VIII. REFERENCES


______, S.-Y. Hong, and Y.-J. Kim, 1996: Sensitivity of cyclogenesis to lower tropospheric enhancement of gravity wave drag using the Environmental Modeling Center Medium-Range Forecast model. 11th NWP Conference, Norfolk VA, 18-23 August.


Chou, Ming-Dah, Kyu-Tae Lee, Si-Chee Tsay, Qiang Fu, 1999: Parameterization for Cloud Longwave Scattering for Use in Atmospheric Models. Journal of Climate, 12, 159-169.


Kiehl, J.T., and co-authors, 1998: The national center for atmospheric research community climate model: CCM3, 11, 1131-1149


________, and W.-S. Wu, 1995: Implementing a mass flux convective parameterization package for the NMC medium-range forecast model. NMC office note 409, 40 pp. [Available from NCEP/EMC, 5200 Auth Road, Camp Springs MD 20746]


FAQ in RSM physics

Is the unified or the same physics desirable (possible)? Isn’t it necessary to have physical process that are dependent upon model resolution?

Ans: Explicitly identical but there are some processes that implicitly take care of grid scale dependent forcings. The most sensitive process to model resolution is “precipitation physics”. There is a grid size dependent closure in the convection scheme. Sophisticated microphysical process - large-scale precip (explicit rain) desirable for high resolution grid is also available. Other processes such as radiation, surface processes are also implicitly resolution dependent in terms of representation of land/use data.

In brief, the RSM has a compatible physics to that in the GSM, rather than the same one.
RSM PHYSICS questionnaire

Land-surface scheme originated from:
   a) Blackada (force-restore scheme)
   b) BATS, Ssib
   c) Ssib
   d) OSU

Land-surface temperature:
   a) none
   b) prescribed
   c) computed via surface heat budget
   d) other (specify)

Land-surface moisture:
   a) none
   b) prescribed
   c) computed via surface moisture budget
   d) other (specify)

Soil model layers
   a) slab
   b) 2
   c) 4
   c) 6

Surface layer scheme:
   a) bulk type (value of CD is)
   b) similarity theory
   c) other (specify)
Method computing evaporation in surface layer
   a) bulk transfer
   b) energy balance method
   c) Penman approach

Planetary boundary layer scheme:
   a) bulk type
   b) K-type (specify form of K)
   c) turbulent kinetic energy scheme
   d) Mellor-Yamada scheme
   e) Nonlocal flux
   f) other (specify)

Vertical diffusion above PBL:
   a) none
   b) constant K
   c) K(Ri)
   d) turbulent kinetic energy scheme
   e) other (specify)

Convection scheme (deep):
   a) convective adjustment
   b) Kuo-type
   c) mass-flux
   d) Arakawa - Schubert
   e) other (specify)

Non-convective condensation:
   a) according to % saturation criterion
   b) Sundqvist scheme
c) explicit scheme (please list prognostic variables)
d) other (specify)

Shallow convection:
a) moist adiabat adjustment
b) mass flux scheme
c) no

Cloudiness:
a) none
b) climatological clouds
c) diagnostic clouds
d) other (specify)

Infrared radiation (free atmosphere):
a) none
b) type of scheme
   If model treats infrared radiation, does it interact with clouds?  (Yes/No)

Solar radiation (free atmosphere)
a) none
b) type of scheme
   If model treats solar radiation, does it interact with clouds?  (Yes/No)

Does model treat gravity wave drag?  (Yes/No)
   -- If Yes, How the model treats GWD?
Best papers describing physics

Kanamitsu, M. and Coauthors, 1991: Recent changes implemented into the global forecast system at NMC. Wea. Forecasting, 6, 425-435

