5 Model Descriptions

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Model Name and History:

Long name [model/variant]:
Goddard Institute for Space Studies - Lawrence Berkeley Laboratory SCM

Acronym (to be used in graphics & data files naming):
GISS_LBL_SCM

Short/conversational name (other than acronym, if any):

Generic predecessor or relative (name/variant, and acronym, whether or not it also takes part in this study):
GISS SCM (Anthony Del Genio is a participant in the intercomparison)

LBL version has a bin resolved cloud microphysics scheme coupled to the GISS SCM and the GISS GCM based turbulence scheme added to the GISS SCM.

Model Type: 1D

Numerical Domain:
- Domain size in z-direction: top at ~16km
- Number of grid points in z-direction: 36
- Grid size in z-direction: ~200 m near the surface
- Time step: 10 sec (microphysics), 3600 sec (radiation)

Numerical Technique:

- Numerical method: Finite-difference
- advection scheme and its order of accuracy: Implicit, 2nd order
- time scheme and its order of accuracy: Implicit, 2nd order
-- numerical diffusion : Implicit, 2nd order
-- surface boundary conditions: Mixed
- upper boundary condition : Zero fluxes
-- Other information:
radiative fluxes are assumed to be constant and recalculated every hour ;

Physics:

Surface parameterization: Surface fluxes are calculated separately for each land surface type (open water, ice, earth and land ice);

Radiation calculations: Based on the k-correlation methodology using 33 correlated spectral intervals in the solar and long wave (Schmidt et al. 2006)

Turbulence scheme: Uses equation for turbulent kinetic energy and diagnostic assumption for dissipation rate and turbulent length scale (Schmidt et al. 2006)

Microphysics scheme is a bin-resolved scheme based on solving quasi-stochastic equation for size (mass) distribution function for cloud condensation nuclei, liquid phase, and ice phase, which includes individual ice crystals of three shapes (columns, plate-like, and dendrites), snow, graupel, and frozen drops/hail (Khain and Sednev, 1995, 1996).

References:

Schmidt et al., 2006: Present day atmospheric simulations using GISS ModelE: Comparison to in-situ, satellite and reanalysis data. J. Clim. 19, 153-192.

Khain, A. P., and I. L. Sednev, 1995: Simulation of hydrometer spectra evolution by water-water, ice-water, and ice-ice interactions. Atmos. Res., 36, 107-138.

Khain, A. P., and I. L. Sednev, 1996: Simulation of precipitation formation in the Eastern Mediterranean coastal zone using a spectral microphysics cloud ensemble model. Atmos. Res., 36, 77-110.