



Dr. Valeria Barra
San Diego State University

Composable operators from long waves to Earth system models

Abstract: In this talk, we present different approaches and methodologies for the numerical solutions of Partial Differential Equations (PDEs) for applications arising mainly in Computational Fluid Dynamics (CFD) at different scales. Starting from problems emerging in the context of thin films or long waves, we are going to end with examples in global-scale, non-hydrostatic, atmospheric modeling for numerical weather and climate predictions.

First, we show a numerical investigation of the nonlinear interfacial dynamics of wetting and dewetting thin layers of non-Newtonian (viscoelastic) fluids in different settings. Subsequently, we broaden the applicability and the impact by introducing libCEED, an open-source mathematical software library with a purely algebraic interface for efficient implementations of finite-element operators that provides performance portability via run-time selection of specialized backends, optimized for CPUs and GPUs.

Finally, we present some recent work in the Climate Modeling Alliance (CliMA), a consortium project developing a new Earth System Model (ESM), with a focus on ClimaCore.jl-the new open-source dynamical core (dycore) library for the land and atmosphere components of the ESM-and ClimaCoupler.jl, the package coupling different model components.

Wednesday, March 19, 1:05 – 1:50 pm in 4-1-314