



A simple diagnostic parametrization for homogeneous ice cloud nucleation

A.M Tompkins (1), K. Gierens (2), and G. Radel (3)

(1) Earth System Physics, ICTP, Trieste, Italy (tompkins@ictp.it), (2) DLR, Inst Phys Atmosphere, Oberpfaffenhofen, Germany, (3) Univ Reading, Dept Meteorol, Reading RG6 2AH, Berks England

A parametrization for ice cloud nucleation is presented, compatible with the cloud scheme in the ECMWF forecast model that allows partial cloud coverage. It is based on the simple, but often justifiable, diagnostic assumption that the ice nucleation and subsequent depositional growth time-scales are short compared to the model time step, thus supersaturation is only permitted in the clear-sky portion of the grid cell. The scheme increases upper-tropospheric humidity, decreases high-level cloud cover and, to a much lesser extent, cloud ice amounts, all as expected from simple arguments. Evaluation of the relative distribution of supersaturated humidity amounts shows good agreement with the observed climatology derived from in situ aircraft observations. The global distribution of frequency of occurrence of supersaturated regions compares well with remotely sensed microwave limb sounder (MLS) data, with the most marked errors of under-prediction occurring in regions where this particular model version is known to under-predict deep convection. It is also demonstrated that the new scheme leads to improved predictions of permanent contrail cloud over southern England, which indirectly implies upper-tropospheric humidity fields are better represented for this region.