

1. Global Earthquakes

In [133...

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import cartopy.crs as ccrs
import cartopy.feature as cfeature

# 读取数据
data = pd.read_csv('usgs_earthquakes.csv')

# 确保 'time' 列是日期格式
data['time'] = pd.to_datetime(data['time'])

# 选择2014年的地震数据
data_2014 = data[data['time'].dt.year == 2014]

# 选择前50次地震数据
data_2014 = data_2014.nlargest(50, 'mag')

# 提取经纬度和震级数据
lats = data_2014['latitude']
lons = data_2014['longitude']
mags = data_2014['mag']

# 创建地图和图形
fig = plt.figure(figsize=(15, 8))
ax = fig.add_subplot(1, 1, 1, projection=ccrs.Robinson(central_longitude=180.0))

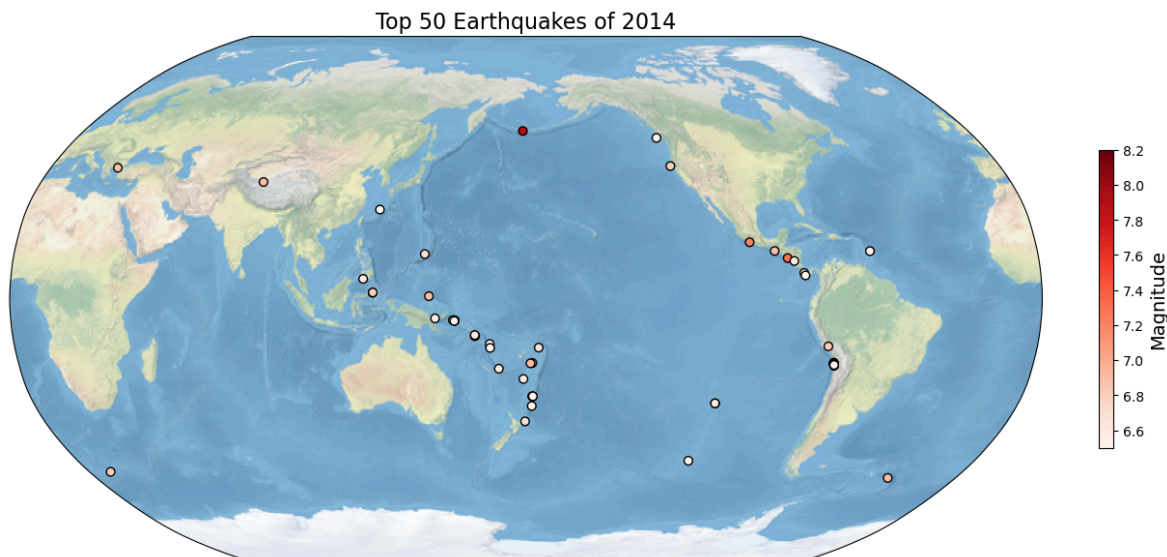
# 添加地图特征
ax.add_feature(cfeature.COASTLINE, edgecolor='none')
ax.add_feature(cfeature.LAND)
ax.add_feature(cfeature.OCEAN)

# 添加地图背景
ax.stock_img()

# 绘制地震点
scatter = ax.scatter(lons, lats, c=mags, cmap='Reds', edgecolor='black', transform=fig.transData)

# 添加颜色条
cbar = plt.colorbar(scatter, orientation='vertical', fraction=0.03, pad=0.05, shrink=0.5)
cbar.set_label('Magnitude', fontsize=14)
cbar.set_ticks(np.arange(6.6, 8.3, 0.2))

# 添加标题
plt.title('Top 50 Earthquakes of 2014', fontsize=16, loc='center')
plt.show()
```



2. Explore a netCDF dataset

In [202...

```
import xarray as xr
import matplotlib.pyplot as plt
import glob
import cartopy.crs as ccrs
import cartopy.feature as cfeature

# 读取数据
folder_path = 'D:/ESE5023/output_file'
files = glob.glob(f'{folder_path}/*.nc4')
ds = xr.open_mfdataset(files, combine='nested', concat_dim='time')

# 选择变量 XC02
variable = ds['XC02'].isel(time=0) # 选择第一个时间步骤

#2.1
# 创建全局地图
fig, ax = plt.subplots(figsize=(15, 8), subplot_kw={'projection': ccrs.PlateCarree})

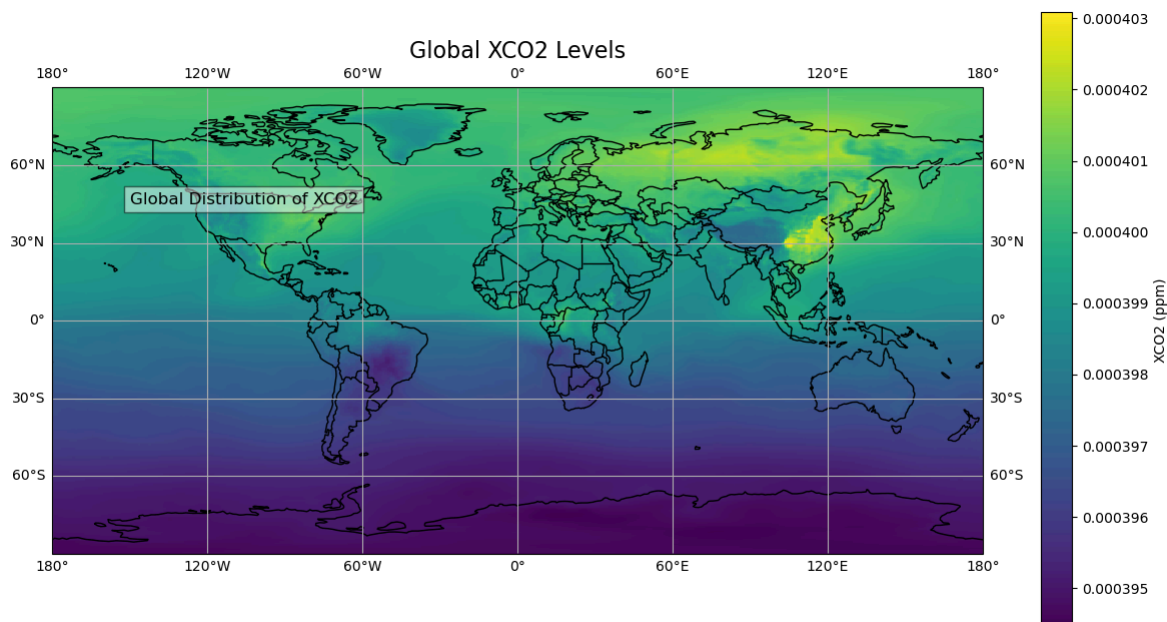
# 添加地图特征
ax.add_feature(cfeature.LAND)
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS)
ax.gridlines(draw_labels = True)

# 绘制变量
pcm = variable.plot(ax=ax, cmap='viridis', add_colorbar=True, cbar_kwargs={'label': 'XC02'})

# 标题和标签
ax.set_title('Global XC02 Levels', fontsize=16)
ax.set_xlabel('Longitude', fontsize=12)
ax.set_ylabel('Latitude', fontsize=12)

# 添加注释
ax.text(-150, 45, 'Global Distribution of XC02', fontsize=12, bbox=dict(facecolor='white',
                                edgecolor='black',
                                width=200,
                                height=50))

plt.show()
```



In [261...

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#2.2
# 创建区域地图
fig, ax = plt.subplots(figsize=(15, 8), subplot_kw={'projection': ccrs.LambertCo
# 设置区域范围（美国东部）
ax.set_extent([-100, -60, 20, 50], crs=ccrs.PlateCarree())

# 添加地图特征
ax.add_feature(cfeature.LAND)
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS)

# 绘制变量
pcm = variable.sel(lon=slice(-100, -60), lat=slice(20, 50)).plot(ax=ax, cmap='vi

# 标题和标签
ax.set_title('Regional XCO2 Levels (Eastern US)', fontsize=16)
ax.set_xlabel('Longitude', fontsize=12)
ax.set_ylabel('Latitude', fontsize=12)
ax.gridlines(draw_labels = True)

# 添加注释
ax.text(-80, 30, 'East Coast XCO2 Levels', fontsize=12, bbox=dict(facecolor='whi

plt.show()
```

