In [1]:

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

1. Global Earthquakes

In [2]:

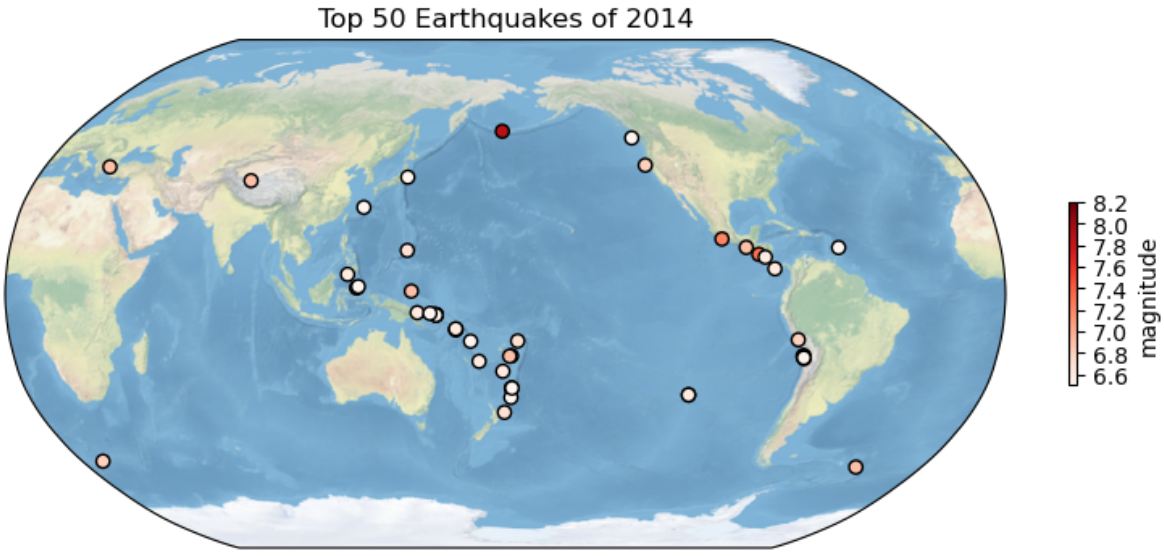
```
# 读取和检查数据
Eq = pd.read_csv("usgs_earthquakes.csv")
Eq.head()
```

Out[2]:

	time	latitude	longitude	depth	mag	magType	nst	gap	dmin	rms	net
0	2014-01-31 23:53:37.000	60.252000	-152.7081	90.20	1.10	ml	NaN	NaN	NaN	0.2900	ak
1	2014-01-31 23:48:35.452	37.070300	-115.1309	0.00	1.33	ml	4.0	171.43	0.34200	0.0247	nn
2	2014-01-31 23:47:24.000	64.671700	-149.2528	7.10	1.30	ml	NaN	NaN	NaN	1.0000	ak
3	2014-01-31 23:30:54.000	63.188700	-148.9575	96.50	0.80	ml	NaN	NaN	NaN	1.0700	ak
4	2014-01-31 23:30:52.210	32.616833	-115.6925	10.59	1.34	ml	6.0	285.00	0.04321	0.2000	ci

In [5]:

```
#选取数据，将最大的50个值排序
data = Eq.sort_values('mag', ascending = False)[:50]
data
#画图
fig = plt.figure(figsize=(10,5), dpi=100)
ax = plt.axes(projection=ccrs.Robinson(central_longitude=180))
#让海洋呈现蓝色，将陆地和海洋分开
ax.stock_img()
ax.set_title('Top 50 Earthquakes of 2014')

AA = ax.scatter(data.longitude,data.latitude,c=data['mag'],edgecolors = 'k',cmap='Reds',transfo
fig.colorbar(AA, shrink =0.3 ,ticks = np.linspace(6.6,8.2,9) ,label = 'magnitude')
plt.show()
```



2. Explore a netCDF dataset

In [6]:

```
# 读取并检查数据
ds = xr.open_dataset('MERRA2.statM_2d_pct_Nx.202109.nc4')
ds
```

Out[6]:

xarray.Dataset

► Dimensions: (**lon**: 576, **lat**: 361, **time**: 1)

► Coordinates: (3)

▼ Data variables:

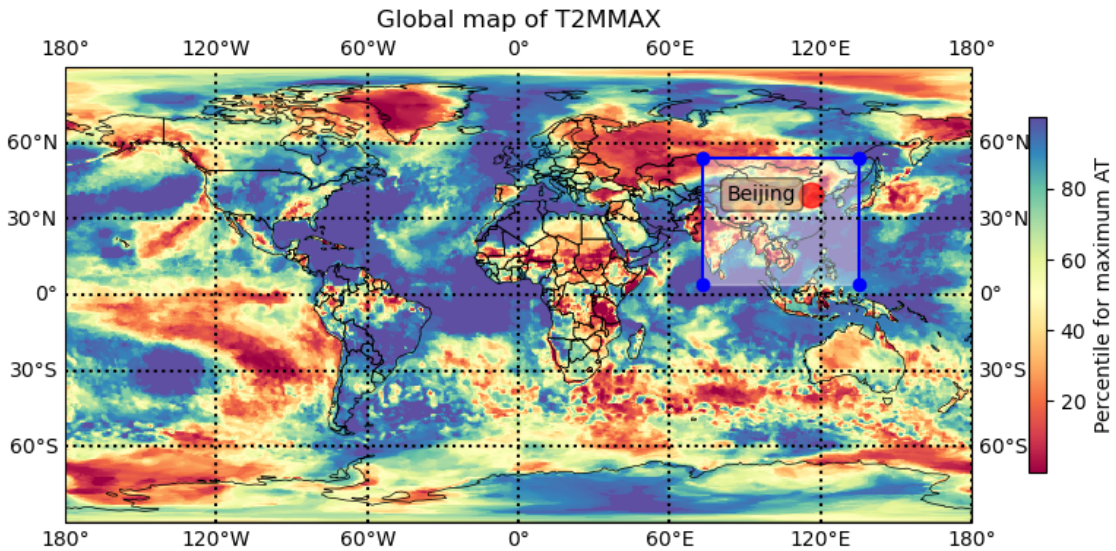
T2MMEAN	(time, lat, lon)	float32	...
T2MMAX	(time, lat, lon)	float32	...
T2MMIN	(time, lat, lon)	float32	...
PRECTOT	(time, lat, lon)	float32	...

► Attributes: (30)

2.1 Make a global map of T2MMAX

In [44]:

```
# 创建画布
fig = plt.figure(figsize=(10, 8),dpi=100)

ax = plt.axes(projection=ccrs.PlateCarree())
# 画图
ds['T2MMAX'].plot(transform=ccrs.PlateCarree(),cmap='Spectral',cbar_kwargs={'shrink': 0.4,'labe

# 添加边界线
ax.add_feature(cfeature.NaturalEarthFeature(category='cultural',
                                            name='admin_0_countries',
                                            scale='110m',
                                            facecolor='none',
                                            edgecolor='black',
                                            linewidth=0.5))

# 添加注释
x, y =  [73,73,135,135] , [3.8,54,54,3.8]
ax.plot(x, y, marker='o',color='blue', transform=ccrs.PlateCarree())
ax.fill(x, y, color='white', transform=ccrs.PlateCarree(), alpha=0.4)
central_lon, central_lat = 116.25,39.54
ax.plot(central_lon,central_lat, marker='o', color='red', markersize=12,
            alpha=0.7, transform=ccrs.PlateCarree())

# 添加文本
geodetic_transform = ccrs.Geodetic()._as_mpl_transform(ax)
text_transform = offset_copy(geodetic_transform, units='dots', x=-10)

ax.text(central_lon,central_lat, 'Beijing',
            verticalalignment='center', horizontalalignment='right',
            transform=text_transform,
            bbox=dict(facecolor='sandybrown', alpha=0.5, boxstyle='round'))

# 添加坐标轴,但是不知为何图片中不展示
plt.xlabel('Longitude')
plt.ylabel('Latitude')
# 创建网格线
ax.gridlines(draw_labels=True,linestyle=":",linewidth=1.5,color='k')
# 添加标题
plt.title("Global map of T2MMAX")

plt.show()
```



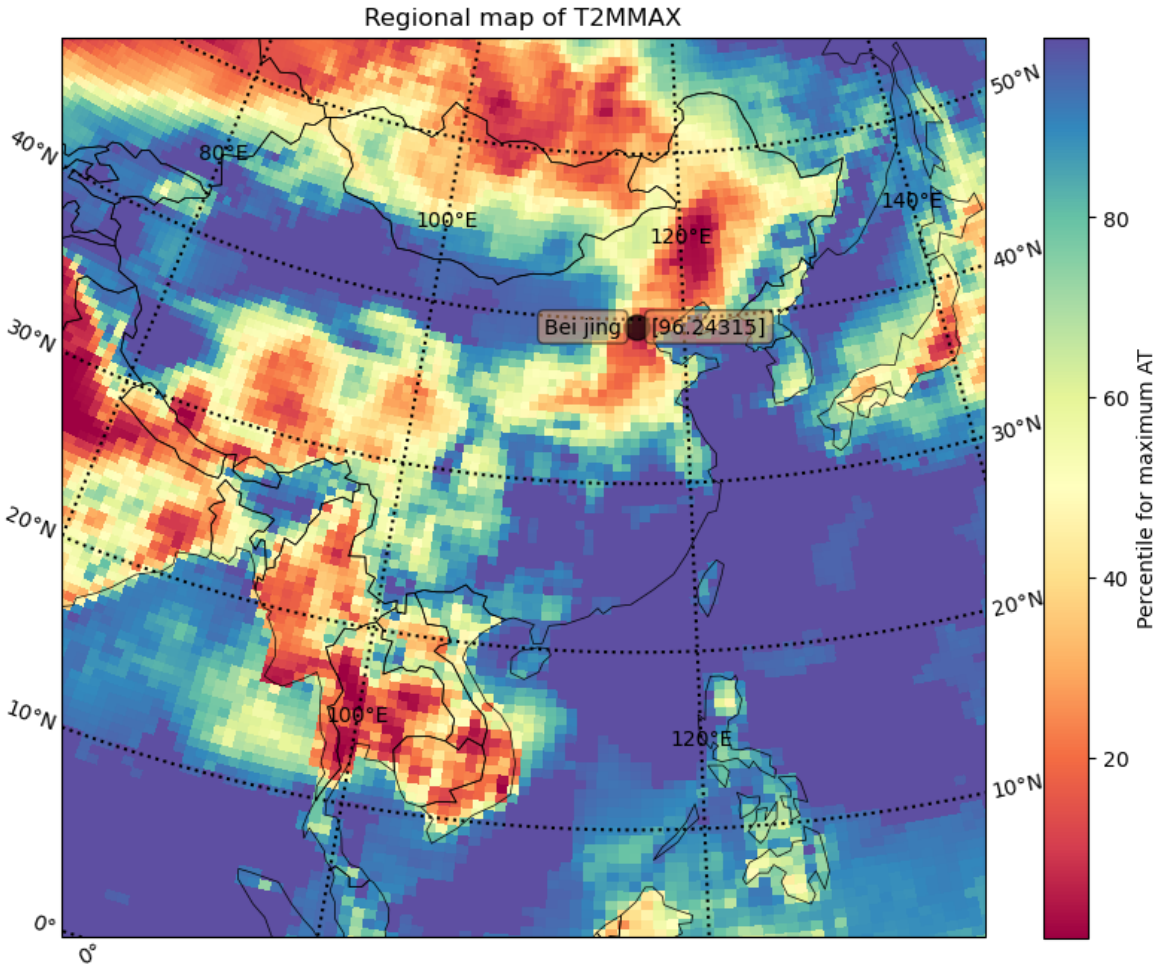
2.2 Make a regional map of T2MMAX

In [47]:

```
# 创建画布
plt.figure(figsize=(10,10),dpi=100)
central_lon, central_lat = 116.25,39.54
proj = ccrs.LambertConformal(central_lon,central_lat)
ax = plt.axes(projection=proj)

# 画图
ds['T2MMAX'].plot(transform=ccrs.PlateCarree(),cmap='Spectral',cbar_kwargs={'shrink': 0.8,'labe

# 设置并应用范围
extent = [central_lon-30,central_lon+18,central_lat-35.74,central_lat+14.46]
ax.set_extent(extent)

# 添加边界线
ax.add_feature(cfeature.NaturalEarthFeature(category='cultural',
                                            name='admin_0_countries',
                                            scale='110m',
                                            facecolor='none',
                                            edgecolor='black',
                                            linewidth=0.5))
ax.add_feature(cfeature.LAND, edgecolor='black')

# 北京的T2MMAX值
T2MMAX_BJ = ds.T2MMAX.sel(lon='114.0',lat='22.5', method='nearest').values

ax.plot(central_lon,central_lat, marker='o', color='black', markersize=12,
            alpha=0.7, transform=ccrs.PlateCarree())

# 添加注释文本
geodetic_transform = ccrs.Geodetic()._as_mpl_transform(ax)
text_transform = offset_copy(geodetic_transform, units='dots', x=-10)
text_transform1 = offset_copy(geodetic_transform, units='dots', x=+10)

ax.text(central_lon,central_lat,T2MMAX_BJ,
            verticalalignment='center', horizontalalignment='left',
            transform=text_transform1,
            bbox=dict(facecolor='sandybrown', alpha=0.5, boxstyle='round'))
ax.text(central_lon,central_lat,'Bei jing',
            verticalalignment='center', horizontalalignment='right',
            transform=text_transform,
            bbox=dict(facecolor='sandybrown', alpha=0.5, boxstyle='round'))

# 添加网格线
ax.gridlines(draw_labels=True,linestyle=":",linewidth=1.5,color='k')

# 添加标题
plt.title("Regional map of T2MMAX")
plt.show()
```

```
F:\Anaconda3\lib\site-packages\xarray\core\indexes.py:234: FutureWarning: Passing
method to Float64Index.get_loc is deprecated and will raise in a future version.
Use index.get_indexer([item], method=...) instead.
  indexer = self.index.get_loc(
F:\Anaconda3\lib\site-packages\xarray\core\indexes.py:234: FutureWarning: Passing
method to Float64Index.get_loc is deprecated and will raise in a future version.
Use index.get_indexer([item], method=...) instead.
  indexer = self.index.get_loc(
F:\Anaconda3\lib\site-packages\matplotlib\text.py:1223: FutureWarning: elementwis
```

```
e comparison failed; returning scalar instead, but in the future will perform ele
mentwise comparison
  if s != self._text:
F:\Anaconda3\lib\site-packages\cartopy\crs.py:245: ShapelyDeprecationWarning: __l
en__ for multi-part geometries is deprecated and will be removed in Shapely 2.0.
Check the length of the `geoms` property instead to get the  number of parts of a
multi-part geometry.
  if len(multi_line_string) > 1:
F:\Anaconda3\lib\site-packages\cartopy\crs.py:297: ShapelyDeprecationWarning: Ite
ration over multi-part geometries is deprecated and will be removed in Shapely 2.
0. Use the `geoms` property to access the constituent parts of a multi-part geome
try.
  for line in multi_line_string:
F:\Anaconda3\lib\site-packages\cartopy\crs.py:364: ShapelyDeprecationWarning: __l
en__ for multi-part geometries is deprecated and will be removed in Shapely 2.0.
Check the length of the `geoms` property instead to get the  number of parts of a
multi-part geometry.
  if len(p_mline) > 0:
```



In [ ]:

```
1
```