Foreword

Starting from the last decades, the Italian scientific community, active in the fields of Sun, Solar System, and Exoplanets studies, has consolidated its internationally prominent position by participating in nearly all the most important exploration and observation space missions: Cassini, Rosetta, MRO, Mars Express, ExoMars, Bepi Colombo, JUNO, JUICE, Dawn, Osiris-Rex for the study of Solar System bodies; Solar Orbiter for the study of the Sun; Cheops, Plato, Ariel for the study of exoplanets. This path has allowed for in-depth exploration of the main disciplines in these scientific areas.

The new challenges will require space missions with increasingly complex architecture to achieve new frontiers. In these new scenarios, innovative concepts of models, scientific instrumentation, laboratory experimentation and validation, and data analysis will need to be developed to achieve future goals.

In this context, in 2019, the Italian Space Agency initiated an initiative aimed at supporting the national scientific community to:

- Consolidate the acquired role in the international context;
- Integrate the acquired know-how in Sun, Solar System, and Exoplanets themes into a network of skills distributed throughout the national territory;
- Stimulate the national scientific community to promote synergies among complementary research groups for common scientific objectives;
- Promote the study and development of innovative concepts;
- Provide guidance for defining the roadmap for the next 15 years.

In partnership with the National Institute for Astrophysics, the implementing agreement ASI-INAF n.2018-16-HH.0 was therefore launched, concerning ”Study Activities for the national scientific community related to Sun, Solar System, and Exoplanets,” which provided funding for proposals related to Sun, Solar System, and Exoplanets themes and transversally the following lines of study:

1. Data Analysis.
   - Interdisciplinary use of archive data in relation to data from ongoing, concluded, and/or future space missions.
   - Correlations of ”space” and/or ”ground-based” data with data acquired from concluded, ongoing, and/or future space missions.
   - Development of intelligent tools/techniques/systems for organization and access to archives.
2. Modelling - Development and/or updating of models necessary for interpreting data acquired from space probes and defining observables for future space missions.
3. Laboratory and/or Field Analysis - Experimentation carried out in the laboratory and/or in analogous sites, aimed at simulating planetary environments or particular space conditions, to support the interpretation of data acquired from space probes and the definition of observables for future space missions.
4. Research and Development - Development of innovative instrumentation or innovative evolution of already developed tools for applications in future missions.

The scientific community responded with great enthusiasm to this initiative. Approximately fifty new project ideas were submitted, all of high scientific profile. The distribution was 73%

in the study of Solar System bodies, 12% in the study of the Sun, and 15% in the study of exoplanets, broken down by lines of study as follows: 35% for Research and Development proposals for new space instrumentation, 27% in data analysis, 17% in modelling, and 21% in laboratory and field analysis.

The projects granted funding were 12. This book describes the most significant results obtained from 10 of these projects.

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