Geophysical Research Abstracts, Vol. 7, 05766, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05766

Stochastic backscatter and eddy viscosity parameterizations for atmospheric circulation models

J.S. Frederiksen

CSIRO Atmospheric Research, Aspendale, Victoria, Australia (Jorgen.Frederiksen@csiro.au / Phone: +61 3 9239 4683)

Dynamical subgrid-scale parameterizations of stochastic backscatter, eddy drain viscosity and net eddy viscosity have been formulated and calculated for two-dimensional turbulent flows on the sphere based on the eddy damped quasi-normal Markovian (EDQNM) and direct intreaction approximation (DIA) closures and on the statistics of direct numerical simulations (DNS) with the barotropic vorticity equation. For the DNS-based parameterization a relatively simple methodology based on a stochastic model representation of the subgrid-scale eddies, but which takes into account the memory effects of turbulent eddies, has been employed. The parameterizations based on the stochastic modeling approach have a cusp behavior at the cut-off wavenumber of the retained scales and have closely similar forms to those based on EDQNM and DIA closure models. Large-eddy simulations (LES) incorporating closure-based or DNS-based subgrid-scale parameterizations are found to have kinetic energy spectra that compare closely with the results of higher-resolution DNS at the scales of the LES for both isotropic turbulence and Rossby wave turbulence. Applications of the parameterizations to general circulation climate models are presented and to prediction models are discussed.