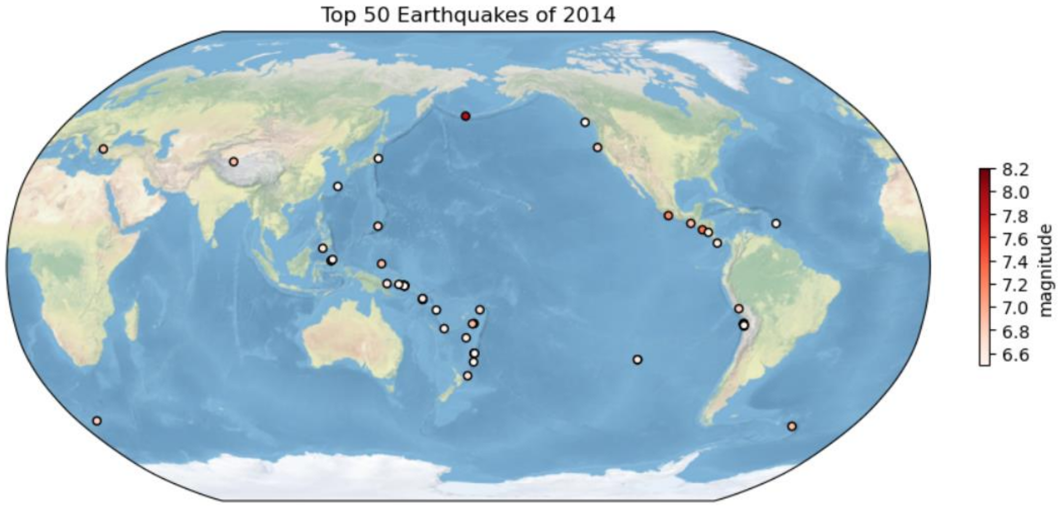
PS4

PS4_1

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

#cite:https://scitools.org.uk/cartopy/docs/v0.14/examples/global_map.html
#select the data
eq= pd.read_csv('usgs_earthquakes.csv')
top_50=(eq.loc[:,['latitude','longitude','mag']]).sort_values('mag',
ascending=False).head(50)
lons=top_50['longitude'].values.tolist()
lats=top_50['latitude'].values.tolist()

#draw the map
plt.figure(figsize=(10,10), dpi=100)
ax = plt.axes(projection=ccrs.Robinson(central_longitude=180))
ax.set_global()
ax.stock_img()
ax.set_title('Top 50 Earthquakes of 2014')

#visualize the data on the map
map_v=ax.scatter(lons, lats, marker='o',c=top_50['mag'], s=20, cmap='Reds',
edgecolors='k', transform=ccrs.PlateCarree())

#color bar
ticks=[6.6, 6.8, 7.0, 7.2, 7.4, 7.6, 7.8, 8.0, 8.2]
cbar= plt.colorbar(map_v, label='magnitude', orientation='vertical', fraction=0.01)
cbar.set_ticks(ticks)

plt.show()
```



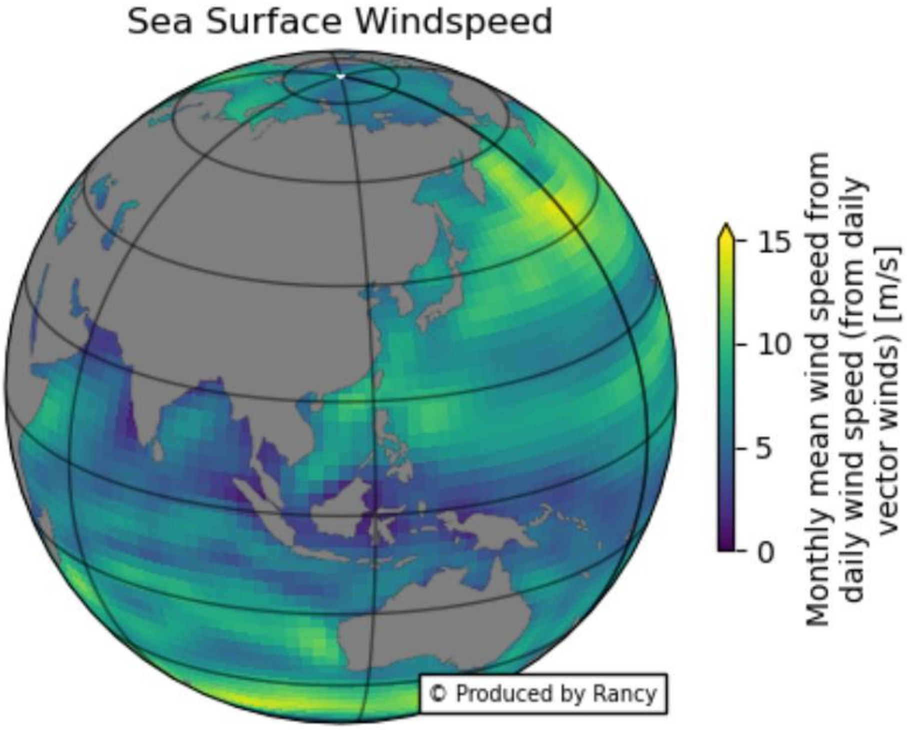
PS4_2

```
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.feature as cfeature
import cartopy.crs as ccrs
from cartopy.mpl.ticker import LongitudeFormatter, LatitudeFormatter
import matplotlib.pyplot as pl
from matplotlib.offsetbox import AnchoredText

#load the data
ds = xr.open_dataset("wspd.mon.mean.nc", engine="netcdf4")
wspd=ds.wspd.sel(level=1000).isel(time=-1)
wspd
```

2.1

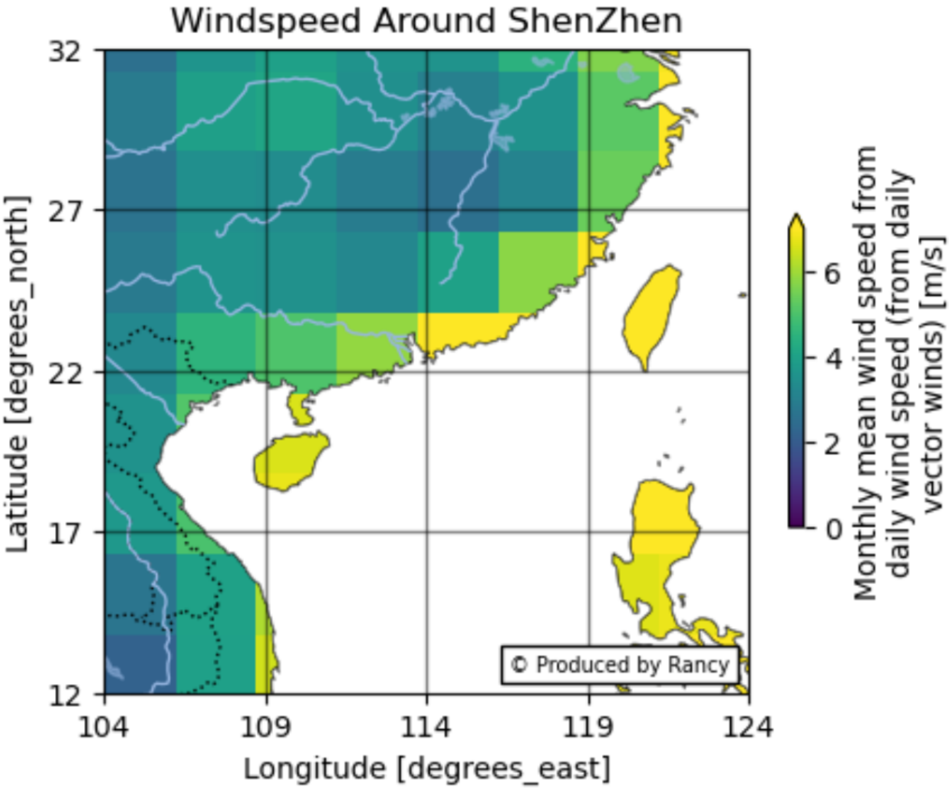
```
# Create and define the size of a figure object
plt.figure(figsize=(5,5), dpi=100)

# Create an axes with Orthographic projection style
central_lon, central_lat = 114.06, 22.54
proj = ccrs.Orthographic(central_lon, central_lat)
ax = plt.axes(projection=proj)

# Add border lines over countries
```

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

# Add lat/lon gridlines, draw gridlines
gl = ax.gridlines(crs=ccrs.PlateCarree(), linewidth=1, color='black', alpha=0.5)

# Plot the windspeed
wspd.plot(ax=ax, transform=ccrs.PlateCarree(),
              vmin=0, vmax=15, cbar_kwargs={'shrink': 0.4})

ax.set_title('Sea Surface Windspeed')

#Mask land data by adding land feature and changing its zorder
ax.add_feature(cfeature.LAND, edgecolor='grey', facecolor='grey',
                          linewidths=0.5, zorder=1)


# Add a text annotation
SOURCE = 'Produced by Rancy'
text = AnchoredText('\u00A9 {}'
                                      ''.format(SOURCE),
                                      loc=4, prop={'size': 7}, frameon=True)
ax.add_artist(text)
```


Sea Surface Windspeed
15
10
5
0
Monthly mean wind speed from daily wind speed (from daily vector winds) [m/s]
© Produced by Rancy

2.2

```
#draw a map around ShenZhen
fig = plt.figure(figsize=(5,5), dpi=100)
ax = fig.add_subplot(1, 1, 1, projection=ccrs.PlateCarree())
ax.set_extent([104, 124, 12, 32], crs=ccrs.PlateCarree())

ax.add_feature(cfeature.LAND)
ax.add_feature(cfeature.OCEAN)
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS, linestyle=':')
ax.add_feature(cfeature.LAKES, alpha=0.5)
ax.add_feature(cfeature.RIVERS)

# Add lat/lon gridlines, draw gridlines
gl = ax.gridlines(crs=ccrs.PlateCarree(), linewidth=1, color='black', alpha=0.5)

# Manipulate latitude and longitude gridline numbers and spacing
gl.ylocator = mticker.FixedLocator(np.arange(12,32,5))
gl.xlocator = mticker.FixedLocator(np.arange(104,124,5))

ax.set_xticks([104,109,114,119,124], crs=ccrs.PlateCarree())
ax.set_yticks([12,17,22,27,32], crs=ccrs.PlateCarree())


# Plot the windspeed
wspd.plot(ax=ax, transform=ccrs.PlateCarree(),
          vmin=0, vmax=7, cbar_kwargs={'shrink': 0.4})

#set title
ax.set_title('Windspeed Around ShenZhen')

# Mask ocean data by adding ocean feature and changing its zorder
ax.add_feature(cfeature.OCEAN, edgecolor='grey', facecolor='white',
                  linewidths=0.5, zorder=1)

# Add a text annotation
SOURCE = 'Produced by Rancy'
text = AnchoredText('\u00A9 {}'
                         ''.format(SOURCE),
                         loc=4, prop={'size': 7}, frameon=True)
ax.add_artist(text)
```


Windspeed Around ShenZhen
32
27
22
17
12
104
109
114
119
124
Latitude [degrees_north]
Longitude [degrees_east]
© Produced by Rancy
0
2
4
6
Monthly mean wind speed from daily wind speed (from daily vector winds) [m/s]