Using open source tools to refactor geoscience education

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Short (400 char):
How do we communicate fundamental concepts in a reproducible, actionable form? How do we put numerical simulation tools in the hands of undergraduate students? These are questions we have been exploring in the development of GeoSci.xyz, a web-based resource in geophysics that leverages the geophysical software package SimPEG, Sphinx documentation, Jupyter notebooks and Binders to make examples and explanations that are reproducible and interactive.

Long (300 Words):
"A picture is worth a thousand words," so what is the ability to easily make thousands of pictures worth? When explaining fundamental concepts or findings in a discipline, text and figures are ubiquitous. The starting point for building upon or exploring a result is first reproducing that picture. For researchers who aim to use and build from a result, reproduction can require a significant time commitment. For students (i.e. anyone new to the topic!) who wants to explore a concept, this is a catch-22, as they must first understand it enough to program-up a solution. Combining free and open source software (that is tested and documented!) with deployment of content on the web provides a way to share reproducible figures and interactive examples with researchers and students alike. We have been creating web-based resources for concepts in geophysics that are reproducible and provide opportunities for exploration with the development of GeoSci.xyz (http://geosci.xyz).

GeoSci.xyz is a collaborative project (15+ contributors since its conception, 1 year ago) aimed at the development of web-based "textbooks" for introductory geophysics (http://gpg.geosci.xyz) and fundamentals in electromagnetic geophysics (http://em.geosci.xyz). It has been used as the primary "textbook" resource for an undergraduate geophysics course at the University of British Columbia that is taken primarily by students who are not majors in geophysics but rather in fields that work with geophysicists (ie. geology and engineering). In this presentation, we will discuss how we have blended (1) code from SimPEG (http://simpeg.xyz), (2) text developed and reproducible figures using sphinx documentation, (3) interactive examples using Jupyter notebooks, and (4) Binders (http://mybinder.org/repo/ubcgif/em_examples) to reduce the barrier to entry for exploring geophysics concepts in an interactive manner. In addition, we will share some of the lessons we have learned bringing new developers into a collaborative project and sharing computational tools and resources with undergraduate students.