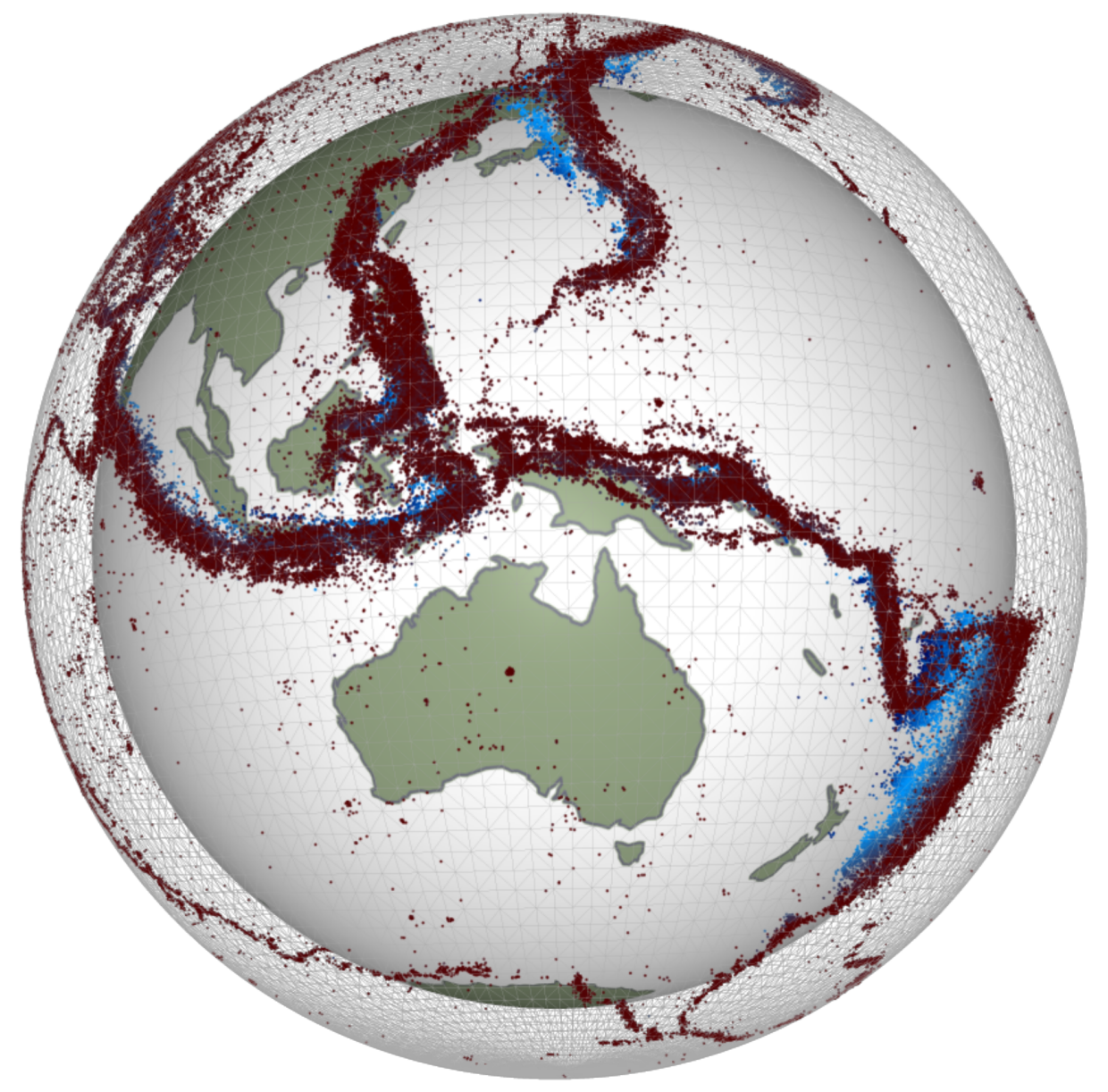


Underworld: A Research and teaching worflow for the development of geodynamic numerical models with Jupyter

Romain Beucher[1], Louis Moresi[1,2], and the Underworld Geodynamics Community

[1] University of Melbourne, School of Earth Sciences, Melbourne, VIC, Australia
[2] The Australian National University, Research School of Earth Sciences, Canberra, ACT, Australia

AGU 100 ADVANCING EARTH AND SPACE SCIENCE

AuScope

Follow us on Facebook:
underworld - earth modeling software

http://www.underworldcode.org

GitHub

Core API:
underworldcode/underworld2
High Level Interface:
underworldcode/UWGeodynamics

Introduction

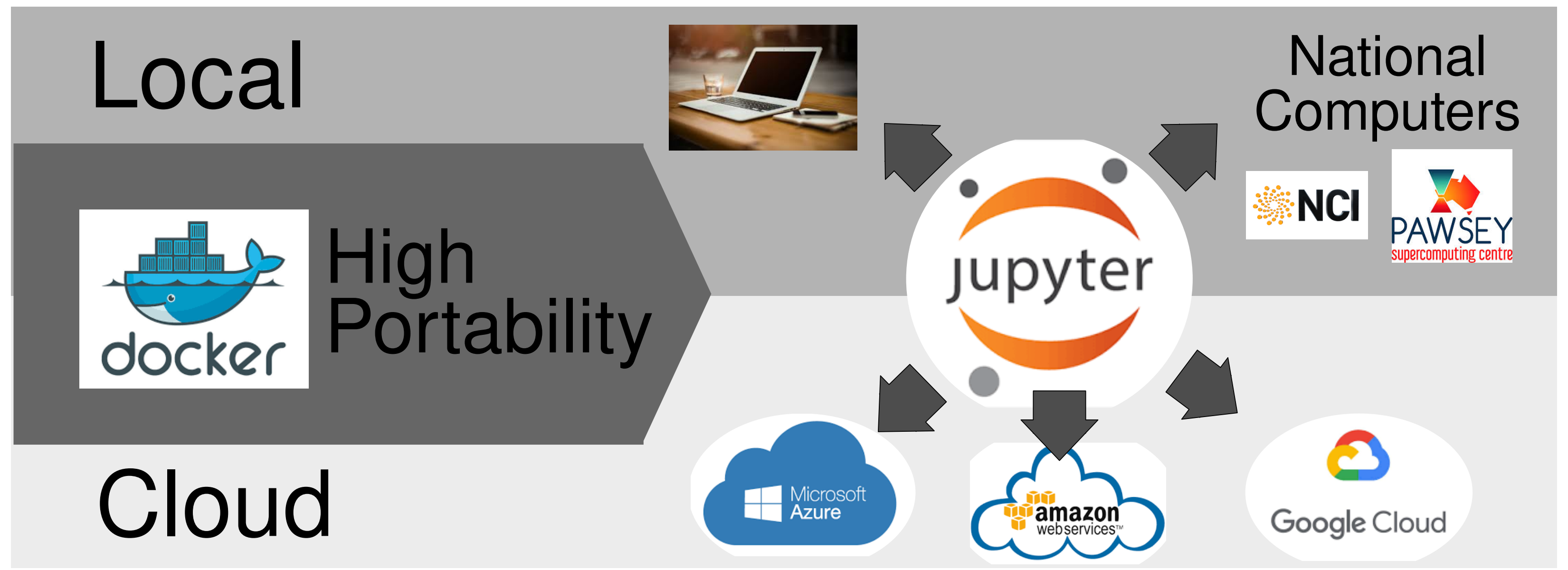
Numerical geodynamic modelling is a powerful tool for testing concepts and ideas in Earth-Science. It is, however, often approached with anxiety by students and non-specialist alike and suffers from the traditional vision of being highly mathematical and requiring advanced coding skills. The popularity of the Python programming language and its development across disciplines provide an opportunity to make computational science more accessible to the general scientific community. Here we discuss how we design the user interface of our scientific code and how we construct online tutorials to facilitate the development of geodynamic models using Jupyter notebooks.

What is it ?

A parallel, python, particle-in-cell, finite-element code for Geodynamics

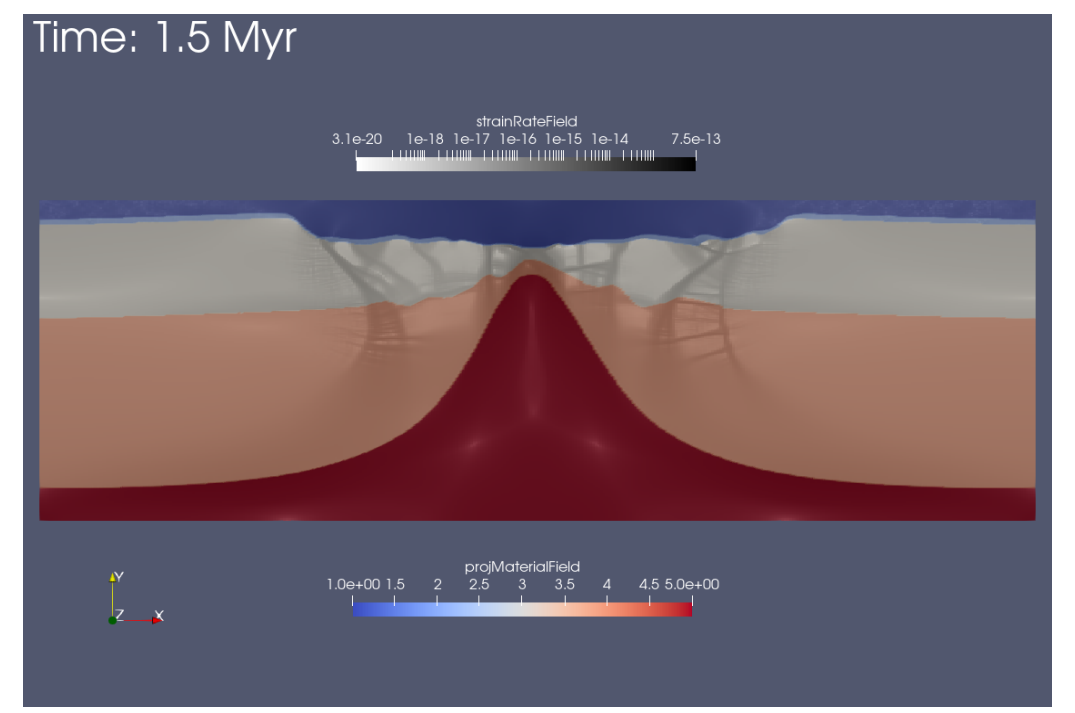
python NumPy PETSc

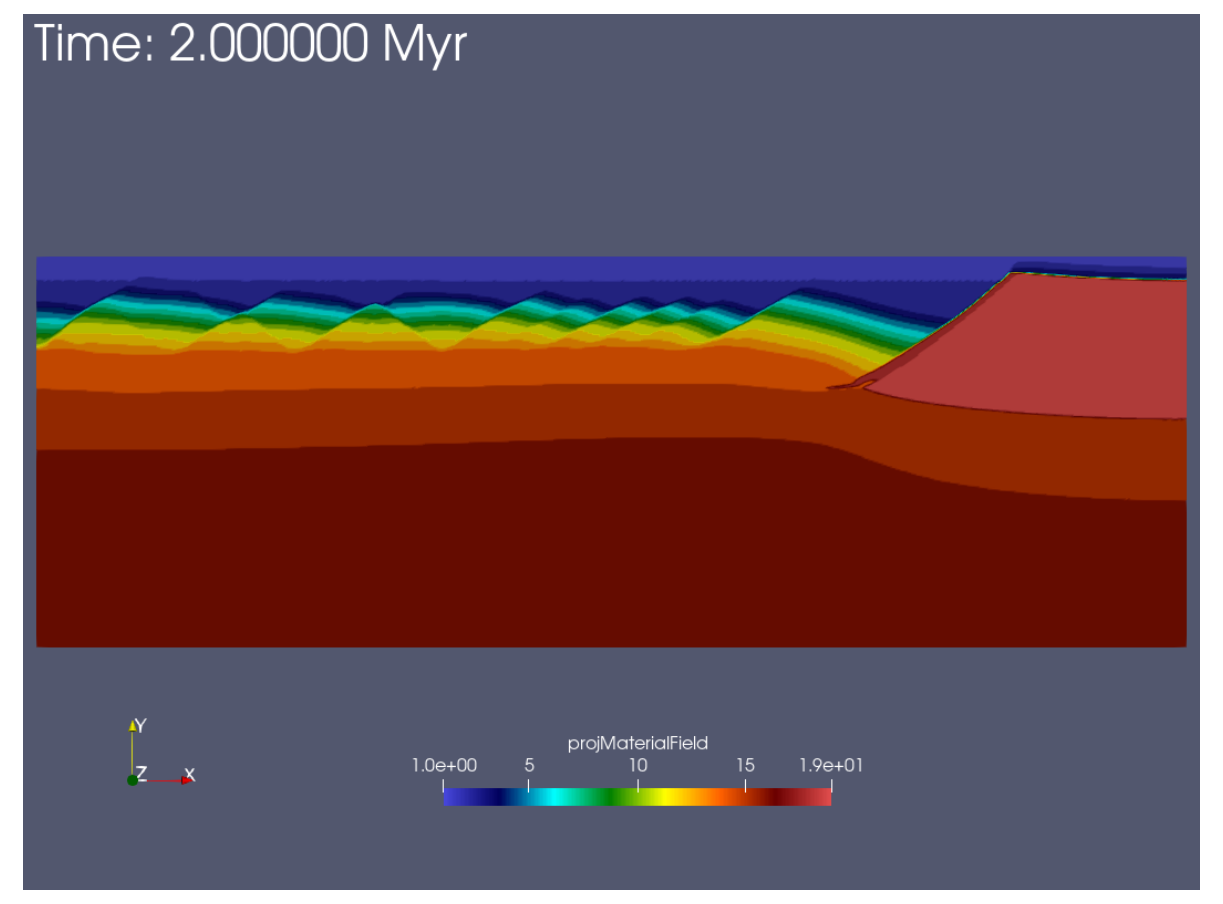
UWGeodynamics is a python framework based on the Underworld Python API. It uses the Jupyter notebook environment to create a structured and reproducible workflow for the design of mechanical and thermo-mechanical geodynamic models. The module uses a granular approach with mechanical, thermal and other rock properties being defined as functions that can be combined to define more complex properties. Pre-existing functions are available and allows for creating complex mechanical or thermal properties. Functions can also be progressively built to incrementally add complexity into the model. Teachers are then free to hide the complexity or can break it down to its constitutive components.



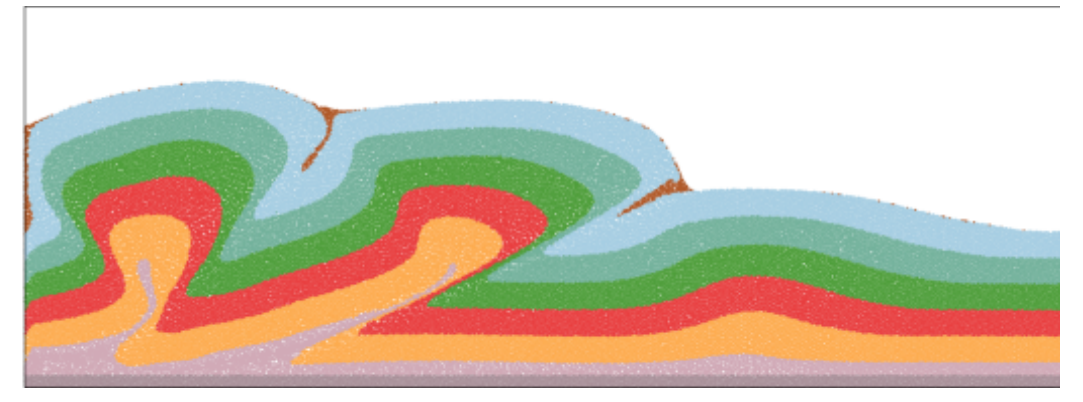
Try it!

What Can You do?

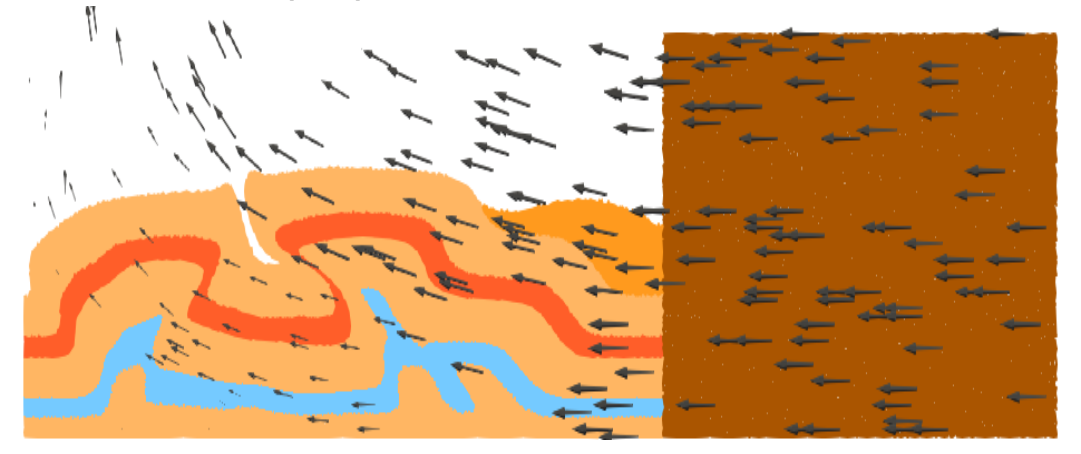


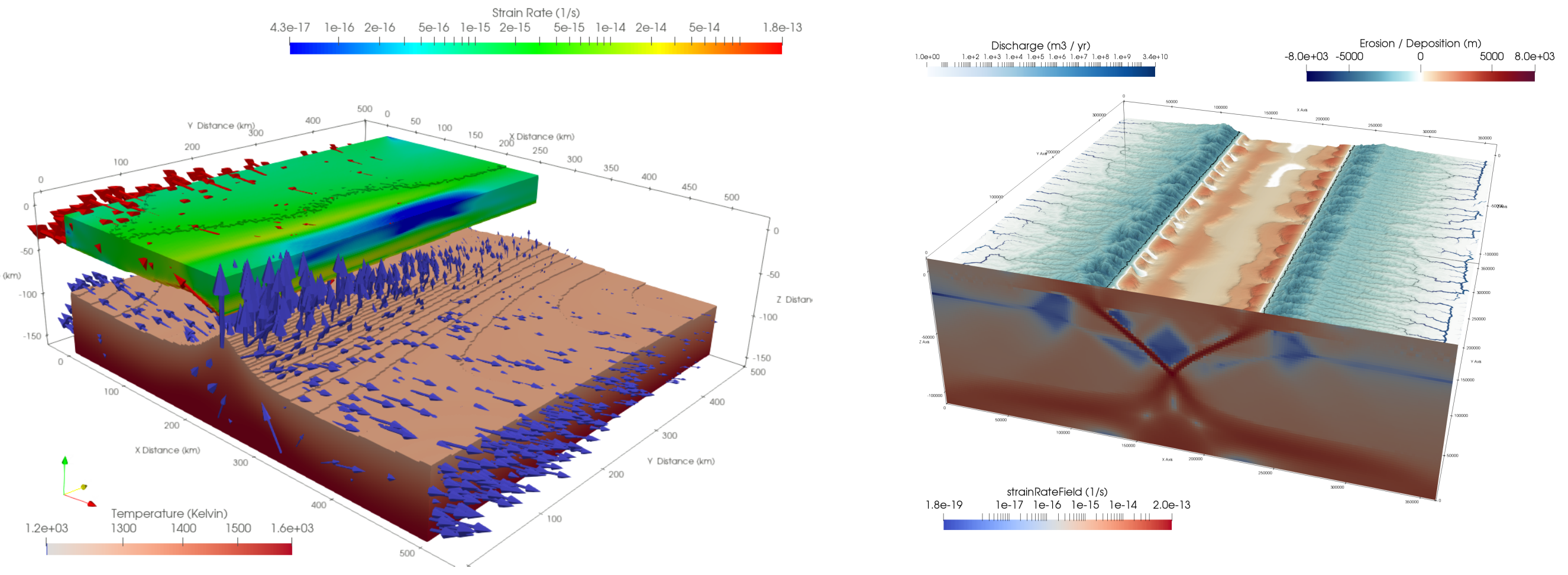


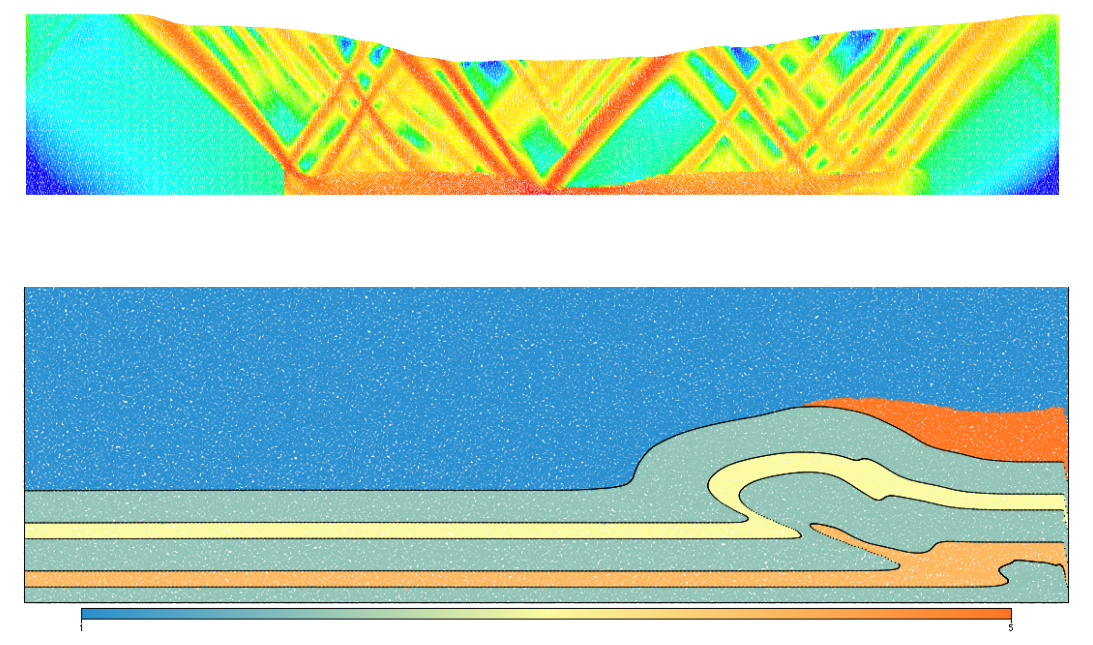
Flexible and Easy to use

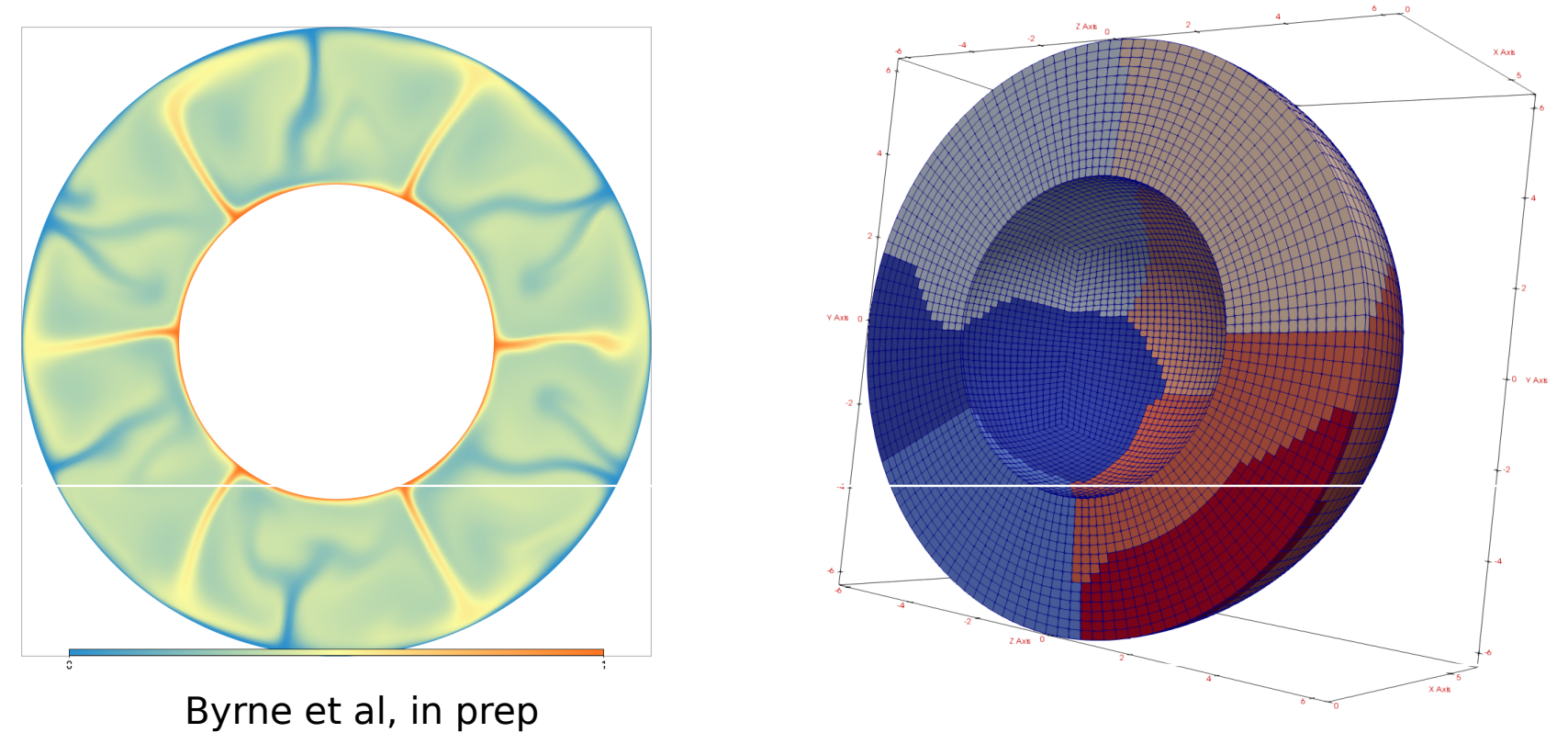


Laik et al, in prep









Byrne et al, in prep

Who is it for ?

SUSTAINABLE DEVELOPMENT GOALS

Research

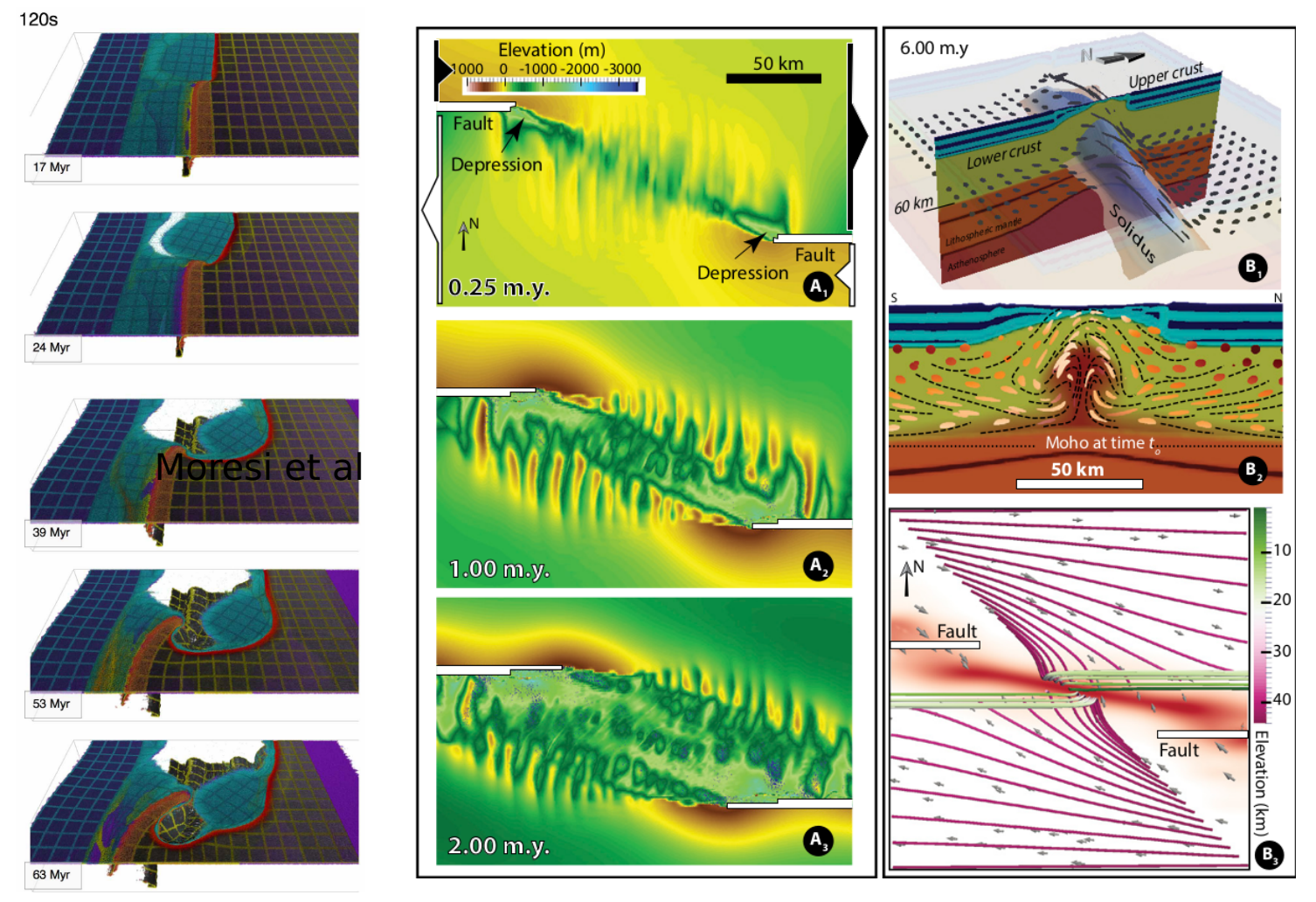
Flexibility
Reliability
Reproducibility

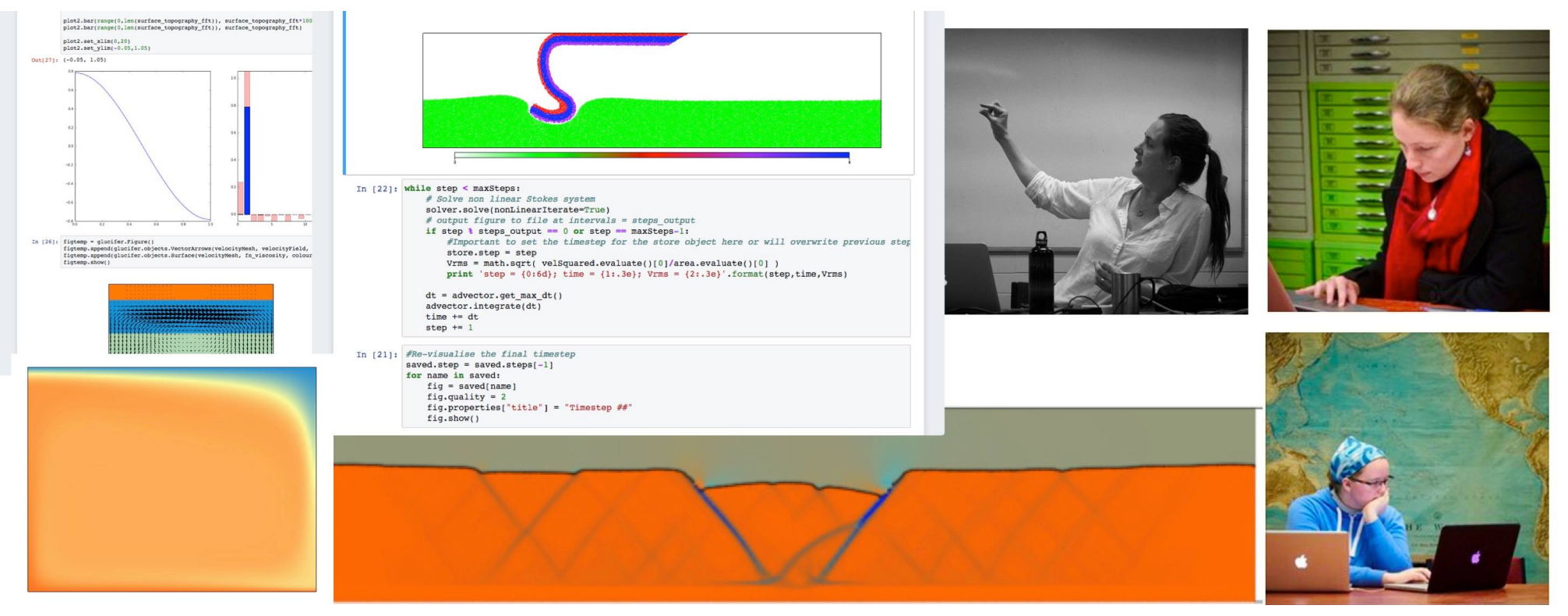
Teaching

Python
Jupyter notebook:
Interactive, Iterative
Evolutive

Industry

Integration with industry worflows





Petrel Shared earth—critical insight

move