

SORS: "Extreme-Scale Simulations on Hybrid Tetrahedral Grids"

Abstract

As one of the grand research questions of the 21st century the understanding of the Earth's interior requires highly resolved models of mantle circulation. With a targeted global resolution to length scales of 1 km finite element discretizations lead to linear systems with trillions (10^{12}) of unknowns. This talk presents the concept of Hybrid Tetrahedral Grids as an approach to design massively parallel algorithms and data structures that enable the efficient solution of such problems at the extreme-scale. A strong focus is put on matrix-free geometric multigrid methods for the approximation of the Stokes system that demonstrate scalability to more than three trillion (3×10^{12}) unknowns on about 150,000 parallel processes.



Short Bio

Nils Kohl got his PhD in computer science in 2024 from FAU Erlangen on the development of massively parallel matrix-free methods for the approximation of PDEs. Since 2024 he works as an assistant professor in the Geodynamics group at the Department of Earth and Environmental Sciences at LMU Munich. His research interest include parallel computing, multigrid methods, matrix-free finite elements, mixed- and progressive precision computations, and software design to enable extreme-scale simulations for the geosciences.

Speakers

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