

SCIENTIFIC PROGRAMME

| Large-scale body dynamics: planets and exoplanets | Large-scale body dynamics: planets and exoplanets | Medium-scale body dynamics: asteroids, comets, NEOs, natural satellites | Perturbation methods and long-term evolution of space objects | Small-scale body dynamics: dust particles, rings and space debris & Numerical and analytical methods for resonances and chaos |
|--|---|---|---|---|
| Opening (10:10 - 10:30) | | | | |
| Jacques LASKAR (10:30 - 11:00) | Eiichiro KOKUBO (10:30 - 11:00) | Vladislav SIDORENKO (10:30 - 10:50) | Christos EFTHYMIPOULOS (10:30 - 11:00) | Massimiliano VASILE (10:30 - 11:00) |
| Winston SWEATMAN (11:00 - 11:20) | Nader HAGHIGHIPOUR (11:00 - 11:20) | Alexandre POUSSE (10:50 - 11:10) | Ugo LOCATELLI (11:00 - 11:30) | Anne-Sophie LIBERT (11:00 - 11:30) |
| Alexandre CORREIA (11:20 - 11:40) | Sergei IPATOV (11:20 - 11:40) | Elke PILAT-LOHINGER (11:10 - 11:30) | Birgit LOIBNEGGER (11:30 - 11:50) | Jérôme DAQUIN (11:30 - 11:50) |
| Melaine SAILLENFEST (11:40 - 12:00) | Hoai Nam HOANG (11:40 - 12:00) | Yoko FUNATO (11:30 - 11:50) | Irene DE BLASI (11:50 - 12:10) | Mahdi JAFARI NADOUSHAN (11:50 - 12:10) |
| Federico MOGAVERO (12:00 - 12:20) | Arnaud ROISIN (12:00 - 12:20) | Eduard KUZNETSOV (11:50 - 12:10) | Mattia ROSSI (12:10 - 12:30) | Tudor VARTOLOMEI (12:10 - 12:30) |
| | | Sergey EFIMOV (12:10 - 12:30) | | |
| Break (12:20 - 12:50) | Break (12:20 - 12:50) | Break (12:30 - 13:00) | Break (12:30 - 13:00) | Break (12:30 - 13:00) |
| Alessandro MORBIDELLI (12:50 - 13:20) | Agnès FIENGA (12:50 - 13:20) | Mara VOLPI (13:00 - 13:20) | Sara DI RUZZA (13:00 - 13:20) | Christoph LHOTKA (13:00 - 13:30) |
| Antoine PETIT (13:20 - 13:40) | Dmitry PAVLOV (13:20 - 13:40) | Timothée VAILLANT (13:20 - 13:40) | Aigerim IBRAIMOVA (13:20 - 13:40) | Mauricio MISQUERO (13:30 - 13:50) |
| Carolina CHARALAMBOUS (13:40 - 14:00) | Xiaojin XI (13:40 - 14:00) | Mariusz TARNOPOLSKI (13:40 - 14:00) | Irene CAVALLARI (13:40 - 14:00) | Ioana-Lucia BOACA (13:50 - 14:10) |
| Pierfrancesco DI CINTIO (14:00 - 14:20) | Alexander PERMINOV (14:00 - 14:20) | Daniel SCHEERES (14:00 - 14:30) | Marco FENUCCI (14:00 - 14:20) | Simon ANGHEL (14:10 - 14:30) |
| | | Stefano MARO' (14:30 - 14:50) | | |

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|--|---|---|---|---|
| Lunch Break (14:20 - 16:00) | Lunch Break (14:20 - 16:00) | Lunch break (14:50 - 16:00) | Lunch Break (14:20 - 16:00) | Lunch Break (14:30 - 16:00) |
| Large-scale body dynamics: planets and exoplanets | Medium-scale body dynamics: asteroids, comets, NEOs, natural satellites | | Exploration and exploitation of space objects | Small-scale body dynamics: dust particles, rings and space debris & Numerical and analytical methods for resonances and chaos |
| Sylvio FERRAZ-MELLO (16:00 - 16:30) | Memorial of Andrea Milani (16:00 - 16:25) | E-POSTER SESSION (16:00 - 19:00) | Alessandro ROSSI (16:00 - 16:30) | Valerio CARRUBA (16:00 - 16:20) |
| Federico ZOPPETTI (16:30 - 16:50) | Giovanni Federico GRONCHI (16:25 - 16:55) | Marcel POPESCU (19:00 - 20:00) | Josué CARDOSO DOS SANTOS (16:30 - 16:50) | Silvia GIULIATTI WINTER (16:20 - 16:40) |
| Bonnie STEVES (16:50 - 17:10) | Zoran KNEŽEVIĆ (16:55 - 17:15) | | George VOYATZIS (16:50 - 17:10) | Edoardo LEGNARO (16:40 - 17:00) |
| Tabare GALLARDO (17:10 - 17:30) | Giovanni VALSECCHI (17:15 - 17:35) | | Begona NICOLAS (17:10 - 17:30) | Nataša TODOROVIĆ (17:00 - 17:20) |
| Óscar RODRÍGUEZ DEL RÍO (17:30 - 17:50) | Giulio BAU' (17:35 - 17:55) | | Zoltan MAKÓ (17:30 - 17:50) | Nicolas LECLERE (17:20 - 17:40) |
| | | | | Helena MORAIS (17:40 - 18:00) |
| Break (17:50 - 18:20) | Break (17:55 - 18:20) | | Break (17:50 - 18:20) | Break (18:00 - 18:30) |
| Jérémy COUTURIER (18:20 - 18:50) | Stanley DERMOTT (18:20 - 18:50) | | Kathleen HOWELL (18:20 - 18:50) | Aaron Jay ROSENGREN (18:30 - 19:00) |
| Barbara BRAGA CAMARGO (18:50 - 19:10) | Ivana MILIĆ ŽITNIK (18:50 - 19:10) | | Douglas HAMILTON (18:50 - 19:20) | Renu MALHOTRA (19:00 - 19:30) |
| Rita MASTROIANNI (19:10 - 19:30) | Alexey ROSAEV (19:10 - 19:30) | | Bhanu KUMAR (19:20 - 19:40) | Kleomenis TSIGANIS (19:30 - 20:00) |
| Daniel GASLAC GALLARDO (19:30 - 19:50) | Louise RIOFRIO (19:30 - 19:50) | | Pelayo PENARROYA and Roberto PAOLI (19:40 - 20:00) | Closing (20:00 - 20:10) |
| Yeva GEVORGYAN (19:50 - 20:10) | Efsevia KARAMPOTSIU (19:50 - 20:10) | | Adrian RODRIGUEZ (20:00 - 20:20) | |

List of Invited speakers

Jérémy Couturier, Observatoire de Paris, France
Stanley Dermott, University of Florida, USA
Christos Efthymiopoulos, University of Padua, Italy
Sylvio Ferraz-Mello, Universidade de Sao Paulo, Brazil
Agnès Fienga, Observatoire de la Côte d'Azur, France
Giovanni F. Gronchi, University of Pisa, Italy
Douglas P. Hamilton, University of Maryland, USA
Kathleen Howell, Purdue University, USA
Eiichiro Kokubo, National Astronomical Observatory of Japan, Japan
Jacques Laskar, Observatoire de Paris, France
Christoph Lhotka, University of Vienna and University of Rome Tor Vergata, Austria
Anne-Sophie Libert, Université de Namur, Belgium
Ugo Locatelli, University of Rome Tor Vergata, Italy
Renu Malhotra, University of Arizona, USA
Alessandro Morbidelli, Observatoire de la Côte d'Azur, France
Aaron J. Rosengren, The University of Arizona, USA
Alessandro Rossi, IFAC-CNR Florence, Italy
Daniel J. Scheeres, University of Colorado, USA
Kleomenis Tsiganis, Aristotle University of Thessaloniki, Greece
Massimiliano Vasile, University of Strathclyde, UK

Session chairs schedule

| | Monday October 18 | Tuesday October 19 | Wednesday October 20 | Thursday October 21 | Friday October 22 |
|----|--------------------------|---------------------------|-----------------------------|----------------------------|--------------------------|
| S1 | Anne Lemaître | Winston Sweatman | Mirel Birlan | Giovanni Valsecchi | Nader Haghhighipour |
| S2 | Elke Pilat-Lohinger | Bonnie Steves | Daniel Hestroffer | Vlad Turcu | Vladislav Sidorenko |
| S3 | Alexandre Correia | Alessandra Celletti | Răzvan Lițcanu | Roberto Paoli | George Voyatzis |
| S4 | Valerio Carruba | Zoran Knežević | | Marcel Popescu | Gales Catalin |

S1 - from 10:30 (EEST) until the morning break;

S2 - starts after the morning break and finishes before the lunch break;

S3 - from 16:00 (EEST) until the afternoon break;

S4 - starts after the afternoon break and finishes after the last talk of the day;

Statistics on the Scientific Programme

I. Invited talks

1. Number of invited talks: 20
2. Number of female speakers invited talks: 4
3. Number of male speakers invited talks: 16
4. Number of non-specified speakers invited talks: 0
5. Number of female invited speakers accepted: 4
6. Number of male invited speakers accepted: 16
7. Number of non-specified invited speakers accepted: 0

II. Contributed talks

1. Number of contributed talks: 65
2. Number of female speakers contributed talks: 22
3. Number of male speakers contributed talks: 43
4. Number of non-specified speakers contributed talks: 0

Summary of the Scientific highlights of the meeting

The last decades have shown a continuous development in dynamics modelling of celestial bodies at various time scales, from days to periods of time comparable with the age of the Solar system, and length scales, from several kilometers to hundreds of astronomical units. New and more refined models are requested by the enormous amount of highly accurate observational data, collected from ground and space, as well as by the current and future space missions. The range of phenomena that manifest at all different time and length scales and the wide range of sizes of space objects, from minor bodies in the Solar system to exoplanets, from dust particles to Jupiter-size bodies, has required the development of modelling and analysis tools that can handle these different scales. The understanding of the dynamics of these space objects is a key to the advancement of space science and technology, with considerable benefits to society and economy. The emergence of new open problems in space science, such as the formation, habitability and long-term evolution of planetary systems, the complex dynamical behavior of minor bodies in the Solar system, the increased traffic in Earth orbit, the exploration and exploitation of space objects, has stimulated the birth of new lines of investigation, the development of new scientific methods and techniques as well as the development of technologies with a potential big impact on our everyday life.

This Symposium covered the recent advances in the multi-scale dynamics of natural and artificial space objects from various perspectives: modelling, development of new methods and tools to analyze the dynamics, stability analysis, exploration and exploitation of minor bodies. The Symposium served a wide international community working in various fields: physics, celestial mechanics, astrodynamics, planetary sciences, space engineering, applied mathematics, dynamical systems. The Symposium provided an ideal venue for interdisciplinary discussions, exchanging ideas, making future plans and developing new collaborations.

The IAU Symposium covered the following key topics:

1. **Large-scale body dynamics: planets and exoplanets;**
2. **Medium-scale body dynamics: asteroids, comets, NEOs, natural satellites;**
3. **Small-scale body dynamics: dust particles, rings and space debris;**
4. **Perturbation methods and long-term evolution of space objects;**
5. **Numerical and analytical methods for resonances and chaos;**
6. **Exploration and exploitation of space objects.**

Executive Summary of the Meeting

The IAU Symposium 364 took place from October 18 to 22, 2021, in hybrid form, in which locals attended the event in person, while all other participants participated remotely. The event was organized with the support from IAU, Division A Fundamental Astronomy and Commission A4 – Inter-Division A-F Celestial Mechanics and Dynamical Astronomy, Al. I. Cuza University of Iasi, University of Rome Tor Vergata and the Romanian National Committee for Astronomy.

The objective of this Symposium was to address the recent advances in the multi-scale dynamics of natural and artificial space objects from various perspectives: modelling, development of new methods and tools to analyse the dynamics, stability analysis, exploration and exploitation of minor bodies. In fact, the IAU Symposium 364 covered the following key topics:

1. Large-scale body dynamics: planets and exoplanets;
2. Medium-scale body dynamics: asteroids, comets, NEOs, natural satellites;
3. Small-scale body dynamics: dust particles, rings and space debris;
4. Perturbation methods and long-term evolution of space objects;
5. Numerical and analytical methods for resonances and chaos;
6. Exploration and exploitation of space objects.

The event gathered **199 participants**, from more than 30 countries, with a large (>50%) participation of post-docs, doctoral and master students. The scientific results obtained by the participants were disseminated through oral communications (**20 invited talks** and **65 contributed talks**) and **38 e-posters**. The technical programme included 9 sessions addressed to the above mentioned key topics, one session devoted to e-posters, a **public lecture** and a **Memorial dedicated to Andrea Milani**.

All sessions, including the *public lecture* scheduled on Wednesday afternoon, October, 20, 2021, were streamed via Zoom.

The **book of abstracts** and the videos of **recorded talks** are available on the website of the Symposium 364 at: https://www.math.uaic.ro/~IAU_S364/programme/

A number of **38 e-posters** are uploaded in the pdf format on the website of the Symposium 364 at: https://www.math.uaic.ro/~IAU_S364/posters/

A **Slack workspace**, titled *Multi-scale (time&mass) dynamics of space objects*, was created and all participants were invited to use its channels for chatting and questions and for interacting with the authors of e-posters and speakers.