Geophysical Research Abstracts
Vol. 15, EGU2013-7800, 2013
EGU General Assembly 2013

Subduction modelling with ASPECT

Anne Glerum (1,2), Cédric Thieulot (1,3), Wim Spakman (1,2), Matthieu Quinquis (4), Susanne Buiter (3,4)

(1) Utrecht University, Earth Sciences, Utrecht, Netherlands (a.c.glerum@uu.nl), (2) The Netherlands Research Centre for Integrated Solid Earth Science, (3) University of Oslo, PGP, Oslo, Norway, (4) Geological Survey of Norway, Geodynamics Team, Trondheim, Norway

ASPECT (Advanced Solver for Problems in Earth's ConvecTion) is a promising new code designed for modelling thermal convection in the mantle (Kronbichler et al. 2012). The code uses state-of-the-art numerical methods, such as high performance solvers and adaptive mesh refinement. It builds on tried-and-well-tested libraries and works with plug-ins allowing easy extension to fine-tune it to the user's specific needs.

We make use of the promising features of ASPECT, especially Adaptive Mesh Refinement (AMR), for modelling lithosphere subduction in 2D and 3D geometries. The AMR allows for mesh refinement where needed and mesh coarsening in regions less important to the parameters under investigation. In the context of subduction, this amounts to having very small grid cells at material interfaces and larger cells in more uniform mantle regions.

As lithosphere subduction modelling is not standard to ASPECT, we explore the necessary adaptive grid refinement and test ASPECT with widely accepted benchmarks. We showcase examples of mechanical and thermo-mechanical oceanic subduction in which we vary the number of materials making up the overriding and subducting plates as well as the rheology (from linear viscous to more complicated rheologies). Both 2D and 3D geometries are used, as ASPECT easily extends to three dimensions (Kronbichler et al. 2012). Based on these models, we discuss the advection of compositional fields coupled to material properties and the ability of AMR to trace the slab's path through the mantle.

Kronbichler, M., T. Heister and W. Bangerth (2012), High Accuracy Mantle Convection Simulation through Modern Numerical Methods, Geophysical Journal International, 191, 12-29.