Bay Area Geophysical Society Seminar Series

Lindsey Heagy

UC Berkeley & Project Jupyter

October 23, 2019

5pm Rm 325 McCone Hall UC Berkeley Campus

Towards open, collaborative practices in Geophysics

Abstract: Open communities in astrophysics, scientific computing, machine learning, and many other domains demonstrate the power of collaborative efforts to develop open-source software that facilitates research in each of their respective areas (e.g. Astropy, SciPy, Scikit-learn, etc.). Not only do open tools facilitate reproducibility of scientific work, they streamline the exchange of ideas between researchers, even across disciplinary boundaries. SimPEG is an effort to build an open-source framework and community around numerical simulations and gradient-based inversions in geophysics. SimPEG supports forward simulations and inversions across a range of geophysical methods including magnetics, gravity, direct current resistivity, induced polarization, electromagnetics and fluid flow.

In this presentation, I will provide an overview of the SimPEG framework and demonstrate its use in research and education. In

particular, I will present results from numerical studies that examine the use of electromagnetic methods for geophysical imaging in settings with steel-cased wells (e.g. for monitoring hydraulic fracturing or carbon-capture and storage). Steel has both a high electrical conductivity (~10^6 S/m) and a significant magnetic permeability (~$100\mu_0$), thus, it can considerably (and non-intuitively) impact the behavior of the currents, fields, and fluxes in an EM survey. I will explore aspects of the physical responses in a time-domain EM experiment and provide context for how these developments fit into the wider open-source ecosystem of tools for geophysics. Finally, I will provide perspective on the role of open tools and communities, such as SimPEG, in multidisciplinary geoscience research.

Speaker Bio: Lindsey Heagy completed her PhD in Geophysics at the University of British Columbia in 2018. Her thesis work focused on computational electromagnetics. She is a recipient of the 2019 Hohmann Early Career Achievement Award. Currently, she is a Postdoctoral Researcher in Statistics at UC Berkeley. She works with the Project Jupyter team on developing tools for interactive computing in the geosciences and co-leads the recently funded "Jupyter meets the Earth" project. She continues to contribute to the development of open source software, SimPEG, and educational resources, GeoSci.xyz, for geophysics.

After the talk: We can meet at La Vals Pizza on Euclid Ave. about 2 blocks away