10. NESTDOWN

Dave Gill
gill@ucar.edu

10.1 Purpose

- Horizontally interpolates σ-level data to an integer-ratio finer resolution, to be used directly as model input
- Vertically interpolates NH σ-level data to new levels if requested
- Input: model input or model output on σ-levels, finer-resolution terrain file, and *MAYBE* the LOWBDY file

10.1 Purpose

- If doing 1-way nest (MM5 output to MM5 input), advantages:
  - Fine grid has lateral BC that use identical physics to the internal grid points
  - Lateral BC data is frequent
  - Vertical structure of the atmosphere is not modified with re-analysis, such as near the surface
  - Additional levels may be added
- Disadvantages? - without obs, drift

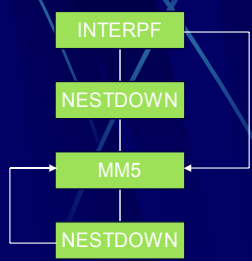
10.2 Procedure

- Fashioned after INTERPF → procedure is similar
  - Ingest σ-level data and terrain file
  - Interpolate 3d data (u, v, T, Qv, w, p', etc.)
  - Interpolate 2d data, not subset of terrain file (ground temperature, SST)
  - Interpolate 2d masked fields (soil temperature, soil moisture, WEASD)

10.2 Procedure

- Compute base state for both coarse and fine grid
- Adjust 3d temperature, various 2d temperatures from base state differences
- Qv → RH using old temp, then RH → Qv using new temp
- If requested, interpolate 3d arrays to new σ-levels, linear in z (from base state heights)
- Output identical to INTERPF: MMINPUT, BDYOUT, LOWBDY

10.2 Procedure



10.3 Base State

- Same as for INTERPF
- Computed for coarse grid and fine grid (temperature adjustment)
- Computed for fine grid + higher vertical resolution (for vertical interpolation)

10.4 Shell Variables

- You've seen'em before for the Cray

10.5 Parameters

- As with the other MM5 system pre- and post-processors (except for TERRAIN), NESTDOWN requires no user information concerning the domain size for static array allocation

10.6 Namelist Input

- Similar to regridder, INTERPF, little_r: uses namelist.input
- Input file names and processing dates are required modifications
- Other namelist records have reasonable default values
- New σ-levels are optional (i.e., omit sigma_f_bu in RECORD2)

10.6 record0

- input_file either MMINPUT file or MMOUT file, must be σ-level data, *more than a single time period for lateral boundary computations*
- input_terrain_file fine grid terrain file, usually set up with previous domain as the coarse grid

10.6 record0

- input_lowbdy_file sometimes optional, the user may choose to generate the data in the LOWBDY file from available information, usually it is safer to just include the file since it exists

10.6 record1

- start_year: 4-digit integer
- start_month: 2-digit month (01 to 12)
- start_day: 2-digit day (01 to 31)
- start_hour: 2-digit Zulu hour (00 to 23)
- interval: integer time in seconds between forecast/analysis periods
- less_than_24h: logical T/F, force < 24 h in computing daily temp means

10.6 record2

- sigma_f_bu: real array, list of full σ-levels, bottom-up; *IF PRESENT, THEY ARE USED*
- sst_to_ice_threshold: real, temperature threshold (K) at which the SST forces the grid cell to switch from the water category to ice – *do not activate if using polar physics or LSM in MM5*

10.6 record4

- wrth2o : T/F flag for saturation wrt to liquid or ice – not operative

10.6 record5

- ifdatim : number of time periods in the MMINPUT file (cuts down substantially on file sizes if the lateral BC is fairly high frequency)
  - ifdatim = 1 → only 1 time period in the MMINPUT file
  - ifdatim = -1 → place ALL time periods in the MMINPUT file
- If you are NOT doing FDDA, set ifdatim=1

10.6 record6

- interp_method : 1 = fast, 2 = slow
- use_mm5_lowbdy : T/F flag to use the file name provided in input_lowbdy_file

10.7.1 Temp Correction

- The σ-levels are a terrain following coordinate: modifying the terrain elevation → modifying the vertical location
- $T_F = T_C + (T_{RF} - T_{RC})$
  F=fine, C=coarse, R=reference state

10.8 How to Run

- Get the source code

ftp://ftp.ucar.edu/mesouser/MM5V3/NESTDOWN.TAR.gz

- Unzip and untar the file, "cd nestdown", type "make" if you are on one of the supported systems
- You need 1) a coarse grid input σ-level data set, 2) a fine grid TERRAIN file, 3) the previous two files must be Appalachia-close related

10.8 How to Run

- The output from NESTDOWN is functionally identical to INTERPF output:
  - MMINPUT_DOMAIN*m*
  - BDYOUT_DOMAIN*m*
  - LOWBDY_DOMAIN*m*
- Domain identifier same as TERRAIN input
- Warning Will Robinson: If this fine grid data is to be used as "coarse grid" input to MM5, it expects the files to all be named as if they are domain ID #1

10.9 NESTDOWN oops

- The coarse grid and fine grid domains should both be *able* to be generated by the same TERRAIN run
- More than 1 time period is required for input
- Verify the vertical bounding layers if you forced extrapolations
- Use at least a full day of forecast or input analysis
- May appear to compile slowly