

Introduction on long-term tectonic modelling using Underworld

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Prerequisites:

- Basic knowledge in mathematics, physics, shell (*any linux distribution*) and Matlab programming
- Good patience for debugging and model optimization

DAY 1

1) General introduction on numerical modelling:

- Why and how?
- Introduction on existing approaches: from discretization to solvers
- Learning objectives and course structure

2) Introduction on Underworld

- Mathematical and physical approach of Underworld
- What is Underworld for?
- Installing and running Underworld

3) Starting with underworld: a first model

- Input file structure
- Shapes and material properties: defining a geometry and applying newtonian rheology
- Simple mechanical model: falling sphere
- Visualization with Paraview

DAY 2

4) Rifting and boundary conditions in 2D

- Model setup: materials and markers
- Brittle rheologies
- Boundary conditions: from free slip to free surface
- Performances: from single core to parallel, using various solvers

- Resolution tests
- Adding the Energy equation
- Modifying rheologies to be stress and temperature dependent

DAY 3

5) Modelling subduction in 2D

- Simple and complex initial geometries: tricks and effects
- The choice of rheologies: from published experimental data to Underworld
- Boundary conditions: why is it so important?
- Resolution: dealing with the particle population control
- Passive tracers

DAY 4

6) Advanced visualisation

- Importing output data from Underworld in Matlab
- Visualisation and analysis

7) From 2D to 3D

- Model setup: shapes and initial temperature
- Model performance and the choice of solvers
- Visualisation: Paraview and Matlab

DAY 5

8) Produce you own model, for your own need

- What scientific question? Which approach? 2D, 3D? Mechanical? Thermo-mecanical? etc...
- Creating own input file and building up complexity