

45th DDA Meeting

Philadelphia, PA – 28 April - 1 May 2014

Meeting Program

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Monday, 28 April 2014

Welcome Address, Matija Cuk, DDA Chair

Monday, 9:00 AM - 9:10 AM; Mitchell Hall

100 The Rich Dynamics of Planets in the Post-main-sequence Systems, Dimitri Veras (University of Warwick)

Monday, 9:10 AM - 9:50 AM; Mitchell Hall

100.01 The rich dynamics of planets in post-main-sequence systems

Author(s): *Dimitri Veras (University of Warwick)*

101 Evolved Planetary Systems and Long Term Evolution

Monday, 9:50 AM - 10:30 AM; Mitchell Hall

101.01 Evolution of Planetary Orbits in Solar Systems with Stellar Mass Loss and Tidal Dissipation

Author(s): *Fred Adams (University of Michigan)*, Anthony Bloch (University of Michigan)

101.02 The onset of large-scale dynamical instability in the Solar System

Author(s): *Konstantin Batygin (Harvard-Smithsonian Center for Astrophysics)*, Matthew Holman (Harvard-Smithsonian Center for Astrophysics), Alessandro Morbidelli (CNRS, OCA)

102 Planet Formation and Structure

Monday, 11:00 AM - 12:40 PM; Mitchell Hall

102.01 Forming Giant Planet Cores by Pebble Accretion -- Why Slow and Steady wins the Race

Author(s): *Katherine Kretek (Southwest Research Institute)*, Harold Levison (Southwest Research Institute)

102.02 Dynamical friction during planet formation in the Grand Tack scenario

Author(s): *Seth Jacobson (Observatoire de la Cote d'Azur)*, Alessandro Morbidelli (Observatoire de la Cote d'Azur)

102.03 Formation of the Terrestrial Planets from an Annulus

Author(s): *Kevin Walsh (Southwest Research Institute)*, Harold Levison (Southwest Research Institute)

102.04 Theia's Provenance: Regional Source of Earth's Late Impactor

Author(s): *Billy Quarles (NASA Ames Research Center)*, Jack Lissauer (NASA Ames Research Center)

102.05 Tidal dissipation in the dense anelastic core of giant planets

Author(s): *Francoise Remus (CEA/DSM/IRFU/Service d'Astrophysique, Observatoire de Paris - IMCCE)*, Stephanie Mathis (CEA/DSM/IRFU/Service d'Astrophysique), Jean Paul Zahn (Observatoire de Paris - LUTH), Valery Lainey (Observatoire de Paris - IMCCE)

103 The Solar System

Monday, 2:00 PM - 4:00 PM; Mitchell Hall

103.01 The Trajectory of the Chelyabinsk Impactor

Author(s): *Paul Chodas (JPL/Caltech)*, Steven Chesley (JPL/Caltech)

103.02 Trajectory and physical properties of near-Earth asteroid 2009 BD

Author(s): *Steven Chesley (Jet Propulsion Laboratory, California Institute of Technology)*, Michael Mommert (Northern Arizona University), Joseph Hora (Harvard-Smithsonian Center for Astrophysics), Davide Farnocchia (Jet Propulsion Laboratory, California Institute of Technology), David Trilling (Northern Arizona University), David Vokrouhlický (Charles University), Michael Mueller (SRON Netherlands Institute for Space Research), Alan Harris (DLR Institute of Planetary Research), Howard Smith (Harvard-Smithsonian Center for Astrophysics), Giovanni Fazio (Harvard-Smithsonian Center for Astrophysics)

103.03 Enhancement of the natural Earth satellite population through meteoroid aerocapture

Author(s): *Althea Moorhead (NASA Meteoroid Environment Office)*, William Cooke (NASA Meteoroid Environment Office)

103.04 Trajectory analysis for the nucleus and dust of comet C/2013 A1 (Siding Spring)

Author(s): *Davide Farnocchia (JPL, Caltech)*, Steven Chesley (JPL, Caltech), Paul Chodas (JPL, Caltech)

103.05 Binary Near-Earth Asteroids: Satellite Spin States Under Spin-Orbit Coupling

Author(s): *Shantanu Naidu (UCLA)*, Jean-Luc Margot (UCLA)

103.06 Defining the Flora Family: Reflectance Properties and Age

Author(s): *Melissa Dykhuis (University of Arizona)*, Lawrence Molnar (Calvin College), Samuel Van Kooten (Calvin College), Richard Greenberg (University of Arizona)

104 My Chaotic Trajectory: A Brief (personalized) History of Solar-System Dynamics, Joseph Burns (Cornell University)

Monday, 4:00 PM - 4:40 PM; Mitchell Hall

104.01 My chaotic trajectory: A brief (personalized) history of solar-system dynamics.

Author(s): *Joseph Burns (Cornell Univ.)*

Tuesday, 29 April 2014

200 Circumbinary Planetary Systems at Home and Abroad, Kaitlin Kratter (University of Arizona)

Tuesday, 9:00 AM - 9:40 AM; Mitchell Hall

200.01 Circumbinary Planetary Systems at Home and Abroad

Author(s): *Kaitlin Kratter (University of Arizona)*, Andrew Shannon (IoA Cambridge), Andrew Youdin (University of Arizona), Scott Kenyon (Harvard-Smithsonian CfA)

201 Exoplanets 1

Tuesday, 9:40 AM - 10:40 AM; Mitchell Hall

201.01 Joint Bayesian and N-body Analyses of the 55 Cancri and GJ 876 Planetary Systems

Author(s): *Benjamin Nelson (Pennsylvania State University, Center of Exoplanets and Habitable Worlds)*, Eric Ford (Pennsylvania State University, Center of Exoplanets and Habitable Worlds), Jason Wright (Pennsylvania State University, Center of Exoplanets and Habitable Worlds), Debra Fischer (Yale University)

201.02 Measuring the masses, radii and orbital eccentricities of sub-Neptunes with transit timing variations.

Author(s): *Daniel Jontof-Hutter (NASA Ames Research Center)*, Jack Lissauer (NASA Ames Research Center), Jason Rowe (NASA Ames Research Center, SETI Institute), Daniel Fabrycky (University of Chicago)

201.03 Scattering outcomes of close-in planets

Author(s): *Cristobal Petrovich (Princeton University)*, Scott Tremaine (Institute for Advanced Study), Roman Rafikov (Princeton University)

202 Exoplanets 2

Tuesday, 11:00 AM - 12:40 PM; Mitchell Hall

202.01 Tidal Synchronization of Close-in Satellites and Exoplanets, Host Stars and Mercury

Author(s): *Sylvio Ferraz-Mello (IAG-USP)*

202.02 Chaotic Dynamics of Stellar Spin in Binaries and the Production of Misaligned Hot Jupiters

Author(s): *Natalia Storch (Cornell University)*, Kassandra Anderson (Cornell University), Dong Lai (Cornell University)

202.03 Chaotic Dynamics of Stellar Spin in Binaries and the Production of Misaligned Hot Jupiters. Part II

Author(s): *Kassandra Anderson (Cornell University)*, Natalia Storch (Cornell University), Dong Lai (Cornell University)

202.04 Fine Structure in the Architectures of Kepler Systems

Author(s): *Jason Steffen (Northwestern University)*

202.05 Planetesimal Interactions Explain the Mysterious Period Ratio Distribution Near Mean Motion Resonances

Author(s): *Sourav Chatterjee (University of Florida)*, Eric Ford (Penn State University)

203 Dynamical and Kinematic Structure of Bars with Supermassive Black Holes, Monica Valluri (University of Michigan)

Tuesday, 2:00 PM - 2:40 PM; Mitchell Hall

203.01 Dynamical and Kinematic Structure of Bars with Supermassive Black Holes

Author(s): *Monica Valluri (University of Michigan)*

204 Galaxies and Galactic Structure

Tuesday, 2:40 PM - 3:40 PM; Mitchell Hall

204.01 Smoothing Rotation Curves in Spiral Galaxies

Author(s): *Joel Berrier (Rutgers University)*, Jerry Sellwood (Rutgers University)

204.02 GALAXY - a highly efficient, collisionless N-body simulation code

Author(s): *Jerry Sellwood (Rutgers Univ.)*

204.03 Dynamics of the Milky Way Bulge and its X-shaped Structure

Author(s): *Juntai Shen (Shanghai Astronomical Obs.)*

205 Other Dynamical Topics

Tuesday, 4:00 PM - 5:00 PM; Mitchell Hall

205.01 Tides, Planetary Companions, and Habitability

Author(s): *Christa Van Laerhoven (University of Arizona)*, Rory Barnes (University of Washington), Richard Greenberg (University of Arizona)

205.02 Dynamical Behavior of Ejecta Produced by the Proposed ISIS Kinetic Impactor Demonstration

Author(s): *Eugene Fahnestock (Jet Propulsion Laboratory, California Institute of Technology)*, Steven Chesley (Jet Propulsion Laboratory, California Institute of Technology), Davide Farnocchia (Jet Propulsion Laboratory, California Institute of Technology)

205.03 On the post mitigation impact risk assessment of possible targets for an asteroid deflection demonstration mission in the NEOShield project.

Author(s): *Siegfried Eggl (IMCCE - Observatoire de Paris)*

Wednesday, 30 April 2014

300 Classical Topics

Wednesday, 9:00 AM - 9:40 AM; Mitchell Hall

300.01 Tidal dissipation in a homogeneous spherical body. Revisiting the old problem.

Author(s): *Michael Efroimsky (U.S. Naval Observatory)*, Valeri Makarov (U.S. Naval Observatory)

300.02 When Did the Mean Solar Day Equal 86,400 SI Seconds?

Author(s): *Victor Slabinski (U.S. Naval Observatory)*

301 The Solar System: Titan

Wednesday, 9:40 AM - 11:00 AM; Mitchell Hall

301.01 Recent Origin of Titan's Orbital Eccentricity

Author(s): *Matija Cuk (SETI Institute)*

301.02 The Origin of Titan and Hyperion

Author(s): *Douglas Hamilton (Univ. of Maryland)*

301.03 On the time-variable nature of Titan's obliquity

Author(s): *Benoit Noyelles (University of Namur)*, Francis Nimmo (University of California)

301.04 Dynamical Fate of Clumps Formed in Satellite Mergers.

Author(s): *Desireé Cotto-Figueroa (Arizona State University)*, Erik Asphaug (Arizona State University), Andreas Reufer (Arizona State University)

302 Understanding the Milky Way Globular Clusters, Sourav Chatterjee (University of Florida)

Wednesday, 11:20 AM - 12:00 PM; Mitchell Hall

302.01 Understanding the Milky Way Globular Clusters

Author(s): *Sourav Chatterjee (University of Florida)*

303 Modeling the Formation and Evolution of Dense Stellar System, Stephen McMillan (Drexel University)

Wednesday, 12:00 PM - 12:40 PM; Mitchell Hall

303.01 Modeling the Formation and Evolution of Dense Stellar Systems

Author(s): *Stephen McMillan (Drexel Univ.)*

304 The Solar System: Moons

Wednesday, 2:00 PM - 4:00 PM; Mitchell Hall

304.01 The Orbital and Interior Evolution of Charon as Preserved in its Geologic Record

Author(s): *Alyssa Rhoden (NASA Goddard)*, Wade Henning (University of Maryland, College Park), Terry Hurford (NASA Goddard), Douglas Hamilton (University of Maryland, College Park)

304.02 Chaotic Rotation of Nix and Hydra

Author(s): *Mark Showalter (SETI Institute)*

304.03 Seeding Life on the Moons of the Outer Planets

Author(s): *Rachel Worth (The Pennsylvania State University)*

304.04 Mimas' physical forced libration places strong constraints on its interior and origin.

Author(s): *Radwan Tajeddine (Cornell University, IMCCE/UPMC)*, Nicolas Rambaux (IMCCE/UPMC), Valery Lainey (IMCCE/UPMC), Sebastien Charnoz (CEA), Attilio Rivoldini (ROB), Andy Richard (IMCCE/UPMC), Benoit Noyelles (Namur University)

304.05 The Small Saturnian Satellites -- Chaos and Conundrum

Author(s): *Robert Jacobson (Jet Propulsion Laboratory)*

304.06 Geophysical Implications of Macro Variations in Enceladan Eruptions

Author(s): *Terry Hurford (NASA GSFC)*, Matthew Hedman (University of Idaho), Joseph Spitale (Planetary Science Institute), Alyssa Rhoden (NASA GSFC)

305 Poster Session

Wednesday, 5:00 PM - 7:00 PM; Mitchell Hall

- 305.01** **Generating unaveraged equations of motion in common orbital elements**
Author(s): Dimitri Veras (University of Warwick)
- 305.02** **URAT: year 3**
Author(s): Charlie Finch (US Naval Observatory), Norbert Zacharias (US Naval Observatory), Mike DiVittorio (US Naval Observatory), Eric Ferguson (US Naval Observatory), Hugh Harris (US Naval Observatory), Fred Harris (US Naval Observatory), Chris Kilian (US Naval Observatory), Ted Rafferty (US Naval Observatory (retired)), Albert Rhodes (US Naval Observatory), Michael Schultheis (US Naval Observatory), John Subasavage (US Naval Observatory), Trudy Tilleman (US Naval Observatory), Gary Wieder (US Naval Observatory)
- 305.03** **Celestial Navigation in the 21st Century**
Author(s): George Kaplan (George H. Kaplan, PhD)
- 305.04** **The Galilean moons orbital constraints and the improved orbit of Jupiter based on the radar ranging data**
Author(s): Marina Brozovic (Jet Propulsion Laboratory/Caltech), Robert Jacobson (Jet Propulsion Laboratory/Caltech), William Folkner (Jet Propulsion Laboratory/Caltech)
- 305.05** **Astrometry of natural satellites: improving the dynamics of planetary systems with old observations.**
Author(s): Vincent Robert (IPSA, IMCCE - Paris Observatory), Dan Pascu (USNO retired), Valery Lainey (IMCCE - Paris Observatory), Jean-Eudes Arlot (IMCCE - Paris Observatory)
- 305.06** **Nuclear Rings in Barred Galaxies**
Author(s): Juntai Shen (Shanghai Astronomical Obs.)
- Abstract Withdrawn:**
305.07 **The evolution of a Pluto-like system during the migration of the ice giants**
Author(s): Priscilla Maria Pires Dos Santos (Unesp), Silvia Giuliatti Winter (Unesp), Rodney Gomes (ON)
- 305.08** **New Mars Moon Ephemerides in the Context of the December 2013 Mars Express Phobos Close Flyby**
Author(s): Valery Lainey (IMCCE - Paris Observatory), Andreas Pasewaldt (DLR - German Aerospace Center), Jürgen Oberst (DLR - German Aerospace Center), Harald Hoffmann (DLR - German Aerospace Center), Pascal Rosenblatt (Royal Observatory of Belgium), Martin Pätzold (Köln University), Tom Andert (Universität der Bundeswehr München), William Thuillot (IMCCE - Paris Observatory)
- 305.09** **Taking Advantage of (Anticipated) Gaia Astrometry...and What about the Bright Stars?**
Author(s): Marc Murison (U.S. Naval Observatory -- Flagstaff Station), Hugh Harris (U.S. Naval Observatory -- Flagstaff Station)
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Thursday, 1 May 2014

400 The Solar System: Early Evolution

Thursday, 9:00 AM - 10:00 AM; Mitchell Hall

400.01 A few points on the dynamical evolution of the young solar system

Author(s): *Renu Malhotra (Univ. of Arizona)*

400.02 Planetary chaotic zone clearing: destinations and timescales

Author(s): *Sarah Morrison (Univ. of Arizona)*, Renu Malhotra (Univ. of Arizona)

400.03 The Dynamics Of Inner Solar System Bodies With $2.8 < T_j < 3.2$ And The Implications For The Origin Of Main-Belt Comets

Author(s): *Nader Haghighipour (Institute for Astronomy, University of Hawaii)*, Henry Hsieh (Institute of Astronomy and Astrophysics, Sinica)

401 The Solar System: Debris

Thursday, 10:00 AM - 10:40 AM; Mitchell Hall

401.01 Transfer of Impact Ejecta Between Pluto and Charon

Author(s): *Henry Dones (Southwest Research Inst.)*, Edward Bierhaus (Lockheed Martin Space Systems Company)

401.02 A steady-state model of the lunar ejecta cloud

Author(s): *Apostolos Christou (Armagh Obs.)*

402 The Solar System: Rings

Thursday, 11:00 AM - 1:00 PM; Mitchell Hall

402.01 Architecture of the Cassini Division revisited

Author(s): *Philip Nicholson (Cornell University)*, Richard French (Wellesley College), Matthew Hedman (University of Idaho), Joshua Colwell (University of Central Florida), Essam Marouf (San Jose State University), Colleen McGhee (Wellesley College)

402.02 Dynamical models of Saturn's Phoebe ring

Author(s): *Daniel Tamayo (Cornell University)*, Stephen Markham (Cornell University), Matthew Hedman (University of Idaho), Joseph Burns (Cornell University)

402.03 An unusual density wave in Saturn's C ring, evidence for a supersonic resonance?

Author(s): *Matthew Hedman (University of Idaho)*, Philip Nicholson (Cornell University)

402.04 Collisional Features in Saturn's F Ring

Author(s): *Nicholas Attree (Queen Mary University of London)*, Carl Murray (Queen Mary University of London), Nicholas Cooper (Queen Mary University of London), Gareth Williams (Queen Mary University of London)

402.05 How can we explain the presence of rings around the Centaur Chariklo?

Author(s): *Maryame El Moutamid (Cornell University)*, Quentin Kral (LESIA OBSPM), Bruno Sicardy (LESIA OBSPM, UPMC), Sebastien Charnoz (Université Paris Diderot, CEA Saclay), Françoise Roques (LESIA OBSPM), Philip Nicholson (Cornell University), Joseph Burns (Cornell University)

402.06 A survey for spiral waves and other radial features in Saturn's rings

Author(s): *Matthew Tiscareno (Cornell Univ.)*, Brent Harris (Cornell Univ., UCLA)

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