Script for Boulder Windstorm case WIND01
ATM419/563 Fall 2024

• There is a *lot of editing* to be done in this experiment

*** ---------- preliminaries ----------** *

* make a directory in your lab space called **WINDSTORM**, and move into it
* copy **$LAB/SCRIPTS/WRF_REAL_SETUP.TAR** and unpack it
(tar -xvf WRF_REAL_SETUP.TAR)
* execute **sh make_all_links.sh**

*** Launch ARCC Jupyterlab**

→ select batch or burst-daes from menu. Minimal resources suffice.
→ navigate to your WINDSTORM directory

*** ---------- geogrid ----------***

• Edit namelist.wps

- 200 x 200 gridpoints
- max_dom = 1
- 6 km horizontal grid spacing [6000 m dx and dy]
- Lambert projection
- Reference lat 40.0, reference lon -105.0, standard lon -105.0
- True latitudes both 40.0

• In Jupyterlab, run notebook plot_WRF_domain.ipynb to visualize your domain prior to running geogrid.exe. Compare to slide 8.

→ this notebook reads in the namelist.wps file in your local directory
→ If your domain does not match, review your namelist.wps settings.

• run geogrid on burst-daes, burst, or batch

srun -p burst-daes -n 4 geogrid.exe Look for: "*Successful completion of geogrid*."

• In Jupyterlab, run notebook plot_WRF_terrain.ipynb to examine your topography. Compare to slide 9. Note map factors extracted by notebook.

*** ---------- ungrib ----------***

• Edit namelist.wps

- start_date = '2021-12-30_12:00:00' *[only first column matters]*
- end_date = '2021-12-31_00:00:00'
- interval_seconds = 10800 [=3 h]

link_grib.csh $LAB/DATA/NAM_2021123012/nam.* .

ls -al GRIBFILE* [make sure everything is OK]

cp Vtable.NAM Vtable [select correct Vtable!]

OPTIONS {because ungrib step will take > 20 min}:

(A) sbatch **-p burst-daes** submit_ungrib [tail -f ug.srun.out *to follow along*]

(B) ln -s $LAB/DATA/NAM_2021123012/FILE* . [to skip ungrib]

*** ---------- metgrid ----------***

• run metgrid on burst-daes, burst, or batch

srun -p burst-daes -n 4 metgrid.exe

ls met_em*

• Check number of metgrid atmospheric and soil levels

ncdump -h met_em.d01.2021-12-30_12:00:00.nc | more [TAB COMPLETION!]

[Note values for `num_metgrid_levels` and `num_st_levels` in the header information. The second is used for `num_metgrid_soil_levels` in `namelist.input`]

*** ---------- real.exe ----------***

• Edit namelist.input (Part 1) – only first column matters since max_dom=1

- run_hours = 12 and run_days = 0 [12 hours]
- start and end times as in namelist.wps [1st column matters]
- interval_seconds to match namelist.wps
- time_step = 20 [20 sec]
- e_we, e_sn to match namelist.wps
- num_metgrid_levels needs to be set correctly
- num_metgrid_soil_levels needs to be set correctly
- leave e_vert [vertical levels] set at 57
- leave p_top_requested at 5000 [50 mb, in Pascals]
- set dx, dy to match namelist.wps [grid spacing in meters]

In namelist.input, make/check these entries:

- bl_pbl_physics = 5 and sf_sfclay_physics = 5 (MYNN2, used by HRRR)
- sf_surface_physics = 2 (Noah land surface model, used by NAM)
- num_soil_layers = 4
  (required by Noah LSM; *not same* as num_metgrid_soil_levels)
- leave bldt = 0
- leave mp_physics = 4, ra_lw_physics = 4, ra_sw_physics = 4
- set cu_physics = 0 [unwanted at 6km Δx]
- *Other settings do not need to be changed at this time*

• execute real as a job on burst, burst-daes, or batch (runs quickly)

srun -p burst-daes -n 4 real.exe

[when job is finished, check 'tail' of rsl.out.0000 file with 'trsl' command.
Make sure it says "SUCCESS COMPLETE REAL_EM INIT"
Break out of tail command with ctrl-c]

*** ---------- wrf.exe ---------- ***

• submit the WRF job to burst-daes, burst, or batch

sbatch -p burst-daes submit_wrf

• submit the WRF job. WRF run should take ~ 35-40 minutes on burst-daes

[NOTE JOB NUMBER ASSIGNED. Example: Submitted batch job 774952]

myjobs [to check job status]

* monitor WRF run – check for 'successful completion'

trsl *(ctrl-c to break out)*

[check for SUCCESS COMPLETE WRF with 'trsl']

ls -1 wrfout_d01*

*** ---------- Python analysis ---------- ***

• You can use and modify WRF_plot_example_V3.ipynb, included in the setup package. **Modifications needed**

→ Cell #3, wrfout file name

→ Cell #5,

Set plot_time_index to time index desired to plot

You may want to reconsider plot_bounds

Vertical cross-section defined by these lon/lat points

left_lon=-108

right_lon=-104

bot_lat=40

top_lat=40

→ Cell #6, may want to reconsider plt.Normalize bounds

For vertical-cross section output, see slide 10.

See slides 11+ for Experiment #2 tasks.