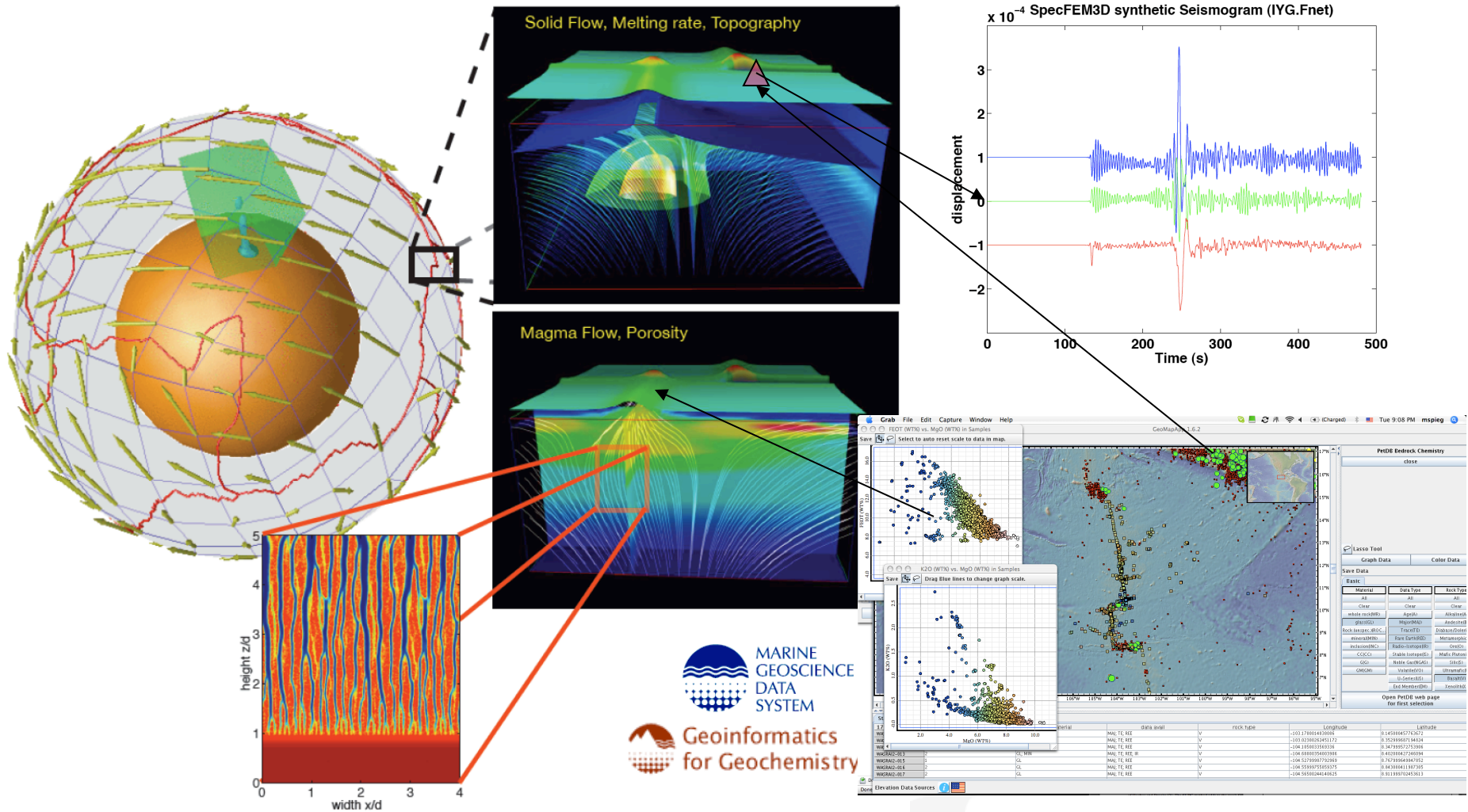


Plate Boundary Dynamics



Magma Dynamics for CIG-II

- Science objectives
 - Dynamics of plate boundaries and intraplate volcanism
 - Coupling (or not) between magmatic regions and the global mantle convection
 - Global Geochemical evolution (multi-scale problem, convective mixing plus fluid/magma mediated fractionation mixing)
 - Crustal scale fluid/solid processes
 - Volcano scale/hydrothermal processes
 - ??
 - Integration with computational thermodynamics
 - Integration with geochemical databases

Magma Dynamics for CIG-II

- Computational needs
 - Consistent integration with robust Stokes solvers used in other CIG models (MC, LTT) (reusable stokes solver)
 - Multi-scale meshing (AMR?) for resolving small scale features
 - Flexible Model Composition (e.g. FFC/FEniCS) for easier integration of multi-physics
 - Flexible solver composition
 - Good interfaces to
 - Thermodynamics
 - Wave propagation codes (generate synthetics for comparison to data)
 - Geochemical databases (composition, partition coefficients)
 - Methods for uncertainty quantification

Magma Dynamics for CIG-II

- Organizational/Community needs
 - close coordination with other CIG projects (MC, LTT, STT)

Magma Dynamics for CIG-II

- Notes:
 - Importance of Magma
 - Direct sampler of earth interior/composition
 - Influences seismic structure
 - Cool physics
 - Science Capabilities
 - Plate boundary scale dynamics: viscous mantle, brittle lithosphere, fluid interactions magma composition/seismology
 - Magma composition: trace elements, isotopes, major elements: need interfaces to wide range of thermodynamic models (simple parameterizations to full thermodynamics)
 - Volcano Scale model - magma ground deformation, earthquakes
 - Global scale differentiation and chemical evolution
 - Two scale problem: global chaotic stirring + fluid/magma mediated mixing and fractionation

Magma Dynamics for CIG-II

- Notes:
 - Technical requirements
 - Plate boundary scale dynamics: viscous mantle, brittle lithosphere, fluid interactions magma composition/seismology
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 - Volcano Scale model - magma ground deformation, earthquakes
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