Assignment 04

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Problem1

```python
# import libraries
import numpy as np
import pandas as pd
import xarray as xr
import matplotlib.ticker as mticker
import matplotlib as mpl
import matplotlib.pyplot as plt
import matplotlib.patches as mpatches
from datetime import datetime
from matplotlib.ticker import FuncFormatter
import matplotlib.gridspec as gridspec
import pandas as pd
import hvplot.xarray
import cartopy.crs as ccrs
import cartopy.feature as cfeature
%matplotlib inline
#%%
# problem 1
# load data
data = pd.read_csv('usgs_earthquakes.csv')
#check data
data
#%%
# find the top 50 earthquakes
top50 = data.sort_values('mag',ascending=False)[0:50]

# check the result
top50
#%%
# plot the map
fig = plt.figure(figsize=(10,8))

# Create a projection of robinson projection style
proj = ccrs.Robinson(central_longitude=180)
ax = plt.axes(projection=proj)

# Create plot coastlines and the world map, the world map was taught by MinQiLiu
ax.coastlines()
ax.stock_img()

# plot the title
plt.title("Top 50 Earthquakes of 2014")

# Scatter plot
plt.scatter('longitude', 'latitude',data=top50,c='mag',cmap='Reds',
edgecolors='black', linewidths=1,zorder=10,transform=ccrs.PlateCarree())
```

```
# plot the color bar
plt.colorbar(ax=ax,shrink = 0.3,ticks=[6.6,6.8,7.0,7.2,7.4,7.6,7.8,8.0,8.2],label='magnitude')
```
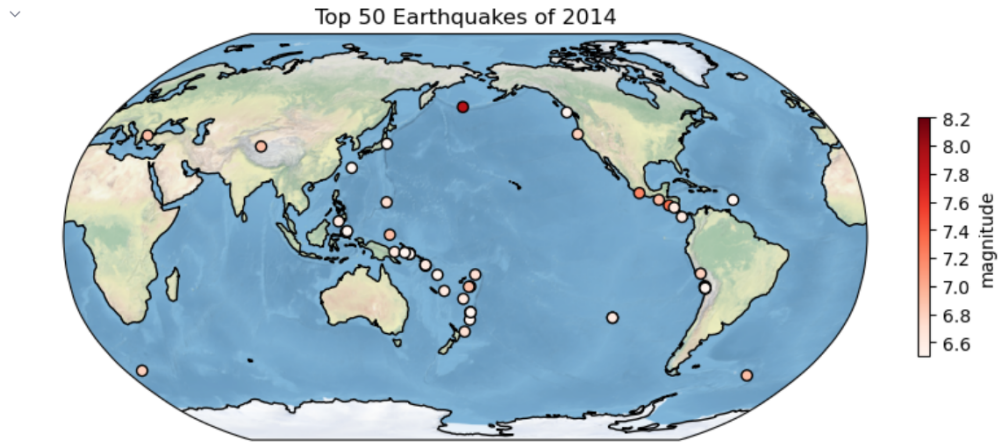
output:

Out 69   <matplotlib.colorbar.Colorbar at 0x1d61cb1f5d0>

Figure 1

Problem2

2.1

```
# problem2
#%%
# import the data
data = xr.open_dataset('sst.mnmean.v4.nc',engine='netcdf4')
# check the result
data
#%%
# choose data 0f 2019
data = data.sel(time=slice('2019-01-01','2019-12-01'))
#check the result
data
#%%
# mean by the time
data = data.mean(dim='time')
# check the result
data
#%%
# 2.1
# global
# create the figure and projection
plt.figure(figsize=(10,8),dpi=120)
ax = plt.axes(projection=ccrs.Robinson())

# add features
ax.coastlines()
ax.add_feature(cfeature.LAND, edgecolor='green', facecolor='green', zorder=0)

# plot the sst
plt.contourf(data.lon, data.lat, data.sst, cmap='Reds',transform=ccrs.PlateCarree())

# add title
plt.title('Global sst in 2019')

# add colorbar
plt.colorbar(shrink = 0.3,label='SST')

# add grid line and ticks
ax.gridlines(draw_labels=True,linewidth = 3)

# add legend , i am inspired by reading csdn
land = mpatches.Patch(color='Green', label='Land')
plt.legend(handles=[land],loc=[0,0])

# add annotation
plt.annotate('Shenzhen', xy=(114,22),xytext(50,0.5),
arrowprops=dict(facecolor='black', shrink=0.15), transform=ccrs.PlateCarree())

# add text box
plt.text(110, 13.5,'southChinasea',fontsize=5,
bbox=dict(facecolor='yellow',alpha=0.15, edgecolor='black'), transform=ccrs.PlateCarree())
```

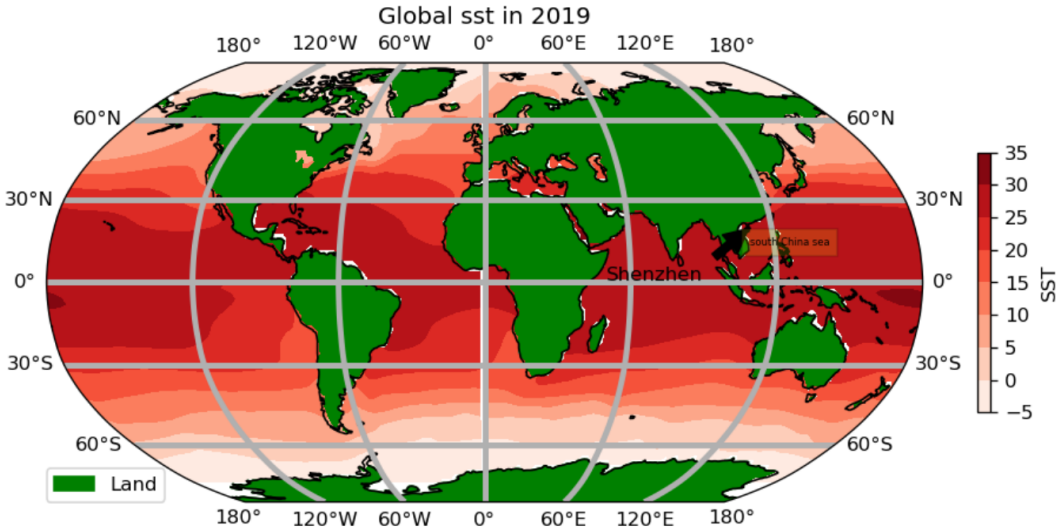output:

Out 86   Text(110, 13.5, 'south China sea')

Figure 2

2.2

```python
# 2.2
# regional
# create the figure
plt.figure(figsize=(20,20),dpi=120)

# create  extent of region
extent = [60,150,0,30]

# create the projection and plot the extent region
ax = plt.axes(projection=ccrs.PlateCarree())
ax.set_extent(extent, crs=ccrs.PlateCarree())

# add features
ax.coastlines()
ax.add_feature(cfeature.LAND, edgecolor='green', facecolor='green', zorder=0)

# plot the sst
plt.contourf(data.lon,data.lat,data.sst,cmap='Reds',
transform=ccrs.PlateCarree(),levels=np.linspace(20,30,11))

# add title
plt.title('Regional sst in 2019')

# add colorbar
plt.colorbar(shrink = 0.3,label='SST')

# add grid line and ticks
ax.gridlines(draw_labels=True,linewidth = 3)

# add legend
land = mpatches.Patch(color='Green', label='Land')
plt.legend(handles=[land],loc=[0,0])

# add annotation
plt.annotate('Shenzhen',xy(114,22),xytext(105,15),
arrowprops=dict(facecolor='black'), transform=ccrs.PlateCarree())

# add text box
plt.text(110,13.5,'southChinasea',fontsize=15,
bbox=dict(facecolor='yellow',alpha=0.15,edgecolor='black'),
transform=ccrs.PlateCarree())
```

output:

```
Text(110, 13.5, 'south China sea')
```
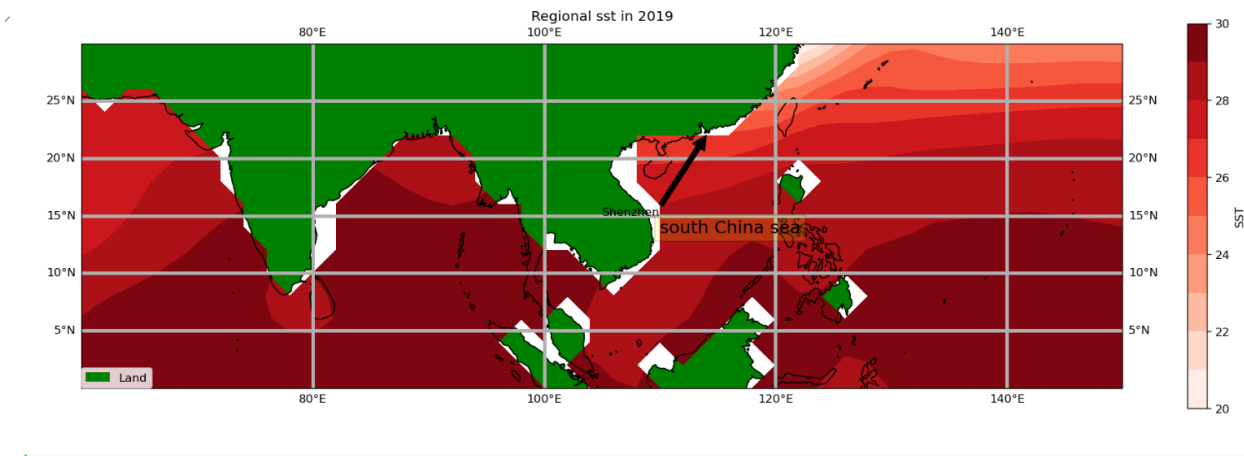

Figure 3