

Real simulation tools in introductory courses: packaging and repurposing our research code

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Abstract:

Numerical simulations are an important tool for scientific research and applications in industry. They provide a means to experiment with physics in a tangible, visual way, often providing insights into the problem. Over the last two years, we have been developing course and laboratory materials for an undergraduate geophysics course primarily taken by non-geophysics majors, including engineers and geologists. Our aim is to provide the students with resources to build intuition about geophysical techniques, promote curiosity driven exploration, and help them develop the skills necessary to communicate across disciplines.

Using open-source resources and our existing research code, we have built modules around simulations, with supporting content to give student interactive tools for exploration into the impacts of input parameters and visualization of the resulting fields, fluxes and data for a variety of problems in applied geophysics, including magnetics, seismic, electromagnetics, and direct current resistivity. The content provides context for the problems, along with exercises that are aimed at getting students to experiment and ask 'what if...?' questions. In this presentation, we will discuss our approach for designing the structure of the simulation-based modules, the resources we have used, challenges we have encountered, general feedback from students and instructors, as well as our goals and roadmap for future improvement. We hope that our experiences and approach will be beneficial to other instructors who aim to put simulation tools in the hands of students.