

```
# Import modules
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
import netCDF4
```

EX1 Global Earthquakes

```
# read the file by using pandas
EarthquakeData=pd.read_csv("usgs_earthquakes.csv")
# use sort_values() to get the largest 50 earthquakes , and reset_index() to get
only first 50
EarthquakeData50=EarthquakeData.sort_values("mag",ascending=False).head(50).rese
t_index(drop=True)
```

```
# create the figure object
plt.figure(figsize=(12,8),dpi=200)
# set the projection with pobison and
proj=ccrs.Robinson(central_longitude=180 , globe=None)
ax=plt.axes(projection=proj)
# using data from existing package in Natural Earth
ax.stock_img()
ax.set_global()
# plot the scatter plot of the largest 50 earthquakes
# first making a symbol of these data
x=EarthquakeData50["longitude"]
y=EarthquakeData50["latitude"]
Mag=EarthquakeData50["mag"]
plt.scatter(x,y,c=Mag,cmap="Reds",edgecolors="black",marker="o",transform=ccrs.P
lateCarree())
# set the scale and label of colorbar
plt.colorbar(shrink=0.5,label="Magnitude")
# add title for the picture
plt.title("Top 50 earthquakes at 2014",fontsize=16)
plt.show()
```

```
# open the Soil Moisture data by xarray with engine net64
ds=xr.open_dataset("soilw.mon.mean.v2.nc",engine="netcdf4")
```

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# set the data in 2018 and calculate the average moisture
Soil_data=ds.soilw.sel(time="2018")
Soil_data_2018=np.mean(Soil_data,axis=0)
```

[illegible]


```

        facecolor='none',
        edgecolor='black',
        linewidth=1.5))

# set the regional drawing area
extent=[116.2-32,116.2+20,39.5-36,39.5+15]
ax.set_extent(extent)
# plot the contour figure based on the soil data
soil_data_2018.plot.contourf(ax=ax,transform=ccrs.PlateCarree(),cbar_kwarg=
{"shrink":0.5,"label":"Soil Moisture"})
# add Beijing as a point
# add annotate for the picture
bbox=dict(boxstyle="round", alpha=0.3, facecolor="0.7")
arrowprop=dict()
plt.annotate("Beijing",xy=(116.2,39.5),xytext=(116.2,42),bbox=bbox)
# add x,y labels and scale
plt.xticks(ticks=np.arange(-180,181,60),fontsize=12)
plt.yticks(ticks=np.arange(-90,91,30),fontsize=12)
plt.xlabel("Longitude",fontsize=12)
plt.ylabel("Latitude",fontsize=12)
# add title for the picture
plt.title("Average soil moisture in 2018", fontsize=14)
# add legend
plt.legend(title="China part",loc="best",fontsize=0.2)

```

No artists with labels found to put in legend. Note that artists whose label start with an underscore are ignored when legend() is called with no argument.

```
<matplotlib.legend.Legend at 0x182d4e07fa0>
```

Average soil moisture in 2018

