

Figure 2. This research project has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under Grant Agreement no 687378.