Report

1

1、读取数据，根据地震震级进行排列，获取地震震级排名前 50 的的地震数据。

```
# Show plots in the notebook
ds = pd.read_csv('usgs_earthquakes.csv')
ds
ds1 = ds.sort_values(by='mag', ascending=False).head(50)
ds1
# 创建地图投影
```

2、创建地图投影，添加海岸线、边界、国家

```
fig, ax = plt.subplots(figsize=(24, 16), subplot_kw={'projection': ccrs.Robinson(central_longitude=180)})
ax.set_global()
# 添加海岸线、边界和国家
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS, linestyle=':', edgecolor='gray')
```

3、获取经纬度、地震震级

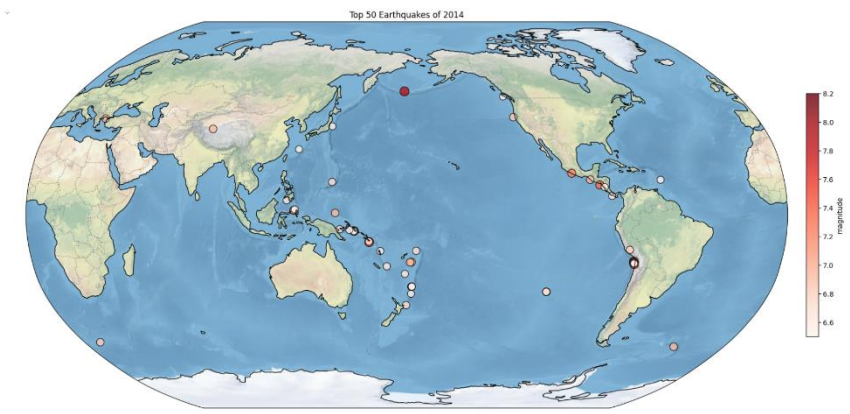
```
lons = ds1['longitude'].values
lats = ds1['latitude'].values
magnitudes = ds1['mag'].values
```

4、标记地震点位，添加颜色条，添加标题以及地球的背景，结果如下

```
sc = ax.scatter(lons, lats, c=magnitudes, cmap='Reds', s=magnitudes ** 2.5, alpha=0.8, edgecolors='k', linewidth=1,
                transform=ccrs.PlateCarree())

# 添加颜色条
cbar = plt.colorbar(sc, orientation='vertical', pad=0.02, aspect=20, shrink=0.4)
cbar.set_label('magnitude')

# 添加标题
plt.title('Top 50 Earthquakes of 2014')
ax.stock_img()  #添加地球背景
```



2.1

1、读取文件，求取月平均，提出数据经纬度以及氨气浓度数据，创建经纬度二维网络

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

# 读取 NetCDF 文件  # 替换为实际的文件路径
ds = xr.open_dataset('SNDR.J1.ATMS.202207.M01.L3_RAMSES2.std.v03_24.G.230413193930.nc')
ds
```

```
lons = ds['lon'].values
lats = ds['lat'].values
nh3 = ds['surf_temp'].values  # 替换为实际的变量名
nh3 = np.nanmean(nh3, 0)
# 创建二维网格
lon_2d, lat_2d = np.meshgrid(lons, lats)
```

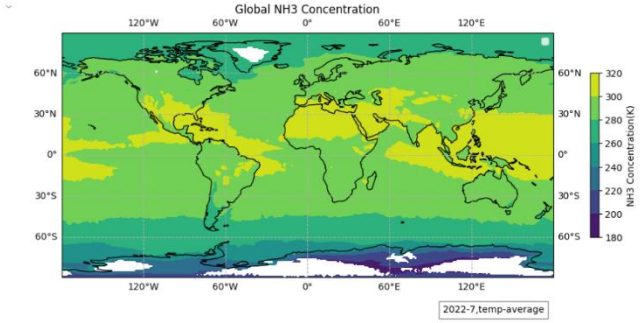
2、创建地图投影，加上地图特征（海岸线、等特征），画二维图

```
fig, ax = plt.subplots(figsize=(12, 8), subplot_kw={'projection': ccrs.PlateCarree()})
# 添加地图特征
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS, linestyle=':', edgecolor='gray')
# 绘制 NH3 浓度分布
cmap = plt.get_cmap('viridis')  # 替换为实际的颜色映射
im = ax.contourf(lon_2d, lat_2d, nh3, cmap=cmap, transform=ccrs.PlateCarree())
```

3、添加颜色条、标题、网格线、坐标轴标签

```
cbar = plt.colorbar(im, orientation='vertical', pad=0.06, aspect=20, shrink=0.4, label='NH3 Concentration(K)')
# 添加标题
plt.title('Global NH3 Concentration')
# 添加网格线
ax.gridlines(draw_labels=True, linestyle='--')
# 添加坐标轴标签
ax.set_xlabel('Longitude')
ax.set_ylabel('Latitude')

# 添加图例
ax.legend()
# 添加文本框
fig.text(0.6, 0.2, '2022-7,temp-average', bbox=dict(facecolor='white', alpha=0.5))
```



2.2

1、画中国区域的月均温度，通过 np.where 获取中国的区域

```
# 获取中国区域的经纬度索引
china_lon_indices = np.where((lons >= 73.6) & (lons <= 135.0))[0]
china_lat_indices = np.where((lats >= 3.86) & (lats <= 53.55))[0]

# 使用索引获取中国区域的 NH3 数据
nh3_china = nh3[china_lat_indices][:, china_lon_indices]

# 获取中国区域的经度和纬度信息
lons_china = lons[china_lon_indices]
lats_china = lats[china_lat_indices]
```

2、通过 countries = cfeature.NaturalEarthFeature

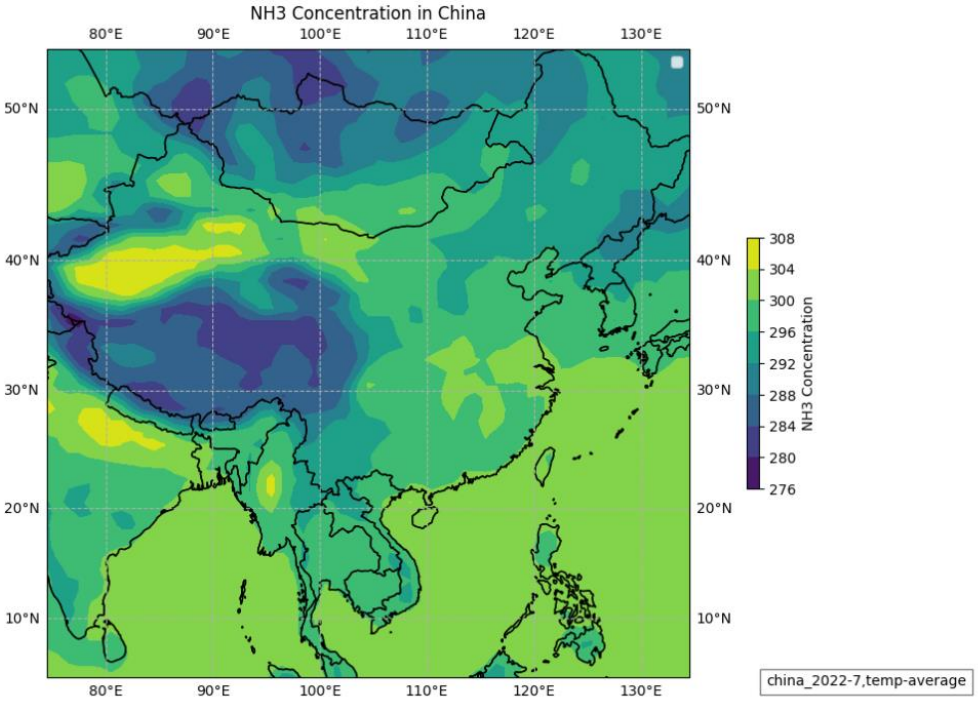
画出国家的分界

```
ax.add_feature(cfeature.COASTLINE)
ax.add_feature(cfeature.BORDERS, linestyle=':', edgecolor='gray')
countries = cfeature.NaturalEarthFeature(
    category='cultural',
    name='admin_0_countries',
    scale='50m',
    facecolor='none',
    edgecolor='black'
)
ax.add_feature(countries)
```

3、绘制中国区域 NH3 浓度分布，再添加一些图的细节

```
# 绘制中国区域 NH3 浓度分布
cmap = plt.get_cmap('viridis')  # 替换为实际的颜色映射
im = ax.contourf(lon_2d_china, lat_2d_china, nh3_china, cmap=cmap, transform=ccrs.PlateCarree())
# 添加颜色条
cbar = plt.colorbar(im, orientation='vertical', pad=0.06, aspect=20, shrink=0.4, label='NH3 Concentration')
# 添加标题
plt.title('NH3 Concentration in China')
# 修改坐标轴标签
ax.set_xlabel('Longitude (Mercator)')
ax.set_ylabel('Latitude (Mercator)')
# 添加网格线
ax.gridlines(draw_labels=True, linestyle='--')
# 添加图例
ax.legend()
# 添加文本框
fig.text(0.8, 0.1, 'china_2022-7,temp-average', bbox=dict(facecolor='white', alpha=0.5))
```

结果如下


NH3 Concentration in China
80°E
90°E
100°E
110°E
120°E
130°E
50°N
40°N
30°N
20°N
10°N
308
304
300
296
292
288
284
280
276
NH3 Concentration
china_2022-7,temp-average