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Model Name and History:

Long Name: Microphysics of Clouds with Relaxed Arakawa-Schubert Scheme, with Liu & Penner ice physics
Acronym: McRASi
Generic Predecessor: GEOS-3; McRAS SCM used for March 2000 intercomparison

[note: this is the same as the submitted McRAS model, with the inclusion of ice physics for the aerosol indirect effect.]

Model Type: 1D (SCM) [Also used in 3D GCM]

Domain size in x-direction: 1
Domain size in z-direction: 17 sigma layers [137 layers for sensitivity study]

Time step: 30 minutes

Physical Parameterizations:

same McRAS as used for March 2000 intercomparison, with the following updates:

aerosol indirect effect (AIE) for liquid droplets. Prognostic liquid cloud condensation nuclei, based on Fountoukis and Nenes (2005), with liquid water autoconversion processes based on Seifert and Beheng (2006).

AIE for ice crystals. Prognostic ice cloud condensation nuclei, based on Liu et al. (2006), with ice water autoconversion processes based on Seifert and Beheng (2006). Includes contact freezing and ice deposition processes, based on Liu et al. (2006).

LW radiation: Chou & Suarez, 1994.
SW radiation: Chou et al., 1998.
Convection Scheme: RAS (Moorthi and Suarez, 1992)
Cloud Scheme: prognostic
Turbulence closure & surface fluxes: M&Y 2.5 (Helfand and Lebraga, 1988)
Boundary Layer Scheme: Sud and Walker, 1999a.

Docementation:

Sud, Y.C. and Dongmin Lee: Parameterization of Aerosol Indirect Effect to Complement McRAS Cloud Scheme and its Evaluation with the 3-year ARM-SGP Analyzed Data for Single Column Model Assessments. Submitted (available upon request).

Sud, Y.C. and G.K. Walker, 1999a: Microphysics of clouds with the Relaxed Arakawa-Schubert Scheme (McRAS). Part I: Design and Evaluation with GATE Phase III Data. J. Atmos. Sci., 56(18), 3196-3220.

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Fountoukis, C. and A. Nenes: Continued development of a cloud droplet formation parameterization for global climate models. J Geophys Res-Atmos, 110(2005),D11212, doi:10.1029/2004JD005591

Seifert, A. and K.D. Beheng: A two-moment cloud microphysics parameterization for mixed-phase clouds. Part 1: Model description. Meteorol Atmos Phys 92(2006), pp. 45-66.

Liu, X., J.E. Penner, S.J. Ghan, and M.-H. Wang: Inclusion of ice microphysics in the NCAR CAM3, J. Climate, 2007, in press.

Moorthi, S., and M. J. Suarez, 1992: Relaxed Arakawa-Schubert: A parameterization of moist convection for general circulation models. Mon. Wea. Rev., 120, 978-1002.

Helfand, H. M., and J. C. Lebraga, 1988: Design of a nonsingular level 2.5 second-order closure model for prediction of atmospheric turbulence. J. Atmos. Sci., 45, 113-132.

Chou, M.-D., and M. J. Suarez, 1994: An efficient thermal infrared radiation parameterization for use in general circulation models. NASA Tech. Memo. 104606, Vol. 3, 85 pp. [NTIS N95-15745.].

Chou, M.-D., C.-H. Ho, M.-H. Yan, and K.-T. Lee, 1998: Parameterization for cloud overlapping and shortwave single scattering properties for use in general circulation and cloud ensemble models. J. Climate, 11, 202-214.