



Systematic modeling for geophysical flows

J.S. Frederiksen, T.J. O'Kane, and M. Zidikheri
CSIRO Marine and Atmospheric Research, Australia

Systematic subgrid modeling approaches using statistical dynamical and stochastic model closures are developed for atmospheric and oceanic flows.

Firstly, a methodology based on a stochastic model representation of the subgrid scale eddies in direct numerical simulation (DNS) has been employed. Large eddy simulations (LES) with these subgrid scale parameterizations have energy spectra very similar to those of higher resolution DNS for atmospheric barotropic and baroclinic turbulent flows.

A stochastic parameterization of baroclinically unstable subgrid-scale eddies in flows with broad similarities to the Antarctic Circumpolar Current (ACC) is formulated. Again, employing these parameterizations leads to LES in close agreement with DNS.

Secondly, closure based parameterizations are presented for the eddy-topographic stress for atmospheric flows.