Coupling geophysical terminology and package development

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Short (400 char):

We discuss the disconnect between scientific terminology and technical implementations and present our response of using terminology from geophysics to drive our implementation choices in SimPEG (Simulation and Parameter Estimation in Geophysics). We have found that using consistent terminology shortens the time from ideation to numerical exploration and fosters communication between researchers.

Long (300 Words):

Using software to address scientific challenges often begins by creating a “whiteboard sketch” that connects terminology and concepts in order to address the question at hand. The next step is the implementation, which generally requires the researcher to adopt a change in terminology and sometimes even a change in mindset to work towards a realization. This disconnect between terminology and code causes delays between ideation and the implementation that is necessary to produce numerical feedback to explore those ideas. In geophysics, we increasingly require integration of multiple disciplines. The lack of technical and linguistic interoperability between these disciplines creates another barrier, which complicates our implementations and often compromises the reproducibility of our methodologies and results.

Our response to these challenges has been to use the terminology of geophysics and inverse theory to drive our decisions in framework development, the layout of modules, and user interactions in SimPEG (Simulation and Parameter Estimation in Geophysics, http://simpeg.xyz). As a result of this investment in framework design, we have experienced increased consistency between the discussion of theory and its implementation in Python, which has created a platform for rapid curation of ideas. We have also found that having these disciplines in the same framework has not only eased the integration of information between them, but also promoted communication between researchers. In this talk, we will describe the iterative process that we have used to develop our framework using examples from a number of geophysical applications.