# HW4 12132210

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## 1. Global Earthquakes

In this problem set, we will use this file from the USGS Earthquakes Database. The dataset is similar to the one you use in Assignment 02. Use the file provided (usgs_earthquakes.csv) to recreate the following map. Use the mag column for magnitude. [10 points]

● Read data

```
1  earthquakes=pd.read_csv('usgs_earthquakes.csv')#,sep='\t'
2  earthquakes.head()
```

|   | time | latitude | longitude | depth | mag | magType | nst | gap | dmin | rms | net |
|---|------|----------|-----------|-------|-----|---------|-----|-----|------|-----|-----|
| 0 | 2014-01-31 23:53:37.000 | 60.252000 | -152.7081 | 90.20 | 1.10 | ml | NaN | NaN | NaN | 0.2900 | ak |
| 1 | 2014-01-31 23:48:35.452 | 37.070300 | -115.1309 | 0.00 | 1.33 | ml | 4.0 | 171.43 | 0.34200 | 0.0247 | nn |

● Extract data

```
1  earthquakes_mag50=earthquakes.sort_values('mag', ascending=False)[0:50]
2  earthquakes_mag50
```

● ● ●

● Draw the picture

```
1   # Create and define the size of a figure object
2   plt.figure(figsize=(5,5), dpi=300)
3
4   #projection
5   proj = ccrs.Robinson(central_longitude=180.0, ) #局部投影
6   ax = plt.axes(projection=proj)
7
8   ax.set_global()
9   ax.stock_img()
10  ax.coastlines(linewidth=0.5)
11
12  ax_scatter=ax.scatter(x=earthquakes_mag50.longitude,
13                        y=earthquakes_mag50.latitude,
14                        c=earthquakes_mag50.mag,
15                        s=7,
16                        edgecolor='k',
17                        linewidths=0.5,
18                        cmap='Reds',
19                        transform=ccrs.PlateCarree()) ## Important
20  plt.colorbar(ax_scatter,label='Magnitude',fraction=0.023,pad=0.05,)
21  plt.title('Top 50 Earthquakes of 2014',fontdict={'size':10})
22  plt.show()
```

Top 50 Earthquakes of 2014
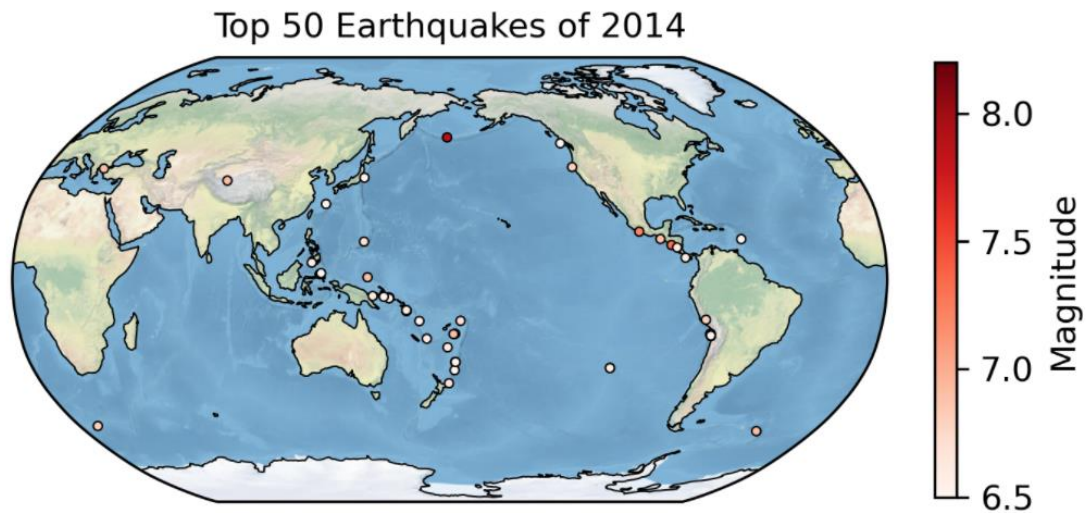
## 2. Explore a netCDF dataset

2.1 [10 points] Make a global map of a certain variable. Your figure should contain: a project, x label and ticks, y label and ticks, title, gridlines, legend, colorbar, masks or features, annotations, and text box (1 point each).\

- data



data from: https://disc.gsfc.nasa.gov/datasets/M2TUNXGLC_5.12.4/summary?keywords=snow

this data is about snow

```
[5]:    1  # Use open_mfdataset to load all the nc files
        2  ds = xr.open_mfdataset('data/*.nc4')
        3  ds
```

[5]:  xarray.Dataset

► Dimensions:         (**time**: 1816, **lat**: 361, **lon**: 576)

▼ Coordinates:

| **lat** | (lat) | float64 | -90.0 -89.5 -89.0 ... 89.5 90.0 | 📄 ≋ |
| **lon** | (lon) | float64 | -180.0 -179.4 ... 178.8 179.4 | 📄 ≋ |
| **time** | (time) | datetime64[ns] | 2001-01-01T01:30:00 ... 2020-12-... | 📄 ≋ |

▼ Data variables:

| WESNSC | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| RUNOFF | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| SNOMAS_GL | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| WESNEXT | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| SNOWDP_GL | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| ASNOW_GL | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |
| SNICEALB | (time, lat, lon) | float32 | dask.array<chunksize=(8, 361, 576), meta=np.n... | 📄 ≋ |

► Attributes: (32)

```
    1  SNOMAS_GL_mean=ds.SNOMAS_GL.mean(dim=['time'])
```

- Draw the picture
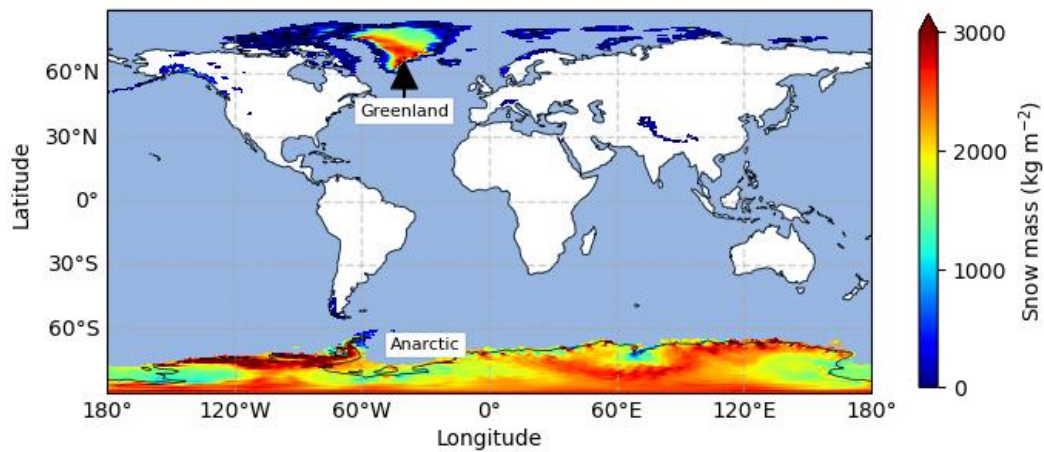


2.2 [10 points] Make a regional map of the same variable. Your figure should contain: a different project, x label and ticks, y label and ticks, title, gridlines, legend, colorbar, masks or features, annotations, and text box (1 point each)

```
1  import matplotlib.path as mpath
2  lat_lims = [65,90]
3  SNOMAS_GL_mean_arctic=ds.SNOMAS_GL.mean(dim=['time']).where(ds['lat']>lat_lims[0])
```

- Draw the picture