Help File for Simple Hurricane Model, smodel_public.m

Reference:

Emanuel, K., 2012: Self-stratification of tropical cyclone outflow: Part II: Implications for storm intensification. *J. Atmos. Sci.*, **69**, 988-996.

This script runs a maximally simple model of the intensification to a mature state of a tropical cyclone whose inner core is already saturated (i.e. the genesis phase is over). It numerically solves the equations in the above reference, including a crude representation of lateral mixing across the eyewall that yields a pre-specified wind profile in the eye. The numerical scheme has leapfrog time stepping with an Asselin filter, and the horizontal advection is a weighted mean between centered and upstream differencing.

The program is controlled by parameters set at the beginning of the script. The definitions of most of these are self-evident and brief descriptions are provided in the script, with default values following in parentheses.

Note that this model is initialized by specification of the boundary layer moist entropy surfeit in the core, not by specification of the wind field. The size of the starting vortex is controlled by the parameters *thedecay* and *r0*.

After the time-marching is completed, an outer wind field is, optionally, added to the inner field produced by the time-dependent model. This wind field assumes that a constant, radiatively-produced subsidence in the free troposphere is matched by Ekman suction at the top of the boundary layer (Emanuel, 2004); see also Chavas and Emanuel (2014).

Chavas, D. R., and K. A. Emanuel, 2014: Equilibrium tropical cyclone size in an idealized state of axisymmetric radiative–convective equilibrium. *J. Atmos. Sci*., **71**, 1663-1680.

Emanuel, K., 2004: Tropical Cyclone Energetics and Structure. In *Atmospheric Turbulence and Mesoscale Meteorology*, E. Fedorovich, R. Rotunno and B. Stevens, editors, Cambridge University Press, 280 pp.