NEOROCKS: The 2020-2023 EU Programme For Planetary Defence. E. Dotto[1], M. Banaszkiewicz[2], S. Banchi[3], M.A. Barucci[4], F. Bernardi[5], M. Birlan[6], B. Carry[7], A. Cellino[8], J. De Leon[9], S. Ieva[1], M. Lazzarin[10], E. Mazzotta Epifani[1], A. Mediavilla[11], D. Perna[1], E. Perozzi[12], V. Petropoulou[1], P. Pravec[13], C. Snodgrass[14], C. Teodorescu[15], A. Zinzi[12] and the NEOROCKS team*

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Introduction: "NEOROCKS - The NEO Rapid Observation, Characterization and Key Simulations project" is an EU project funded in the framework of the Horizon 2020 - Work Programme 2018-2020 Leadership in Enabling and Industrial Technologies – Space. It includes 14 partners from 7 countries.

The project: The project started on January 2020 and ends on June 2023. It proposed a radically new approach to address the challenges posed by the NEO investigation for planetary defence: the dynamical and physical characterizations - two domains usually kept separate – were carried out in strict connection and the scientific/observational activity devoted to physical characterization has been driven by the theoretical work on orbital dynamics. NEOROCKS proposes an innovative approach focused on: a) performing physical observations and foster the related data reduction process, in order to keep the physical characterization up with the increasing NEO discoveries dominated by small-size objects; b) investigating the strong relationship between the orbit determination of newly discovered objects and the quick execution of follow-up observations in order to face the threat posed by the "imminent impactors"; c) planning and executing breakthrough experiments foreseeing the remote tasking of highly automatized robotic telescopes, in order to provide a proof-of-concept rapid response system; d) guaranteeing extremely high standards in the data dissemination.

Ambitions: The activity has been organized and carried out in order to address the following ambitions: Ambition 1: Networking large aperture telescopes; Ambition 2: Advancing NEO physical properties modelling and simulations; Ambition 3: Improving the orbit determination process Ambition 4: Addressing the imminent impactors monitoring; Ambition 5: Establishing a NEO physical properties data centre; Ambition 6: Fostering international cooperation for follow -up observation; Ambition 7: Raise the public awareness on NEO and im-pact hazard.

Activity: Observations are carried out with a wide range of ground telescopes and techniques: photometry, spectrophotometry, spectroscopy, polarimetry. A Task is devoted to search of cometary-like activity. NEOROCKS includes also an activity of data mining focused on retrieving NEOs data from available sky surveys.

The orbit characterization includes:

- Ephemerides and orbit determination
- Precovery and discovery apparition
- Imminent impactor identification
- Follow-up prioritization.

Particular attention is devoted to Imminent Impactors. Current discoveries (about 3000 per year) mainly concern "small" NEOs close approaching the Earth that become bright enough to be studied in detail only for short time spans (≈ weeks), whereupon they could become too faint for years or even decades. The lack of dedicated, early-response physical observations is then causing the NEO characterization rate to fall further and further behind the discovery rate. In order to provide a proof-of-concept rapid response system, we timely carried out physical characterization of a sample of newly discovered objects, having response times on the order of days, demonstrating that using European existing assets it is possible to set-up an integrated imminent impactor rapid response system encompassing both dynamical and physical characterization.

The NEOROCKS legacy: NEOROCKS is an ambitious programme and very important is the legacy that it leaves to the Planetary Defence community: the outcome of the observational activity, at all level of processing, is permanently stored and made available through the Technical Web Portal, available at the ASI-SSDC in order to maximize data exploitation also in the future, well beyond the end of the project.

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