EXPANDING THE SCOPE OF OPEN SOURCE SOFTWARE FROM RESEARCH TO GEOPHYSICS EDUCATION

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Developing geophysical simulation software to answer research questions requires pondering and exposing access to the details of the implementation. Tinkering with these pieces is where methodologies can be developed, scientific questions addressed, and new questions found. To capture and disseminate this knowledge, it must be packaged to promote application and reuse by other researchers. Within the context of education, we require tools that enable a spectrum of people interested in geophysical applications, including students, researchers, and industry professionals, to explore geophysical concepts. These applications use the same underlying scientific methodologies; however, each audience requires abstractions that capture various levels of details relevant to them: from introducing a concept, developing research tools, to disseminating that knowledge in a reusable form. SimPEG (Simulation and Parameter Estimation in Geophysics, http://simpeg.xyz) is an open-source geophysical simulation and inversion software package; seven different geophysical methods, including magnetics, gravity, DC resistivity, induced polarization, frequency and time domain electromagnetics, magnetotellurics and vadose zone fluid flow, have been developed under SimPEG's umbrella. The SimPEG framework has been designed to provide the structure and supporting code-base for these methods to work together in a consistent, accessible way. This has allowed our researchers to readily explore, experiment with and communicate geophysical concepts in a consistent and accessible manner. In this presentation, we will first discuss how we use SimPEG to facilitate the exploration of research questions and promote communication within our own research group. We then discuss how the geophysical simulations in SimPEG are re-packaged, using freely available tools in Python, in

(1) web-based textbooks (http://geosci.xyz) to provide context and
(2) interactive apps to enable learners to explore the physical systems introduced to them.

These resources have been used in an undergraduate geophysics course at UBC, and in a short-course (http://disc2017.geosci.xyz) targeted at researchers and industry professionals being delivered.