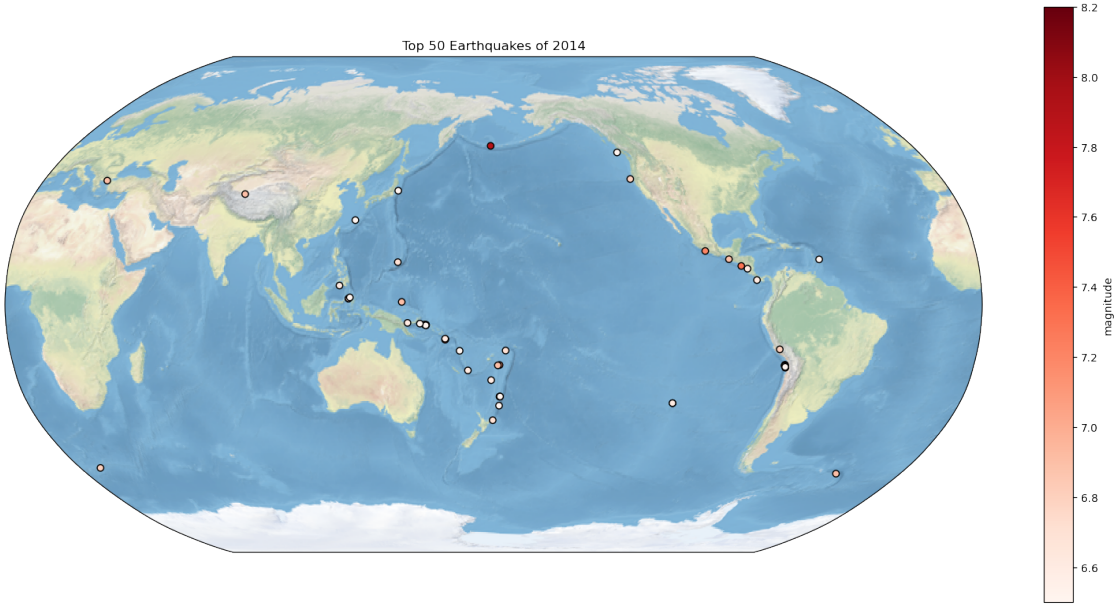
PS4

November 24, 2021

1 PS4_1

[1]:
```
import numpy as np
import xarray as xr
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.ticker as mticker
%matplotlib inline
import cartopy.crs as ccrs
import cartopy.feature as cfeature
```

[2]:
```
ds = pd.read_csv("usgs_earthquakes.csv")
top_50 = ds.sort_values("mag", ascending=False)[:50]

plt.figure(figsize=(20,20), dpi=100)
proj = ccrs.Robinson(central_longitude=180)
ax = plt.axes(projection=proj)
ax.set_global()
ax.stock_img()

plt.scatter(top_50.longitude,top_50.latitude,c=top_50.
 ↪mag,cmap='Reds',edgecolors='k',transform=ccrs.PlateCarree())
plt.colorbar(shrink=0.5,label='magnitude')
plt.title('Top 50 Earthquakes of 2014')

gl = ax.gridlines(crs=ccrs.PlateCarree(), linewidth=0, color='black', alpha=0.
 ↪5)#       text(0.5, 1.0, 'Top 50 Earthquakes of 2014')
```



[ ]:

2 PS4_2

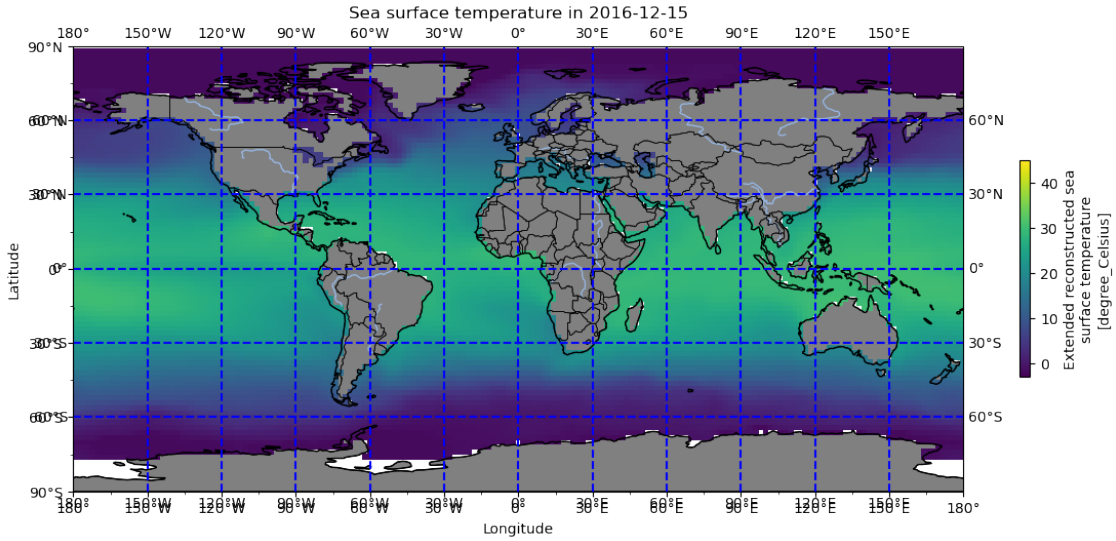
2.1 4_2.1

https://zhajiman.github.io/post/cartopy_introduction/

[3]:
```
# Import modules
import numpy as np
import xarray as xr
import pandas as pd
import matplotlib as mpl
import matplotlib.pyplot as plt
import matplotlib.ticker as mticker
import cartopy.crs as ccrs
import cartopy.feature as cfeature
from cartopy.mpl.ticker import LongitudeFormatter, LatitudeFormatter
%matplotlib inline
```

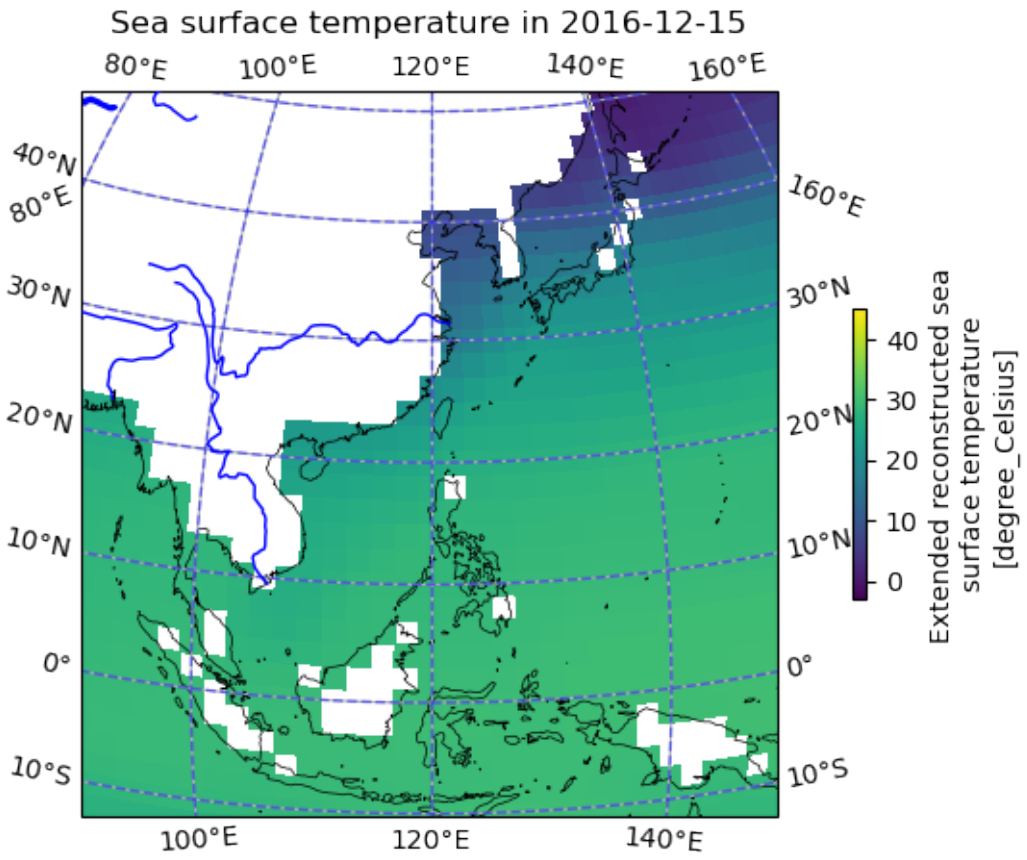
[4]:
```
ds = xr.open_dataset("NOAA_NCDC_ERSST_v3b_SST.nc", engine="netcdf4")

sst_latest = ds.sst.isel(time=-1)

proj = ccrs.PlateCarree()
fig = plt.figure(figsize=(14,7),dpi=100)
ax = fig.add_subplot(1,1,1, projection= proj)
ax.coastlines()
```

```
ax.set_global()

tick_proj = ccrs.PlateCarree()
ax.set_xticks(np.arange(-180, 180 + 30, 30), crs=tick_proj)
ax.set_xticks(np.arange(-180, 180 + 15, 15), minor=True, crs=tick_proj)
ax.set_yticks(np.arange(-90, 90 + 30, 30), crs=tick_proj)
ax.set_yticks(np.arange(-90, 90 + 15, 15), minor=True, crs=tick_proj)
ax.xaxis.set_major_formatter(LongitudeFormatter())
ax.yaxis.set_major_formatter(LatitudeFormatter())

gl = ax.gridlines(crs=ccrs.PlateCarree(), draw_labels=True, linewidth=1.5,␣
 ↪color='blue', linestyle='--')
gl.xlocator = mpl.ticker.FixedLocator(np.arange(-180, 180, 30))
gl.ylocator = mpl.ticker.FixedLocator(np.arange(-90, 90, 30))

sst_latest.plot(ax=ax,transform=ccrs.PlateCarree(),
         vmin=-3.0, vmax=45.0, cbar_kwargs={'shrink': 0.4})
plt.title('Sea surface temperature in 2016-12-15')

ax.add_feature(cfeature.LAND, edgecolor='black', facecolor='grey',linewidths=0.
 ↪5)
ax.add_feature(cfeature.RIVERS)

ax.add_feature(cfeature.NaturalEarthFeature(category='cultural',
                                            name='admin_0_countries',
                                            scale='110m',
                                            facecolor='none',
                                            edgecolor='black',
                                            linewidth=0.5))

plt.xlabel("Longitude")
plt.ylabel("Latitude")
plt.show()
```



2.2 4_2.2

[5]:
```
plt.figure(figsize=(10,5), dpi=100)

central_lon, central_lat = 120, 20
proj = ccrs.Orthographic(central_lon, central_lat)

ax = plt.axes(projection=proj)

extent = [central_lon-30, central_lon+30, central_lat-30, central_lat+30]
ax.set_extent(extent)
ax.add_feature(cfeature.LAKES, edgecolor='blue', facecolor='blue', zorder=2)
ax.add_feature(cfeature.RIVERS, edgecolor='blue', zorder=3)
ax.coastlines(resolution='50m', linewidth=0.5)

ax.gridlines()
gl = ax.gridlines(crs=ccrs.PlateCarree(), draw_labels=True, linewidth=1,␣
 ↪color='blue',linestyle='--',alpha=0.5)

sst_latest.plot(ax=ax,transform=ccrs.PlateCarree(),
         vmin=-3.0, vmax=45.0, cbar_kwargs={'shrink': 0.4})

plt.title('Sea surface temperature in 2016-12-15')
plt.show()
```


Sea surface temperature in 2016-12-15
80°E
100°E
120°E
140°E
160°E
40°N
80°E
30°N
20°N
10°N
0°
10°S
160°E
30°N
20°N
10°N
0°
10°S
100°E
120°E
140°E
40
30
20
10
0
Extended reconstructed sea surface temperature [degree_Celsius]