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ATMO558
HW1

The NCEP Global Ensemble is an extension of NCEP's global spectral model, the Global Forecast System. Since the model is a global spectral model, the fundamental equations in the dynamical core are slightly different from a regional model. Divergence and vorticity equations replace the momentum equations, and all variables and tendencies are rewritten in spherical harmonic form. The operational GFS runs at a T254 Gaussian grid (i.e., triangular truncation, wavenumber 254) which produces a grid-box of approximately 0.5° square in the horizontal. There are 64 unevenly-spaced levels in the vertical, using the σ coordinate system. The GFS uses both leapfrog and semi-implicit schemes for time integration. Model physics are implemented as adjustments and are solved in a prescribed sequence. The parameterizations include gravity-wave drag, radiation, convection (shallow and deep), cloud fraction, grid-scale condensation/precipitation, boundary layer, surface fluxes, and land surface processes.

NCEP's Ensemble Forecast System (EFS) is slightly different from the operational GFS. A high resolution control forecast is run first at T382L64 resolution out to 7 days then at T126L64 out to 16 days. From this, a T126L28 control is created and run for 16 days. Finally, 20 perturbed forecasts are each run for 16 days at T126L28. Perturbations are created using an ensemble-transform with rescaling method (ETR). The fundamental concept in ensemble forecasting is that there are errors in the initial conditions. These analysis errors can eventually lead to wildly divergent solutions. Therefore, the goal of an EFS is to introduce perturbations that are similar to these analysis errors. Thus, random perturbations should not be used. The ETR method is an extension of the Breeding Method (BM): perturbations result from the scaled difference between forecasts from an unperturbed run and a perturbed run. That is, the perturbations are bred from the atmospheric state itself; the fastest growing modes unique to that system are selected.