Idaho State University | Mathematics and Statistics

Colloquium

Ocean modeling using high-order Galerkin methods

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Oceans cover more than two-thirds of the surface or Earth, and as such are the primary control of our planet's climate. Understanding the dynamical behavior of the ocean is therefore paramount for both understanding the long-term consequences of climate change, as well as short term weather predictions, among other things. The complex nature of the fluid motion makes it impossible to analytically solve the partial differential equations describing the conservation of mass, momentum and energy of water moving on the surface of rotating sphere, and affected by the complex boundaries of ocean basins, as well as rugged ocean bottom. We can, however, approximate the dynamics of the ocean using numerical methods and computer simulation.
The current generation of ocean models uses a mixture of low-order finite volume and finite difference methods to approximate the partial differential equations governing the fluid motion. Those methods has been developed over the past half-century, and with the advent of modern computing platforms are approaching a limit of usability due to limited parallel performance. In this talk, I will provide an overview of the benefits and costs of using high-order Galerkin methods for ocean modeling compared with traditional methods. I will also go over the modeling assumptions we make in the formulation of the governing equations for the ocean, and fundamental forces which affect the motion of fluid on the surface of the Earth.

Friday, April 11
4:00 pm
PS 307

(or) Zoom ID: 819 2329 9449