NEOROCKS MAGAZINE ISSUE 01 - EDITORIAL

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Welcome to NEOROCKS, our newly launched magazine for insights into the world of Near Earth Objects (NEOs).

"NEOROCKS - The NEO Rapid Observation, Characterization and Key Simulations" is a Collaborative Research Project, funded by the European Union Horizon 2020 programme for Research and Innovation.

With our NEOROCKS magazine, we want to share knowledge being developed by our group of international research institutions and industry partners, the *Neorockers*.

Each issue will bring you updates on our work and share some key findings: carefully selected articles to bring you into the world of NEOROCKS and to learn a bit more about this fascinating field.

Not only that, our magazine will also republish some classic articles from the Tumbling Stone magazine (on-line publication of the Spaceguard Foundation, from 2001-2003), timeless pieces helping us to understand asteroids.

We will finish each issue with something for the new generation, the mini-Neorockers.

Before you dive into all of that, as the project coordinator, it is my job to tell you a bit more about what NEOROCKS is.

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 and industrial partnerships participating in European Space Situational Awareness programmes. You can find out more about them in the *"Meet the Neorockers"* section of this issue.

NEOROCKS was designed to improve our knowledge on the physical characterization of the NEO population and the implications for their origin and evolution, as well as for planetary defence.

The challenge for physical characterization is to keep pace with the ever-increasing NEO discovery rate: at present, less than 20% of NEOs have known physical properties (shape, albedo, composition, rotation etc.) and this fraction is likely to decrease when the near-future widefield high-sensitivity NEO surveys come into operation.

Meanwhile, the challenge for planetary defence is to keep up with the fact that, due to ever increasing performance of NEO surveys, discoveries are dominated by objects that may be small in size, but would still be capable of causing damage in case of impact. Among them, we have the so-called "imminent impactors". These would allow for an extremely short warning time (hours to weeks) and limited time to determine impact location reliably and estimate the severity of the strike. In this case, we need rapid response for effective risk assessment and mitigation.

NEOROCKS offers a coordinated approach to these

dual challenges. We link up 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 defence, which aims to provide operational loops and information systems to protect citizens and ground infrastructures from potential threats.

Our innovative approach will improve and optimize observational activities, enhance modelling and simulation tasks, foster international coordination and speed-up response times. We are doing this by:

a) building a team of European expert astronomers, able to grant access to large aperture telescopes equipped with state of the art instrumentation to perform high-quality, physical observations and foster the related data reduction process;

b) investigating the relationship between the orbit determination of newly discovered objects and the quick execution of follow-up observations, in order to provide enabling technologies to face the threat posed by the "imminent impactors";

c) using European industrial expertise in ongoing SSA (Space Situational Awareness) initiatives to plan and execute breakthrough experiments foreseeing remote tasking of highly automatized robotic telescopes, in order to provide a proof-of concept rapid response system;

d) guaranteeing extremely high standards in data dissemination through agency level involvement of a data centre facility (ASI Space Science Data Centre - SSDC) already operating in a European and international context. Our European born technical web portal will host an orbital catalogue, ephemerides and physical properties database. Astronomers and observers will be able to find both dynamical and physical properties of already observed NEOs and lists of observable, but not yet characterized NEOs.

NEOROCKS has been running since January 2020. We had just got started, when the global health pandemic emerged. COVID-19 hit NEOROCKS activities hard. Critical observation facilities, the high-sensitivity, large-aperture telescopes, were closed for prolonged periods. Some major telescopes and observatories have since re-opened their facilities, but the backlog of previous commitments limits the possibility for new observation proposals.

This has also meant a reduction in data analysis and modelling tasks, due to the limited flux of input data. We have attempted remote management of astronomical observations using smaller, less-performing telescopes and, in this way, succeeded in completing some observational campaigns. However, limited telescope performances made it difficult to detect the most valuable NEOROCKS targets (small and faint objects). Luckily, the European Commission has granted us a 12-month extension, so we are now ready to make up for lost time and we'll be with you until June 2023!

All that is left for me then, is to say that I hope you enjoy this first issue of the NEOROCKS magazine and that you will follow our work over the next few years. Happy reading!