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Numerical Analysis, Scientific Computing, Geophysical Fluid Dynamics

Currently, my research interests focus on analysis and computation of the Partial Differential Equations (PDEs) arising from geophysical fluid dynamics. For example, equations related to weather prediction and oceanography are the inviscid Primitive Equations (PEs) and the Shallow Water Equations (SWEs).

In Figure 1, the basic level of physical complexity in geophysical fluid dynamics is presented. The Navier-Stokes equations govern the motion of the fluid. In the ocean or atmosphere, due to the thin layer structure (the ratio of the vertical scale of the domain to the horizontal scale is relatively small), Navier-Stokes equation can be simplified in the form of Primitive equations. Shallow water equations are derived from the first mode of the Primitive equations.

In addition, I am also interested in stochastic differential equations(SDEs)/stochastic partial differential equations(SPDEs) which give us different points of view to understand what the world is. This approach also has been suspected that fluid equations with noise perturbation such as the stochastic Navier-Stokes Equations(SNSEs) and stochastic Euler Equations might be an important mathematical model for the turbulence of a fluid with a high Reynold number.

The following issues are focused:

1. Non-reflecting boundary conditions
2. Time periodic flows
3. Long-time stability analysis

For more details, please see my homepage (Figure 2).

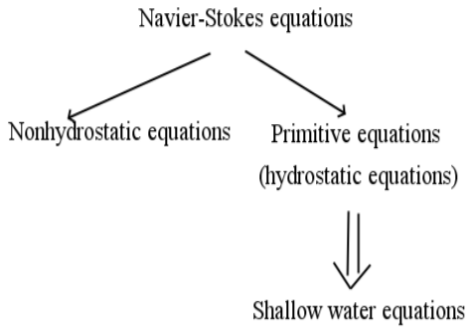

Figure 1:
Level of physical complexity

Figure 2:
QR code for My homepage