3rd International Conference on Earth System Modelling
Vol. , 3ICESM-399, 2012
3rd International Conference on Earth System Modelling

Aerosol-Cloud Interactions in EC-Earth

I. Ivanova
SMHI, Rossby Center, Norrköping, Sweden (i.t.ivanova@gmail.com)

Simulating the coupled processes in the Southern Ocean is a challenge for many Earth System Models such as EC-Earth, which tend to display a warm surface bias in this region. This impacts on the uptake of heat and carbon in the global ocean, as well as on the simulation of sea ice. Key atmospheric processes contributing to ocean mixing in the Southern Ocean are surface momentum and radiation fluxes, the latter being greatly influenced by clouds. This work is a part of a coupled assessment of the EC-Earth model, looking at the atmospheric and the ocean side of the problem, and concentrates on further development and evaluation of the new prognostic cloud microphysics scheme, with a particular emphasis on cloud-aerosol interactions. These developments will test the benefit of more complete aerosol and cloud representation and the impacts these will have on the Southern Ocean warm bias. EC-Earth version 3 has recently been developed and is now being run with prescribed aerosol concentrations. Until now only the direct radiative effect of aerosols have been included in these simulations. In this study, we extend the precipitation scheme to include a dependency on diagnostic cloud droplet number concentration and on the dispersion of the cloud droplet size distribution, in addition to the dependency on cloud water amount traditionally included in models. Several diagnostic relationships for cloud droplet number concentration that depend on the prescribed aerosols are tested and their impact on the clouds and radiation aspects of the model are evaluated against remote sensing observations.