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A simple Jovian cloud scheme for OPUS

L. C. Zuchowski (1), Y. H. Yamazaki (1), P. L. Read (1)
University of Oxford, Clarendon Lab., AOPP, Parks Road, OX1 3PU, Oxford, UK

A simple Jovian cloud scheme based on an existing cloud model for Venus and Mars has been developed for the Oxford Planetary Unified model System (OPUS). Vapor and condensed components of a modeled volatile are represented as a pair of passive tracers, whose advection and diffusion is handled by the model's built-in tracer scheme. It is assumed that cloud particles evaporate in sub-saturated air and condense in super-saturated air. A change of phase occurs instantaneously without thermodynamic or microphysical effects. Cloud particles in the model fall with a Stokes velocity appropriate of their typical size.

Among the three major cloud decks of Jupiter, ammonia ice clouds are expected to best fulfill the characteristics of a passive atmospheric tracer. Therefore we have chosen this species for first modeling experiments with the cloud scheme. Further studies will include ammonium-hydrosulphide and water clouds as well. Ultimately the latter will be the basis of a parametrization of moist convection on Jupiter and Saturn.

The Jovian cloud scheme will be used to illustrate and verify GCM simulations of the stability of Jupiter's mid-latitude zonal jets. The motion of clouds in the model will thereby provide diagnostics directly comparable to observational data.