Newsletter

September 2020

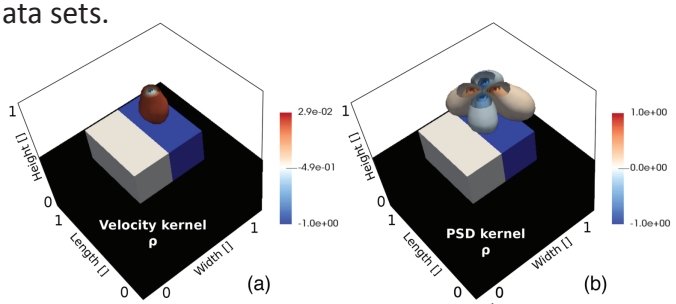
News

M³ODEL started on July 1, 2019; the first formal event was the meeting in Ebernburg, after which interdisciplinary PhD projects were defined. The call for applications to fill went out in November and four candidates accepted PhD positions. Due to the University lockdown starting in March 2020, M³ODEL offered to extend funding to PhD students whose work was delayed. We funded 3 such students: M. Navandar (PI Gerber), L. Grulich (PI Spichtinger) and O. Kottwitz (PI Kaus).

Internships: We opened a program to offer MSc and PhD students the chance to come to Mainz and work for up to 6 months with PIs. The first intern, Pilar Di Martino Perez, will come from Aberdeen (UK) in October 2020 to work with Luca De Siena.

Featured Publication

Most problems in geosciences deal with how to understand processes from incomplete observations. This requires inverse modeling approaches, which are not yet widely used in geodynamics. This paper is a result of an interdisciplinary collaboration between mathematics (Hanke-Bourgeois) and geosciences (Kaus). They derive the adjoint formulation of the Stokes equations to take into account new observations (e.g., principal stress directions measured in boreholes) as part of the inversion framework and implement it in a massively parallel code. This thus represents a first step towards multi-observable geodynamic inversions including ever more diverse data sets.



Pointwise derivative of the forward solution with respect to the density for (a) the surface velocity and (b) the principal strain direction. This reveals that the two observables are informed by different areas in the domain.

Inferring rheology and geometry of subsurface structures by adjoint-based inversion of principal stress directions. G.S. Reuber, L. Holbach, A.A. Popov, M. Hanke, B.J.P. Kaus. *Geophysical Journal International* 223.2 (2020): 851-861.

Send us more joint publications!

About us

M³ODEL, the Mainz Institute of Multiscale Modeling, is a consortium of researchers from such different areas as physics, chemistry, geosciences, molecular biology, applied mathematics, and computer sciences who have one common vision: To develop robust, efficient, and reliable computational models for simulating processes and quantitatively predicting properties that emerge through the interplay of multiple scales.

Events

Kick-off Meeting, August 2019, Burg Ebernburg: In our first PI retreat, we had breakout sessions to brainstorm ideas for the joint projects for the PhD program. As a result, 12 projects were advertised.

August 2020, Wasem Kloster: The agenda included the introduction of new PIs, the status of the consortium and its future developement. Prof. Waldvogel joined us as well and gave an update on a similar platform, SusInnoScience, and other projects he leads.

Burg Ebernburg, Bad Münster am Stein, 2019

Wasem Kloster, Ingelheim, 2020

Students

The first two PhD students of M³ODEL started in June 2020. They are **Stanislav Sys**, who works on the joint project of Susanne Gerber and Karin Everschor-Sitte, and **Yi Zhang**, who works on a project with Luca de Siena, Markus Bachmayr, Lisa Hartung and Tobias Baumann. **Mariane Gonçalves** joined M³ODEL in September to work with Miguel Andrade and Friederike Schmid. **Simon Boisserée** is scheduled to start later this year to work with Markus Bachmayr, Vangelis Moulas, and Boris Kaus. We also affiliated other ongoing students: Simon Lemcke, Lucas Grulich, Oskar Kottwitz, and Georg Reuber.