

## Data Assimilation Cycling for Weather Analysis

This software package runs the atmospheric model MM5 in data assimilation cycling mode to produce an optimized weather analysis, including the ability to insert or adjust a hurricane vortex. The program runs MM5 through a cycle of short forecasts every three hours where the vortex is adjusted to match the observed hurricane location and storm intensity. This technique adjusts the surrounding environment so that the proper steering current and environmental shear are achieved. MM5cycle uses a Cressman analysis to blend observation into model fields to get a more accurate weather analysis. Quality control of observations is also done in every cycle to remove bad data that may contaminate the analysis. This technique can assimilate and propagate data in time from intermittent and infrequent observations while maintaining the atmospheric field in a dynamically balanced state.

The software consists of a C-shell script (MM5cycle.driver) and three FORTRAN programs (splitMM5files.F, comRegrid.F, and insert\_vortex.F), and are contained in the pre-processor component of MM5 called "Regridder." The model is first initialized with data from a global model such as the Global Forecast System (GFS), which also provides lateral boundary conditions. These data are separated into single-time files using splitMM5.F. The hurricane vortex is then bogussed in the correct location and with the correct wind field using insert\_vortex.F. The modified initial and boundary conditions are then recombined into the model fields using comRegrid.F. The model then makes a three-hour forecast. The three-hour forecast data from MM5 now become the analysis for the next short forecast run, where the vortex will again be adjusted. The process repeats itself until the desired time of analysis is achieved. This code can also assimilate observations if desired.

*This program was written by Nam Tran, Yongzuo Li, and Patrick Fitzpatrick of the GeoResources Institute at Mississippi State University for Stennis Space Center.*

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