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Edited by

Anne Lemaître
Anne-Sophie Libert

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COMPLEX PLANETARY SYSTEMS II: LATEST METHODS
FOR AN INTERDISCIPLINARY APPROACH

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COVER ILLUSTRATION:

Artist's concept of an exoplanet (Credits : ESA)

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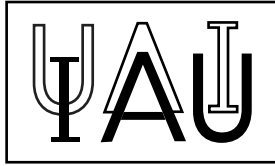
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**COMPLEX PLANETARY
SYSTEMS II: LATEST METHODS
FOR AN INTERDISCIPLINARY
APPROACH**

**PROCEEDINGS OF THE 382nd SYMPOSIUM OF
THE INTERNATIONAL ASTRONOMICAL UNION
NAMUR, BELGIUM
3–7 JULY 2023**

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Preface

The Symposium IAUS-382 entitled *Complex Planetary Systems II* (CPSII) took place at the University of Namur, in Belgium, from July 3 to 7, 2023. It was the second edition of CPS, the first one being organized in Namur in July 2014 (IAUS-310). The subtitle of this second edition was *Latest methods for an interdisciplinary approach*. The Kavli label was attributed to CPSII, it contributed to reinforce the interdisciplinarity of the Symposium and gave the opportunity to enlarge the scope of the Symposium, with additional contributions of scientists from close fields, as geologists, biologists, geographers, applied mathematicians, observers, and engineers.

By definition, complex systems are systems composed of interacting parts / agents whose local behavior, resulting from the interactions between them, cannot provide a complete understanding of the global behavior, i.e., when the system is considered as a whole, on a macroscopic scale. Several levels of modeling of the system should be considered at the same time. This forces complex systems to be studied by transdisciplinary teams, able to understand the whole construction and critically analyze the connections among the description levels. This vision is really efficient and challenging for space and astronomy sciences.

The huge number of available observations (from ground and space) and their accurate precision, as well as the computational power and speed of our present-day computers, have spectacularly changed the nature of the dynamical models, especially for planetary evolution studies. Planetology, celestial mechanics, and space geodesy have considerably evolved in that direction during the last decade, and have reinforced the need for crossing experiences and methods. Let us mention several examples: the concept of habitability of an extrasolar planet; the dynamical history of the Solar System and other planetary systems; the rotation of planets and satellites linked to their internal structure; the motion of natural satellites needing astrometry, tides and dissipations; the thermal effects on the evolution of the rotating small asteroids; the long-term evolution of space debris and satellites, including drags, shadowing effects, and collisional chain reactions. All these problems as well as many others were tackled at CPSII, showing how the formal historical border between analytical and numerical approaches has now disappeared.

The Symposium was a real opportunity to show the power of interdisciplinary collaboration and was a unique occasion to gather astronomers of many disciplines together. While the global thematic remained the planetary systems as in the first edition, CPSII highlighted that first, the tools and the methods have considerably evolved, and second, the interdisciplinarity has touched more communities. The Symposium opened new doors and created collaborations, exchanges of ideas, combinations of techniques, sometimes unexpected, to solve complex planetary systems.

CPSII was attended by 130 scientists from 30 different countries and proposed a rich program with 19 invited speakers, 57 talks, and 33 posters. Moreover, the organization of the meeting was innovative, with a priority to young promising speakers on interdisciplinary topics, two round tables on space awareness and habitability, poster flash talks ('one slide, one minute') with different prizes awarded to the best poster presentations. Cultural events, namely the visit of the citadel underground and a dance show about the astrophysicist Vera Rubin, completed the program.

The scientific communities of the Solar system and the exoplanets, were particularly happy to meet again after the pandemic. It was a great success in terms of contacts, discussions, and future projects.

CPSII was supported by the International Astronomical Union, Kavli Foundation, F.R.S.-FNRS, UNITER doctoral school, naXys Research Institute, UNamur, and the *Fonds Jacques Cox pour les générations futures*.

Anne Lemaitre and Anne-Sophie Libert (co-chairs)

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