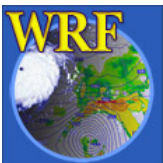# Analysis and Observation Nudging: Set Up and Run

Wei Wang

Analysis Nudging

- Compile WRF as usual
- Edit **namelist.input** file for nudging related options, **&fdda**
- No special data preparation needed
- Run **real.exe** to produce additional file, or files if you want to nudge the nest domains.

Preparing input files..

Edit these namelists before running **real.exe**:

grid_fdda = 1, 1,

   ; grid-nudging fdda on (=0 off) for each domain

gfdda_inname = "wrffdda_d<domain>"

   ; defined name in real

io_form_gfdda = 2,

   ; io format (2 = netCDF, default)

Running **real.exe** will produce:

   wrfinput_d01, wrfbdy_d01, **wrffdda_d01**, (wrfinput_d02, wrffdda_d02..)

namelist `&fdda`

`gfdda_interval_m` = 360
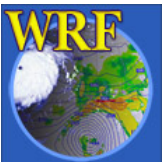
   ; time interval (min) between analysis times

`gfdda_end_h` = 6

   ; time (h) to stop nudging after start of forecast

`fgdt` = 0

   ; calculation frequency (minutes) for grid-nudging (0=every step)

namelist `&fdda`

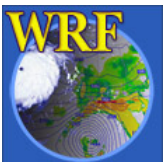## Nudging coefficients:

`guv` = 0.0003

    ; nudging coefficient for u and v (sec-1)

`gt` = 0.0003

    ; nudging coefficient for temp (sec-1)

`gq` = 0.0003

    ; nudging coefficient for qvapor (sec-1)

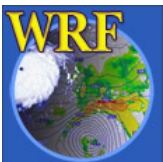# namelist `&fdda`

Nudging control:

`if_no_pbl_nudging_uv` = 0

  ; 1= no nudging of u and v in the pbl, 0=nudging in the pbl

`if_no_pbl_nudging_t` = 0

  ; 1= no nudging of temp in the pbl, 0=nudging in the pbl

`if_no_pbl_nudging_q` = 0

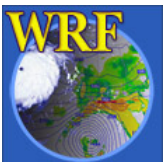 ; 1= no nudging of qvapor in the pbl, 0=nudging in the pbl

namelist `&fdda`

Nudging control:

`if_zfac_uv` = 0

  ; 0= nudge u and v all layers, 1=
limit nudging to levels above
k_zfac_uv

`k_zfac_uv` = 10

  ; 10= model level below which
nudging is switched off for u and v

namelist `&fdda`

`if_zfac_t` = 0

  ; 0= nudge temp all layers, 1= limit nudging to levels above k_zfac_t
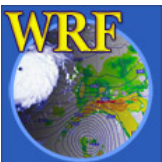
`k_zfac_t` = 10

  ; 10= model level below which nudging is switched off for temp

`if_zfac_q` = 0

  ; 0= nudge qvapor all layers, 1= limit nudging to levels above k_zfac_q

`k_zfac_q` = 10

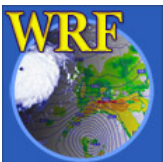 ; 10= model level below which nudging is switched off for qvapor

namelist `&fdda`

Nudging control for dynamic initialization:

`if_ramping` = 0

   `; 0= nudging ends as a step function, 1= ramping nudging down at end of period`
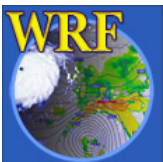
`dtramp_min` = 60.0

   `; time (min) for ramping function, 60.0=ramping starts at last analysis time, -60.0=ramping ends at last analysis time`

Observation Nudging

- Compile WRF as usual

- Prepare observation data files (see more details at
  http://www.mmm.ucar.edu/users/wrfv2/nudging.html

➔ **`OBS_DOMAIN101`**

   `OBS_DOMAIN201` (for domain 2)
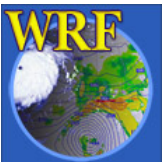
namelist &fdda

In namelist record **&time_control**, add
auxinput11_interval_s = 120, 120,
; in seconds
auxinput11_end_h = 6, 6,
; in hours
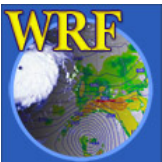
namelist &fdda

Nudging control:

obs_nudge_opt = 1,1,

   ; obs nudging switch, =1, on

max_obs = 150000,

   ; max number of obs used on a domain during any given time window

fdda_start =   0.,   0.,

   ; nudging start time in minutes

fdda_end = 360., 360.,

   ; nudging end time in minutes

namelist &fdda

Nudging coefficients:

obs_nudge_wind = 1,1,

    ; nudging switch for wind

obs_coef_wind = 6.E-4,6.E-4,

    ; nudging coeffient for wind

obs_nudge_temp = 1,1,

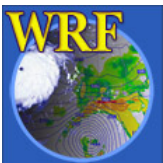obs_coef_temp = 6.E-4,6.E-4,

obs_nudge_mois = 1,1,1,1,1

obs_coef_mois = 6.E-4,6.E-4,

namelist &fdda

Nudging controls:

obs_rinxy = 240.,240.,

  ; horizontal radius of influence

obs_rinsig = 0.1,

  ; vertical distance of influence

obs_twindo = 0.666667.

  ; half time window for obs, in h

obs_ionf = 2,

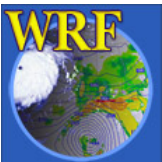 ; freq in coarse grid timesteps for obs input and err calc

namelist &fdda

Nudging control for dynamic initialization:

obs_idynin = 0,

  ; DI switch, = 1, on

obs_dtramp = 40.,

  ; time window in minutes over which nudging is ramping down from 1 to 0

namelist &fdda

Control for printing:

```
obs_ipf_errob = .true.

obs_ipf_nudob = .true.

obs_ipf_in4dob = .true.

obs_npfi = 10,
   ; diagnostic prints in coarse
 grid timesteps
```
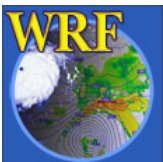
Namelist templates

- For grid analysis nudging: start with the namelist record **&fdda** in `test/em_real/namelist.input.grid_fdda`

- For observation nuding: start with the namelist record **&fdda** in `test/em_real/namelist.input.obs_fdda`

To run model

Run wrf.exe as usual:

`wrf.exe >& wrf.out`

or

`mpirun -np 4 wrf.exe`

➔ **`wrfout_d01_<date>`**