

MS-Th-D-07 13:30–15:30 202A
Computational Methods in Ice Sheet Modeling for Next Generation Climate Simulations - Part I of II
For Part 2, see [MS-Th-E-07](#)

Organizer: [Tezaur, Irina](#) Sandia national Laboratories
Organizer: [Wei, Leng](#) LSEC
Organizer: [Martin, Daniel](#) Lawrence Berkeley National Laboratory
Organizer: [Ng, Esmond](#) Lawrence Berkeley National Laboratory
Organizer: [Perego, Mauro](#) Sandia National Laboratories

Abstract: Changes in glaciers and ice sheets are expected to have a tremendous influence on sea-level rise and global climate change. Many mathematical challenges in simulating ice sheet dynamics arise: ill-conditioned systems; a wide range of scales; complex evolving geometries; ill-posed inverse problems; sparse observational data; large-scale forward and inverse UQ problems in high-dimensions (“curse of dimensionality”). Speakers in this MS will present recent developments aimed at overcoming these and other difficulties arising in ice sheet modeling. A broad range of topics will be covered, including forward and inverse problems, UQ, solvers/preconditioners, and coupling to global climate models.

► **MS-Th-D-07-1** 13:30–14:00
Mechanical Estimators for Shallow Ice Flow Models
[Jouvet, Guillaume](#) ETH Zurich, VAW

Abstract: In this talk, we will revisit the derivation of shallow ice flow models from the Glen-Stokes one by working on the minimisation formulation instead of the Euler-Lagrange form as usual. This approach substantially shortens the traditional derivation and provides a unified formulation, which allows us to establish a posteriori estimates for the discrepancy between two hierarchically embedded model solutions. Eventually, we perform some modelling experiments to test the efficiency of these estimates.

► **MS-Th-D-07-2** 14:00–14:30
A Parallel Multigrid Solver for Full Stokes Ice Sheet Model
[Wei, Leng](#) LSEC

Abstract: The full Stokes ice sheet problem with Coulomb friction boundary condition is a nonlinear problem, which requires a nonlinear iteration with dozens of steps, and with in each step a linearized boundary condition Stokes problem with nonlinear coefficient is solved. A two level multigrid solver is proposed to handle the nonlinear boundary condition, and numerical result is presented to shown the efficiency of our solver.

► **MS-Th-D-07-3** 14:30–15:00
Albany/FELIX: A Robust and Scalable Trilinos-Based Finite-Element Ice Flow Dycore Built for Advanced Architectures and Analysis

[Tezaur, Irina](#) Sandia national Laboratories
[Demeshko, Irina](#) Sandia National Laboratories
[Eldred, Michael](#) Sandia National Laboratories
[Jakeman, John](#) Sandia National Laboratories
[Perego, Mauro](#) Sandia National Laboratories
[Price, Stephen](#) Los Alamos National Laboratory
[Tuminaro, Raymond](#) Sandia National Labs

Abstract: This talk focuses on several recent computational advancements involving the Albany/FELIX finite-element dycore for the First-Order Stokes ice flow equations, notably: (1) porting to new architecture platforms using Trilinos templated linear algebra and Kokkos performance-portable kernels, (2) development of scalable and robust solvers for runs on these platforms, and (3) recent work in combining deterministic and Bayesian calibration methods towards formal UQ of uncertain model parameters (e.g., basal traction) influencing sea-level rise.

MS-Th-D-08 13:30–15:30 202B
The Ginzburg-Landau Model and Related Topics - Part IV of IV
For Part 1, see [MS-We-D-08](#)
For Part 2, see [MS-We-E-08](#)
For Part 3, see [MS-Th-BC-08](#)

Organizer: [Golovaty, Dmitry](#) The Univ. of Akron
Organizer: [Giorgi, Tiziana](#) New Mexico State Univ.

Abstract: The focus of the minisymposium is on mathematical problems related to Ginzburg-Landau model with application in physics and materials science including but not limited to: superconductivity, superfluidity, liquid crystals, and polymers. The speakers in this minisymposium will describe their recent research, including the development and structure of singular solutions of the Ginzburg-Landau-type problems and the dynamics of vortex motion. This minisymposium is sponsored by the SIAM Activity Group on Mathematical Aspects of Materials Science (SIAG/MS).

► **MS-Th-D-08-1** 13:30–14:00
About A Family of Harmonic Maps into the Projective Plane
[Montero, Alberto](#) Pontificia Universidad Catolica de Chile

Abstract: In this talk I will present some results concerning some harmonic maps into the projective plane that appear as limits of minimizers of the Landau-de Gennes energy functional when the (one) elastic constant goes to zero. This is Joint work with Dmitry Golovaty.

► **MS-Th-D-08-2** 14:00–14:30
Chevron Structures in Smectic A Liquid Crystals
[Giorgi, Tiziana](#) New Mexico State Univ.

Abstract: We will present an analysis of the chevron structure, which is formed in a Smectic A liquid crystal under the influence of an applied magnetic field. We will start with a two-dimensional de Gennes free energy functional for Smectic A, and use Gamma-convergence to show that in a suitable regime of fields, a chevron structure is favored by the energy. We will next present analogous results for the more general Chen-Lubensky free energy in a one-dimensional setup. This is joint work with Carlos Garcia-Cervera and Sookyoung Joo.

► **MS-Th-D-08-3** 14:30–15:00
Global Bifurcations of Vortices and Dipoles in 2D Bose-Einstein Condensates.
[Contreras, Andres](#) New Mexico State University

Abstract:

We prove the existence of symmetric periodic solutions to

$$iu_t + \varepsilon^2 \Delta u + (1 - (x^2 + y^2) - |u|^2)u = 0.$$

Some of these solutions correspond to dipoles predicted in the physics literature. This is joint work with Carlos Garcia-Azpeitia.

► **MS-Th-D-08-4** 15:00–15:30
Dimension Reduction for the Landau-de Gennes Model in Nematic Thin Films.

[Golovaty, Dmitry](#) The Univ. of Akron
[Montero, Alberto](#) Pontificia Universidad Catolica de Chile
[Sternberg, Peter](#) Indiana Univ.

Abstract: We use the method of Gamma-convergence to study the behavior of the Landau-de Gennes model for a nematic liquid crystalline film in the limit of vanishing thickness. We assume general weak anchoring conditions on the top and the bottom surfaces of the film and the strong Dirichlet boundary conditions on the lateral boundary of the film. We establish a general convergence result and then discuss the limiting problem in several parameter regimes.

MS-Th-D-09 13:30–15:30 203A
Recent advances on computational wave propagation - Part I of II
For Part 2, see [MS-Th-E-09](#)

Organizer: [Li, Jichun](#) Univ. of Nevada Las Vegas
Organizer: [Huang, Yunqing](#) Xiangtan Univ.
Organizer: [Shu, Shi](#) Xiangtan Univ.

Abstract: This mini-symposium is organized to provide a forum for fellow researchers working on numerical methods for wave propagation problems to present and discuss their recent advances and achievements. Topics to be covered include but not limited to: hybrid FDTD methods, time-domain finite element methods, spectral methods, high-performance computing, high frequency waves, multiscale methods, novel techniques for metamaterials and cloaking simulations).

Note: All invited speakers are confirmed.

► **MS-Th-D-09-1** 13:30–14:00
Fast Spectral PDE Solvers for Complex Structures: the Fourier-Continuation Method

[Bruno, Oscar](#) Caltech

Abstract: We present new spectral solvers for time evolution of Partial Differential Equations in general domains. Based on the novel Fourier-Continuation (FC) method for the resolution of the Gibbs phenomenon, these methodologies give rise to essentially dispersionless evolution. A variety of applications to linear and nonlinear PDEs, including the Maxwell equations, the Navier-Stokes equations and the elastic wave equation, demonstrate the significant improvements the new algorithms provide over the accuracy and speed resulting from other approaches.

► **MS-Th-D-09-2** 14:00–14:30
A Class of Uncertainty Quantification Algorithms for Stochastic Wave Scattering

[Ganesh, Mahadevan](#) Colorado School of Mines

Abstract: We present an efficient framework for quantifying uncertainties in