

The EU project NEOROCKS - The NEO Rapid Observation, Characterization and Key Simulations project.

E. Dotto¹, M. Banaszekiewicz², S. Banchi³, M.A. Barucci⁴, F. Bernardi⁵, M. Birlan⁶, B. Carry⁷, A. Cellino⁸, J. De Leon⁹, M. Lazzarin¹⁰, E. Mazzotta Epifani¹, J. Nomen Torres¹¹, D. Perna¹, E. Perozzi¹², P. Pravec¹³, N. Sanchez Ortiz¹⁴, C. Snodgrass¹⁵, C. Teodorescu¹⁶ and the NEOROCKS team*

¹INAF – Osservatorio Astronomico di Roma, I (elisabetta.dotto@inaf.it); ²NEOSPACE sp. z o.o., PL; ³Resolvo s.r.l., I; ⁴LESIA – Observatoire de Paris, F; ⁵Space Dynamics Services s.r.l., I; ⁶IMCCE – Observatoire de Paris, F; ⁷Observatoire de la Côte d’Azur, F; ⁸INAF – Osservatorio Astrofisico di Torino, I; ⁹Instituto de Astrofisica de Canarias, S; ¹⁰Università di Padova, I; ¹¹DEIMOS Castilla La Mancha sl, S; ¹²ASI-Agenzia Spaziale Italiana, I; ¹³Astronomický Ústav AV ČR, CZ; ¹⁴DEIMOS Space, S; ¹⁵University of Edinburgh, UK; ¹⁶DEIMOS Space s.r.l., RO.

*A full list of authors appears at the end of the abstract

“NEOROCKS - The NEO Rapid Observation, Characterization and Key Simulations project” (the logo is shown in Fig. 1) is an EU-funded project, started in January 2020, to address the topic c) “Improvement of our knowledge of the physical characteristics of the NEO population” of the call SU-SPACE-23-SEC-2019 from the Horizon 2020 - Work Programme 2018-2020 Leadership in Enabling and Industrial Technologies – Space.



Fig. 1: The NEOROCKS logo

NEOROCKS addresses the challenge of improving our knowledge on the physical characterization of the Near Earth Objects (NEOs) population and of the implications for their origin and evolution as well as for planetary defense. This goal is achieved by linking up the expertise in performing small body astronomical observations and the related modelling needed to derive their dynamical and physical properties to the pragmatic approach of planetary defense, which aims to provide operational loops and information systems to protect the citizens and the ground infrastructures from potential threats. This will involve both, research institutions and industry, in order to improve and optimize observational activities, enhance modelling and simulation tasks, foster international coordination and speed-up response times.

The challenge for physical characterization is keeping up with the ever increasing NEO discovery rate: at present only 20% of NEOs have known physical properties (shape, albedo, composition, rotation etc.)

and this fraction is likely to decrease when the near-future wide-field high-sensitivity NEO surveys will come into operation. The challenge for planetary defense is to keep up with the ever increasing trend of NEO discoveries to be dominated by small-size objects in the vicinity of the Earth, yet capable to produce damages in case of impact. Among them the so-called “imminent impactors” would allow for an extremely short warning time (hours to weeks) thus needing the onset of rapid response for an effective risk assessment and mitigation (i.e. reliably determining the impact location and estimate the severity of the strike).

The NEOROCKS project addresses all the scientific and technical issues involved in this scenario proposing an innovative approach focused on: a) building a team of European expert astronomers able to grant access to large aperture telescopes equipped with state of the art instrumentation in order to perform high-quality physical observations and foster the related data reduction process; b) investigating the strong relationship between the orbit determination of newly discovered objects and the quick execution of follow-up observations in order to provide enabling SW technologies for facing the threat posed by the “imminent impactors”; c) profiting of the European industrial expertise in on-going SSA (Space Situational Awareness) initiatives to plan and execute breakthrough experiments foreseeing the remote tasking of highly automatized robotic telescopes in order to provide a proof-of-concept rapid response system; d) guarantee extremely high standards in the data dissemination through the involvement at agency level of a data centre facility already operating in a European and international context, thus scaling up at a global level the visibility of the results achieved during the project.

The NEOROCKS team joins top scientists with long standing experience in NEO observations and physical

characterization, governmental institutions able to guarantee access to large infrastructures, either owned or operated under international agreements, and industrial partnerships actively participating to European Space Situational Awareness programmes.

NEOROCKS has the potentiality to perpetuate the approach followed during the project and the results obtained, through the in-kind contribution of the ASI Space Science Data Centre (SSDC) in hosting the project products. The possibility of profiting of a well established facility devoted to science data exploitation after the project is finished ensures a high-level dissemination toward the scientific and technological communities involved in NEO research as well as to the public at large.

*NEOROCKS Team: S. Anghel, N. Ariani, A. Bertolucci, F. Colas, A. Del Vigna, A. Dell'Oro, A. Di Cecco, L. Dimare, P. Fatka, S. Fornasier, E. Frattin, P. Frosini, M. Fulchignoni, R. Gabryszewski, M. Giardino, A. Giunta, J. Huntingford, S. Ieva, J.P. Kotlarz, F. La Forgia, J. Licandro, H. Medeiros, A. Mediavilla, G. Polenta, M. Popescu, A. Rozek, P. Scheirich, A. Sergeev, A. Sonka, G.B. Valsecchi, P. Wajer, A. Zinzi.

Acknowledgments: This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870403 (project NEOROCKS).