

Ravi kumar Kopparapu

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Postdoctoral Positions

- 2010 September - Present:
NASA Astrobiology Institute-Virtual Planetary Lab Postdoctoral scholar at the Department of Geosciences, The Pennsylvania State University.
- 2007 September - 2010 August:
Postdoctoral scholar at *Center for Gravitational-wave Physics*, Department of Physics, The Pennsylvania State University.
- 2007 January - 2007 July:
Postdoctoral scholar at *Center for Computation and Technology (CCT)*, Louisiana State University.

Education

- August 2000- December 2006- Ph.D in Physics, Louisiana State University;
Dissertation : Population Boundaries and Gravitational Wave Templates for White Dwarf Binaries.
- May 2003 - M.S. in Physics, Louisiana State University
- June 1998 - M.Sc. in Physics, University of Pune, India
- June 1996 - B.Sc. in Electronics, Nagarjuna University, India

Awards & Fellowships

- Louisiana State University, Baton Rouge LA: Graduate Student Fellowship (2000-2004).
- University of Pune, India: National Level Entrance Examination for M.Sc. Scholarship (1996-1998).
- Nagarjuna University, Sarada College: Silver Medalist in B.Sc (1996).

Invited Talks & Workshops

1. NASA Goddard Space Flight Center, Exoplanets seminar (July, 2011)
2. NASA Astrobiology Institute (NAI) workshop on *Revisiting the Habitable Zone*, Seattle (August 2010)
3. Center for Exoplanets and Habitable Worlds, Penn State (May 2010)
4. NASA Goddard Space Flight Center, Exoplanets seminar (May, 2010)
5. Northwestern University, special colloquium (March, 2010)
6. Northwestern University, theoretical astrophysics group (March, 2010)
7. Penn State Institute for Gravitation and Cosmos post-grad seminar (January, 2010)

Reviewer

- Astrophysical Journal
- Astrophysical Journal Letters
- Astronomy & Astrophysics

Affiliation

- Virtual Planetary Lab, NASA Astrobiology Institute (NAI), Pennstate.
- Member of NASA's ExoPlanet Exploration Program Analysis Group (ExoPAG) on "Planetary Architecture and Dynamical Stability"
- American Astronomical Society (AAS)
- American Physical Society (APS)

Research & Computational Experience

- *Extra-solar planets: Habitability & atmospheric characterization*
 - Modified a 1-D radiative-convective climate code to find habitable-zone boundaries around main-sequence stars. Potential habitability of terrestrial planets, such as those discovered by NASA’s *Kepler* mission, can be determined using these boundaries.
 - Developed a photochemical code to study hot Jupiter atmospheres. The goal is to help interpret spectral data from NASA’s Spitzer Space Telescope (and eventually JWST).
 - Four years of experience in running large serial and parallel jobs on High Performance Computing (HPC) systems at Penn State and TeraGrid resources.
 - Successful in obtaining 1 million CPU hours of computing time on Extreme Science and Engineering Digital Environment (formerly TeraGrid) to study dynamical stability of Earth-like planets in habitable zones.
 - Generated a catalog of known extrasolar planetary that can dynamically support an Earth-mass planet in their habitable zones. This catalog can guide observers towards systems that can host habitable planets.
- *Gravitational-waves and Astrophysics of Compact binary systems*
 - Developed codes in Fortran 90 and MATLAB to analyze the data obtained from ground-based gravitational-wave detectors such as NSF funded LIGO (*Laser Interferometer Gravitational-wave Observatory*) and VIRGO.
 - Generated a galaxy catalog for LIGO data analysis to search for potential mergers of neutron-star binaries.
 - Generated a gravitational-wave equivalent of “color-Magnitude” diagram of double-white dwarfs for the proposed space-based NASA/ESA gravitational-wave detector, LISA (*Laser Interferometer Space Antenna*).

Publications

1. A photochemical model for the carbon rich planet Wasp-12b
—**Kopparapu, R**; Kasting, J. F.; Zahnle, K. 2012, *Astrophysical Journal*, 745, Issue 1
2. Population synthesis of hot subdwarfs
—Clausen, D.; Wade, R.; **Kopparapu, R**; O’Shaughnessy, R.; 2012, *Astrophysical Journal*, 746, Issue 2
3. Habitable zones around Main-Sequence stars: An update.
—**Kopparapu, R**; Ramses R.; Kasting, J. F.; Eymet, V.; 2012, *in preparation*
4. Impact of star formation inhomogeneities on merger rates and interpretation of LIGO results
—O’Shaughnessy, R.; **Kopparapu, R**; Belczynski, K.; 2012, *Classical Quantum Gravity*, submitted
5. Greenhouse warming by dense CO₂/CH₄ atmospheres and a critique of the impact hypothesis for martian valley formation
—Ramses R.; **Kopparapu, R**; Kasting, J. F.; 2011, *Icarus*, submitted
6. Secular Behavior of Exoplanets: Self-Consistency and Comparisons with the Planet-Planet Scattering Hypothesis
—Timpe, M; Barnes, R; **Kopparapu, R**; Raymond, S; Greenberg, R; 2011, *Astrophysical Journal*
7. *Stability analysis of single planet systems and their habitable zones*
—**Kopparapu, R**; Barnes, R; 2010, *Astrophysical Journal*, 716, 1336
8. *Population boundaries for compact white-dwarf binaries in LISA’s amplitude-frequency domain*
—**Kopparapu, R**; 2009, *Astrophysical Journal*, 697, 2089
9. *Stability of Additional Planets in and Around the Habitable Zone of the HD 47186 Planetary System*
—**Kopparapu, R**; Raymond, S. N; Barnes, R; 2009, *Astrophysical Journal letters*, 695, 181
10. *Host Galaxies Catalog Used in LIGO Searches for Compact Binary Coalescence Events*
—**Kopparapu, R**; Hanna, C; Kalogera, V; O’Shaughnessy, R; Gonzalez, G; Brady, P. R; Fairhurst, S; 2008, *Astrophysical Journal*, 675, 1459
11. *Population Boundaries for Galactic White Dwarf Binaries in LISA’s Amplitude-Frequency Domain*
—**Kopparapu, R**; Tohline, J. E; 2007, *Astrophysical Journal*, 655, 1025
12. LIGO-VIRGO collaboration publications (49).

Teaching & Mentoring

- 2012: Co-instructor for ‘Planetary Atmospheres’ class (senior undergraduate and graduate students).
- 2011: Substitute instructor for Earth 2 class (Extra-solar planets) in the Department of Geoscience, Pennsylvania State University.
- 2011: Lecture on gravitational-waves for Physics 444 class at Pennsylvania State University.
- 2008-2010: Mentored an undergraduate student on a research project related to the sensitivity of LISA spacecraft to gravitational-waves.
- Substitute instructor for a senior undergraduate class on General Theory of Relativity at Pennsylvania State University (Lecture slides on website).
- 2006-2007: Substitute instructor for introductory astronomy course at Louisiana State University (Lecture slides on website).
- 2000-2006: Graduate Teaching Assistant. Introductory astronomy laboratory with topics on solar systems, night sky observations and CLEA lab experiments.

Public Outreach

- 2012 - Invited speaker at park forest elementary school.
- 2011 - Featured public talk on habitable planets at the annual “Astrofest” (images on the website).
 - Coordinator for the telescope observation.
 - In charge of rocket experiment at the annual “Astrofest”.
 - “Science day” guest speaker at park forest elementary school.
- 2010 - Science exploration day volunteer at Pennsylvania State University.
 - Planetarium show at AstroFest 2010.
 - Featured talk: “What makes a planet habitable” at Astrofest 2010.
- 2009 - Co-creator of a presentation program for “Astrofest 2009”, based on “Black-hole hunter” game.
 - Public Talk on Total solar eclipse of July 22 2009 at Regional Science Center of Vijayawada, India (**media images on website**).
 - Volunteer/Coordinator for astronomy on “Science Exploration day” at Penn State.
- 2008 - Volunteer/co-ordinator for public observing nights at the Department of Astronomy, Pennsylvania State University.
- 2006-2007 - Organized public observing nights at the Department of Physics and Astronomy, LSU.

Selected Conference Presentations

1. *Habitable Zones Around Low Mass Stars*
 - **Kopparapu, R**; 2012 *Extreme Solar Systems* (talk)
2. *A Photochemical Model for the Carbon Rich Planet WASP-12b*
 - **Kopparapu, R**; 2011 *Extreme Solar Systems* (talk)
3. *Distinguishing Compact White-dwarf Binary Systems - An application of GW color magnitude diagram for LISA*
 - **Kopparapu, R**; 2010 *APS meeting* (talk)
4. *Dynamical Stability of Terrestrial Mass Planets around the Habitable Zones of Single Planet Systems*
 - **Kopparapu, R**; 2010 *AAS meeting* (talk)
5. *Hot sub-dwarfs as gravitational-wave sources for LISA*
 - **Kopparapu, R**; Wade, R; 2009 *APS meeting* (talk)
6. *Distinguishing GRB Progenitors using Gravitational-Wave Observations*
 - Bondarescu, R; **Kopparapu, R**; Finn, L. S; Lang, M; Summerscales, T. Z.; 2009 *LIGO-VIRGO Scientific Collaboration meeting* (poster)
7. *Stability of Multi-planet Systems in and around Habitable Zones*
 - **Kopparapu, R**; Barnes, R; 2009, *American Astronomical Society* (talk)
8. *A gravitational-wave color-magnitude diagram for compact binary systems*
 - **Kopparapu, R**; 2008, *Eastern Gravity meeting* (talk)
9. *Models of Evolving Galactic DWD Populations Projected onto LISA’s Observational Domain*
 - Gokhale, V; **Kopparapu, R**; Tohline, J. E; Frank, J; 2008, *AAS meeting* (poster)

10. *Can Binary Population Synthesis Models Be Tested With Hot Sub-dwarfs ?*
—**Kopparapu, R**; Wade, R; 2008, *American Astronomical Society meeting* (poster)
11. *Population Boundaries for DWDs in LISA's Amplitude-Frequency Domain*
—**Kopparapu, R**; Tohline, J. E; 2006, *6th international LISA Symposium* (poster)

Conference Proceedings

1. *Testing Binary Population Synthesis Models with Hot Sub-dwarfs*
—Wade, R; **Kopparapu, R**; 2009, *Future Directions in Ultraviolet Astronomy*, AIP, **1135**, 231
2. *Population Boundaries for DWDs in LISA's Amplitude-Frequency Domain*
—**Kopparapu, R**; Tohline, J. E; 2006, *6th International LISA Symposium*, AIP **873**, 476