

Bay Area Geophysical Society Seminar Series



Bridging Mineral Physics and Geomagnetism in Ice Giant Interiors

Kyla de Villa

2024 BAGS Lu Pellerin Memorial Scholarship Recipient

January 30th, 2025, 5 PM PST

In-person: 265 McCone Hall, UC Berkeley Campus

[Zoom link](#)

Abstract: There is still considerable ambiguity in the exact structure, composition, and thermal profiles of ice giant planets Uranus and Neptune. While these planets are assumed to be primarily composed of complex mixtures of water, methane, and ammonia, known as *planetary ices*, the material properties of these mixtures are poorly known. As a result, there is no interior model of Uranus and Neptune based on material properties which adequately matches observed heat fluxes, magnetic fields, and gravitational fields simultaneously. Moreover, studies of the geodynamo which generates Uranus' and Neptune's strange magnetic fields are typically divorced from a mineral physics understanding of these planets' interiors. My research focuses on calculating and applying equations of state and transport properties over a broad compositional space of planetary ices using *ab initio* and machine learning atomistic simulations. Such calculations enable us to develop modern dynamo models for the ice giant planets using MHD simulations based on realistic, radially varying properties. Ultimately, we hope to constrain the interior profiles, compositions, and pressure/temperature conditions of Uranus and Neptune to provide a complete model of these planets' interiors.



Author: Kyla de Villa is a PhD candidate in the Department of Earth and Planetary Science at UC Berkeley. Prior to starting her PhD, Kyla earned a BS in Chemistry and a BA in Planetary Science from UC Berkeley. Her research focuses on using computer simulation techniques to study the material and geophysical properties of planetary interiors. Kyla recently received the 2024 AGU Mineral Physics Division Jamieson Student paper award, and the 2024 NERSC High Performance Computing Achievement Award. Beyond research, Kyla participates in STEM outreach and mentoring at all levels, ranging from elementary school workshops to running her department's graduate mentoring program.

Zoom Meeting Information:

Zoom ID: 869 6734 3937

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