The NEO Physical Observations and Properties Simulation (NEOPOPS) – an EU funded project for planetary defense. J. Bourdelle de Micas[1], E. Dotto[1], S. Ieva[1], P. Pravec[2], M. Lazzarin[3], S. Bagnulo[4], M.A. Barucci[5], M. Birlan[6,7], J.L. Cano[8], M. Devogèle[9], A. Farina[3], P. Fatka[2], F. Ferri[3], M. Fulchignoni[5], F. La Forgia[3], E. Mazzotta Epifani[1], M. Micheli[6], A. Mura[3], D. Perna[1], and M. Siciliano[10].

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The study of Near-Earth Objects (NEOs) provides key insights into the primordial structure of planetesimals. These bodies carry information on the compositional gradient of the solar nebula and on the processes that governed the early stages of the Solar System evolution as a function of heliocentric distance. NEOs may also have contributed to the delivery of water and organic-rich material to Earth, contributing to the emergence of life [1]. From a planetary defense perspective, these objects can pose a threat to our civilization. Terrestrial impact craters and paleontological evidence of mass extinction events attest to the catastrophic effects of past asteroid collisions with our planet (e.g. the K-Pg event which occurred approximately 65 million years ago, and is attributed to the impact of an asteroid of about 10 km in size). More recently, the Chelyabinsk meteor event in February 2013 demonstrated that even relatively small objects (less than 100 m in size) can have significant consequences for human safety and infrastructures [2]. In any potential impact scenario, mitigation measures require accurate knowledge of an object's physical properties [3], which is essential for both planning and successfully implementing appropriate response strategies.

In this context, the NEO Physical Observations and Properties Simulation (NEOPOPS) was established, building on the success of previous international research programs dedicated to the study of NEOs (NEOShield 1 and 2, and NEOROCKS). NEOPOPS is an European project funded by the European Union's Horizon Europe Programme for the period 2025-2028. Its objectives are multiple :

- to efficiently organize follow-up astronomical observations of NEOs, in order to obtain high-quality data for deriving their physical properties, with priority given to the timely characterization of potentially hazardous objects;
- to significantly improve statistical analyses, modeling, and numerical simulations aimed at understanding the physical nature of NEOs, with a particular focus on small-sized objects, which are of paramount importance for designing effective mitigation measures both in space and on the ground;
- to foster European and international cooperation in NEO physical characterization, providing scenarios and roadmaps with the scale up the experience gained during the project to a global level;

- to collaborate with ESA to significantly improve public understanding and perception of the asteroid hazards, counteracting the spread of misinformation and unwarranted alarm.

Our team consists of six partners from four countries (Italy, France, the Czech Republic, and UK) employing complementary observational techniques to consolidate and further enhance the ground-based physical characterization of NEOs. The team also contributes to rapid-response exercises aimed at characterizing newly discovered objects, thereby addressing the challenge posed by imminent impactors.

The Rome Observatory and the Italian National Institute of Astrophysics is responsible for several working packages, including overall project coordination, spectroscopic observations and rapid-response activities. In this presentation, we will describe in more detail the structure of NEOPOPS and present recent results obtained during the first year of the project.

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References:

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