Parametrizing microphysics in global models

Damian Wilson

Met Office
Exeter, United Kingdom
damian.wilson@metoffice.gov.uk

Cloud microphysical processes are important to parametrize in a large-scale model for a number of reasons:

i) The properties of cloud particles need to be represented in order for radiative transfer calculations to take place

ii) The water cycle is affected by fluxes of water through precipitation, and by latent heat release as water changes phase

iii) They directly affect key numerical weather prediction forecast quantities of rainfall and visibility. Through the effect on low cloud and subsequent radiative heating, the near-surface temperature can be strongly affected by the action microphysical processes

iv) Increasingly, knowledge of the properties of the clouds themselves, for example supercooled water, is a valuable output from forecast models, having direct customer application.

Sophisticated cloud microphysical parametrizations are now standard in the large-scale precipitation part of many large-scale models, often coming from a heritage of large-eddy modelling. This presentation looks at the future challenges of representing microphysics in a large-scale model, concentrating on the Met Office's Unified Model as an example. Key elements to develop in the next generation of large-scale models are:

i) The representation of microphysics within convection schemes

ii) Improvements in the parametrization of liquid-phase processes, linking more directly with aerosol properties and the effect of turbulence on the droplet size spectrum

iii) Better representation of the subgrid-scale nature of clouds and microphysical processes

iv) Evaluation techniques to better identify deficiences in current parametrizations and suggest solutions

The presentation will look at recent work and discuss opportunities for progress in each of these areas.