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Edited by

Anne Lemaître
Anne-Sophie Libert

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COVER ILLUSTRATION:

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

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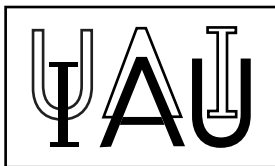
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COMPLEX PLANETARY SYSTEMS II: LATEST METHODS FOR AN INTERDISCIPLINARY APPROACH

PROCEEDINGS OF THE 382nd SYMPOSIUM OF
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NAMUR, BELGIUM
3–7 JULY 2023

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Table of Contents

Preface	viii
Editors	x
List of Participants	xi
The obliquity of Mercury: Models and interpretation <i>Rose-Marie Baland</i>	1
Dynamics of Circumstellar Planets in Binary Star Systems <i>Man Hoi Lee, Ka Ho Wong, Ho Wan Cheng, Trifon Trifonov, Sabine Reffert and Andreas Quirrenbach</i>	12
Long-term stability and dynamical spacing of compact planetary systems <i>Antoine C. Petit</i>	20
Long-term evolution of exoplanet systems <i>Cristobal Petrovich</i>	30
Derivation and Properties of the Angular Momentum Relative Amended Potential <i>Daniel J. Scheeres</i>	41
Progress report on the BEBOP search for circumbinary planets with radial velocities <i>Thomas A. Baycroft, Amaury H. M. J. Triaud and Dong Lai</i>	51
Transversal Yarkovsky acceleration for Apophis through jet transport <i>Luis Benet and Jorge A. Pérez Hernández</i>	59
Tidal effects in resonant chains of close-in planets: TTV analysis of Kepler-80 <i>Carolina Charalambous and Anne-Sophie Libert</i>	66
Revisiting the Cassini States of synchronous satellites with an angular momentum approach <i>Alexis Coyette, Rose-Marie Baland and Tim Van Hoolst</i>	73
Lagrangian descriptors and their applications to deterministic chaos <i>Jérôme Daquin</i>	80
Deconvolving the complex structure of the asteroid belt <i>Stanley F. Dermott, Dan Li and Apostolos A. Christou</i>	86
Towards a complete picture of the evolution of planetary systems around evolved stars <i>Mats Esseldeurs, Stéphane Mathis and Leen Decin</i>	98
Multi-planet systems explored: the case of the HD34445 system revisited <i>Nikolaos Georgakarakos and Ian Dobbs-Dixon</i>	101

Stability maps for the 5/3 mean motion resonance between Ariel and Umbriel with inclination	103
<i>Sérgio R. A. Gomes and Alexandre C. M. Correia</i>	
Migration of giant planets in low viscosity discs and consequences on the Nice model	110
<i>P. Griveaud, A. Crida, E. Lega, A. C. Petit and A. Morbidelli</i>	
Secular Resonances and Terrestrial Planet Formation in Planetary Systems with Multiple Stars	116
<i>Michael Andrews and Nader Haghighipour</i>	
Positive Weathering Feedback Compensates Carbonates at Shallow Ocean Depths	123
<i>Hakim Kaustubh</i>	
Hazardous Asteroids and Space Situational Awareness – Do Look UP !	126
<i>Daniel Hestroffer</i>	
Secular Resonance Maps	130
<i>Zoran Knežević</i>	
On the retrograde planar co-orbital asteroid motion with Jupiter	136
<i>George Voyatzis and Thomas Kotoulas</i>	
Sun-planets tidal interactions: an extended catalog	139
<i>Sergey M. Kudryavtsev, Rodolfo G. Cionco and Willie W.-H. Soon</i>	
New semi-analytical calculation of lunar, solar and planetary perturbations in motion of Earth satellites	142
<i>Sergey M. Kudryavtsev</i>	
Can the stellar dynamical tide destabilize the resonant chains of planets formed in the disk?	146
<i>Leon Ka Wang Kwok, Emeline Bolmont, Alexandre Revol, Stéphane Mathis, Aurélie Astoul, Corinne Charbonnel and Sean Raymond</i>	
Medium Earth Orbit Secular Resonances and Navigation Satellites	149
<i>Edoardo Legnaro</i>	
Investigation of the dynamical evolution of planetary systems with isotropically varying masses	156
<i>M.Zh. Minglibayev, A.N. Prokopenya and A.B. Kosherbayeva</i>	
On the long-term orbital evolution of a satellite revolving around an oblate body	159
<i>Gabriela-Ana Nadabaică</i>	
Food for thought	165
<i>Yaël Nazé</i>	
On the computation of resonant tidal dissipation in the liquid layers of planets and stars	167
<i>Jérémy Rekier and Santiago A. Triana</i>	

Secular dynamics of a coplanar, non-resonant planetary system, consisting of a star and two planets	174
<i>Vladislav Sidorenko</i>	
Chaotic diffusion in the GJ 876 exoplanetary system	177
<i>Raphael Alves Silva, Cristian Beaugé and Sylvio Ferraz-Mello</i>	
Jovian encounter manifolds	180
<i>Nataša Todorović and Nikola Knežević</i>	
On the predictability horizon in Impact Monitoring of Near Earth Objects . . .	185
<i>Giacomo Tommei and Giovanni B. Valsecchi</i>	
Excitation of the obliquity of Earth-like planets via tidal forcing using the Andrade rheology	191
<i>Ema F. S. Valente and Alexandre C. M. Correia</i>	
Comparison of Mars rotation angle models	198
<i>Marie Yseboodt, Rose-Marie Baland and Sébastien Le Maistre</i>	
Collision outcomes due to planetesimal and planetary embryo interactions in inclined binary star systems	205
<i>Maximilian Zimmermann and Elke Pilat-Lohinger</i>	
Author Index	209

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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