March 2022 Thunderstorm demonstration

ATM 419/563 Spring 2024 - Fovell

• **SETUP**

• Create a directory called TSTORM and move into it

• Copy **$LAB/SCRIPTS/WRF_REAL_SETUP_SNOW.TAR** into it and unpack as per usual

• Copy **$LAB/TSTORM/plot_WRF_TSTORM.ipynb** to your TSTORM directory

• Execute make_all_links_SNOW.sh

• **GEOGRID**

• Edit namelist.wps to configure our domain

- max_dom = 2 *[so for multicolumn entries, the 2nd column matters]*
- D1: e_we = 115, e_sn = 100
- D2: e_we = 166, e_sn = 100
- dx = dy = 12000
- Lambert, ref_lat = 42.6, ref_lon = -76, both truelats = 42.6, stand_lon = -76
- MAKE SURE you do not write these numbers with more than one decimal point

• Position D2 within D1

i_parent_start = 1, **22**,
j_parent_start = 1, **32**,

• Visualize domain using 'ncl plotgrids.ncl' and/or plot_WRF_domain.ipynb and compare to image in PPT [**don't skip this step!]**

• Run geogrid: srun -p snow -n 8 geogrid.exe

• Visualize terrain with plot_WRF_terrain.ipynb

• **UNGRIB**

• Vtable.GFS as Vtable

• Edit namelist.wps for our start and end times, and interval_seconds

start_date ='2022-03-31_12:00:00', '2022-03-31_12:00:00'
end_date = '2022-04-01_00:00:00', '2022-04-01_00:00:00'
interval_seconds = **3600**,

• Link to the GFS data:

• link_grib.csh $LAB/DATA/GFS_2022033112/gfs* .

• Submit ungrib script. You may have to wait for resources. Ungrib takes time:

sbatch -p snow submit_ungrib

• Looking for at end of ungrib.log:

"*** Successful completion of program ungrib.exe ***"

• **METGRID** **[after both ungrib *and* geogrid are complete]**

• No further editing of namelist.wps should be needed at this point

• Submit metgrid script

sbatch -p snow submit_metgrid

• tail -f metgrid.log.0000: "*** Successful completion of program metgrid.exe **"

- What are num_metgrid_levels, num_st_layers, num_sm_layers????
  → select one of the met_em outputs, dump header, pipe to more
  → edit num_metgrid_levels, num_metgrid_soil_levels in namelist.input

- **REAL**
- Edit namelist.input to configure time information
- We will run for 12 hours, so: run_days = 0, run_hours = 12
- Set same start and end times as namelist.wps
- Same interval_seconds as in namelist.wps

- Edit namelist.input for domain information
- time_step = 30 [this is specified for D1 ONLY. See PPT.]
- **max_dom = 1** **[we are running the single domain version at this point]**
- Same e_sn, e_we for D1 and D2 as in namelist.wps
- Leave e_vert at 57 for each domain [they need to be set equal]
- dx = 12000, 4000, and dy = 12000, 4000
- Nest positioning to match namelist.wps
  i_parent_start = 1, **22**,
  j_parent_start = 1, **32**,
- Make sure num_metgrid_levels, num_metgrid_soil_levels are correct

- **Edit namelist.input for physics information!! Some of these need to be changed**
- Thompson microphysics mp_physics = 8 for both domains
- Noah land surface model sf_surface_physics = 2 for both domains
- MYNN surface layer sf_sfclay_physics = 5 for both domains
- MYNN PBL bl_pbl_physics = 5 for both domains
- Cumulus cu_physics = **1, 0** [Kain-Fritsch scheme, **ON** for 12 km, **OFF** for 4 km domain]

- Submit real script: sbatch -p snow submit_real
- tail -f rsl.out.0000: “real_em: SUCCESS COMPLETE REAL_EM INIT”

- **WRF for control run**
- Submit wrf script: sbatch -p snow submit_wrf
- tail -f rsl.out.0000: “wrf_em: SUCCESS COMPLETE WRF”

- **Visualization of control run**
- Launch ARCC Jupyterlab. Either Batch or Snow is OK; minimal resources will suffice.
- Launch and execute plot_WRF_TSTORM.ipynb

- **Cumulus ensemble**
- See slides 37+