

ATM 419/563 – Geogrid, projections, and map factors

Fall, 2024 – Fovell

Due Wednesday, September 18, by start of class.

Set up a domain centered somewhere on Earth and evaluate several map projections in order to recognize potential accuracy and performance issues involved with various domain setups relating to effective resolutions. **I strongly suggest you use this assignment to start thinking about where you want to place the domain for your final project simulations.** You will explore 4 projections, and for each make a terrain map, extract map factors, and compute the largest and smallest grid spacings. Put your information together into a PPT and submit it. Use “GEOGRID_assignment_example.pptx”, which you can find on the class web page, as a template.

In your lab space, create a directory called GEOGRID and copy into it the `make_all_links.sh`, `namelist.wps`, `max.csh`, and `plot_WRF_terrain.ipynb` files from your SNOWSTORM directory. Execute `make_all_links.sh`. Then design a single **60 x 60 point** domain, at **48 km grid spacing**, centered somewhere on Earth. Report your `ref_lat` and `ref_lon` in the PPT. You can set `stand_lon = ref_lon` or not, as you wish or need. Report your `stand_lon` in the PPT, too.

You will run `geogrid.exe` **4 times**, for four different configurations. Two versions will use Lambert and there will be one each with Mercator and Polar Stereographic. For **Lambert #1**, use the traditional true latitude values of `truelat1 = 30` and `truelat2 = 60`. For **Lambert #2**, use `truelat1 = truelat2 = ref_lat`, which is commonly employed when domains are spatially small. For **Mercator** (“mercator”) and **Polar Stereographic** (“polar”), use `truelat1 = ref_lat` (`truelat2` is not used and is ignored).

For each of these four domains, use `ncview` or `max.csh` as shown in class to determine the max and min values of `MAPFAC_M`. Use these values to compute the smallest and largest grid spacings in your domain. Summarize your findings in a table as shown in the example PPT.

Keep in mind that `plot_WRF_terrain.ipynb` creates a file called “terrain_plot.png”, which you can import into the PPT. (You can also right click on the image in the notebook to copy/paste it.) This notebook will read your `namelist.wps` file to extract projection information, so run it each time you run `geogrid.exe`. You may want or need to modify the range of terrain heights used to make your plot look better. The lines you want are:

```
# plotting range for terrain height [i.e., 0 to 4000 m above mean sea level]
norm = plt.Normalize(0, 4000)
```

You can run `geogrid.exe` on multiple cpus: `srun -p burst-daes -n 8 geogrid.exe`

For more information, please refer to https://www2.mmm.ucar.edu/wrf/users/wrf_users_guide/build/html/wps.html#running-the-wps.