Igor Z. Palubski

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Education

University of California, Irvine — **Irvine, CA**
Ph.D in Physics (Computational/Theoretical) — *August 2024*

Iowa State University — **Ames, IA**
B.S in Physics (with minors in Math and Astronomy) — *Awarded 2017*

Programming Languages: Python • C/C++ • Matlab • Java • JavaScript • HTML
Familiar with: React • MPI • PyTorch • Linux Systems • SQL • Git • Docker
Natural Languages: English (fluent) • Polish (fluent)
Related Coursework: Three graduate level courses in Machine Learning

Software and Data Analysis Experience

University of California, Irvine - Graduate Student Researcher — **Irvine, CA**
Astrophysics Theory — *November 2020 - Present*
Develop and analyze cosmological, hydrodynamical simulations for Dark Matter studies.

• Developed Monte Carlo simulations for dark matter interactions in galaxies, enhancing an existing hydrodynamical simulation code in C, GIZMO, by implementing new features and addressing critical limitations in massively-parallelized N-body simulations. Improvements include new physics routines: a variety of scattering models, an evolving baryon gravitational potential, and model verification tools.
• Discovered an empirical relation that predicts the evolution of dark matter halos under any particle physics model.
• Engineered analysis tools in Python to process and verify large-scale hydrodynamical datasets from galaxy simulations, optimizing data handling and interpretation.

Shields Center for Exoplanet Climate and Interdisciplinary Education — **Irvine, CA**
Atmospheric Physics — *August 2018 - November 2020*
Extrasolar planet climate studies using a hierarchy of numerical models of varying complexity.

• Investigated the effects of orbital dynamics on planetary habitability by creating a parallelized 1-Dimensional Energy Balance Model in MATLAB for extensive parameter scans on supercomputers, revealing significant habitable zones on extreme planetary orbits. However, retaining water on such planets may prove a challenge due to increased levels of high energy radiation.
• Designed a Fortran script to generate climatic initial conditions for synchronously rotating planets with desired spatial resolution, contributing to the development of sophisticated 3D Global Circulation Models (GCMs) for climate simulation on extrasolar planets.

Communication Skills

Publications
- A General Evolution Model of Self-Interacting Dark Matter Halos with velocity-dependent cross sections. (in-prep)
- Numerical Challenges in Modeling Gravothermal Collapse in Self-Interacting Dark Matter Halos link
- Terminator Habitability: the Case for Limited Water Availability on M-dwarf Planets link
- The Eccentric Habitable Zone: Habitability and Water Loss Limits on Eccentric Planets link
- Red-dwarf Habitability Recipe, August Publications issue of Sky and Telescope, Vol. 138, Issue 2, pg. 34-40. link
- Global Energy Budgets for Terrestrial Extrasolar Planets link
- Imaging the Localized Plasmon Resonance Modes in Graphene Nanoribbons link

Talks and Poster Presentations
- Habitability and Water Loss Limits on Eccentric Planets Orbiting Main-Sequence Stars, ExSoCal 2020 and American Astronomical Society/Division for Planetary Sciences Meeting October 2020 (**Talks**)
- Temporal Habitability and Water Loss Limits on Eccentric Planets, Exoclimes V, August 2019 and Sagan Exoplanet Summer Workshop, July 2019. (**Posters**)
- Eccentricity Thresholds for Planetary Deglaciation at Varying Obliquity, KITP Conference: "Planet-Star Connections in the Era of TESS and Gaia", May 2019 and American Astronomical Society, AAS Meeting 233, id.247.24, January 2019 (**Posters**)