Explore a netCDF dataset

2.1

In [2]:

```
# Import modules
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
```

In [3]:

```
ds= xr.open_dataset("CERES_EBAF-TOA_200003-201701.nc")
ds
```

Out[3]:

xarray.Dataset

▶ Dimensions: (**lat**: 180, **lon**: 360, **time**: 203)

▼ Coordinates:

lon	(lon)	float32	0.5 1.5 2.5 ... 357.5 358.5 35…
time	(time)	datetime64[ns]	2000-03-15 ... 2017-01-15
lat	(lat)	float32	-89.5 -88.5 -87.5 ... 88.5 89.5

▼ Data variables:

toa_sw_all_mon	(time, lat, lon)	float32	...
toa_lw_all_mon	(time, lat, lon)	float32	...
toa_net_all_mon	(time, lat, lon)	float32	...
toa_sw_clr_mon	(time, lat, lon)	float32	...
toa_lw_clr_mon	(time, lat, lon)	float32	...
toa_net_clr_mon	(time, lat, lon)	float32	...
toa_cre_sw_mon	(time, lat, lon)	float32	...
toa_cre_lw_mon	(time, lat, lon)	float32	...
toa_cre_net_mon	(time, lat, lon)	float32	...
solar_mon	(time, lat, lon)	float32	...
cldarea_total_d…	(time, lat, lon)	float32	...
cldpress_total_…	(time, lat, lon)	float32	...
cldtemp_total_d…	(time, lat, lon)	float32	...
cldtau_total_da…	(time, lat, lon)	float32	...

▼ Attributes:

title :	CERES EBAF (Energy Balanced and Filled) TOA Fluxes. Monthly Averages and 07/2005 to 06/2015 Climatology.
institution :	NASA/LaRC (Langley Research Center) Hampton, Va
Conventions :	CF-1.4
comment :	Data is from East to West and South to North.
Version :	Edition 4.0; Release Date March 7, 2017
Fill_Value :	Fill Value is -999.0
DOI :	10.5067/TERRA+AQUA/CERES/EBAF-TOA_L3B.004.0
Production_Files :	List of files used in creating the present Master netCDF file: /homedir/nloeb/ebaf/monthly_means/adj_fluxes/deliverable/sw*.gz /homedir/nloeb/ebaf/monthly_means/adj_fluxes/deliverable/lw*.gz /homedir/nloeb/ebaf/monthly_means/adj_fluxes/deliverable/net*.gz /homedir/nloeb/ebaf/monthly_means/adj_fluxes/deliverable/solflx*.gz /homedir/nloeb/ebaf/monthly_means/out_glob.dat

In [28]:

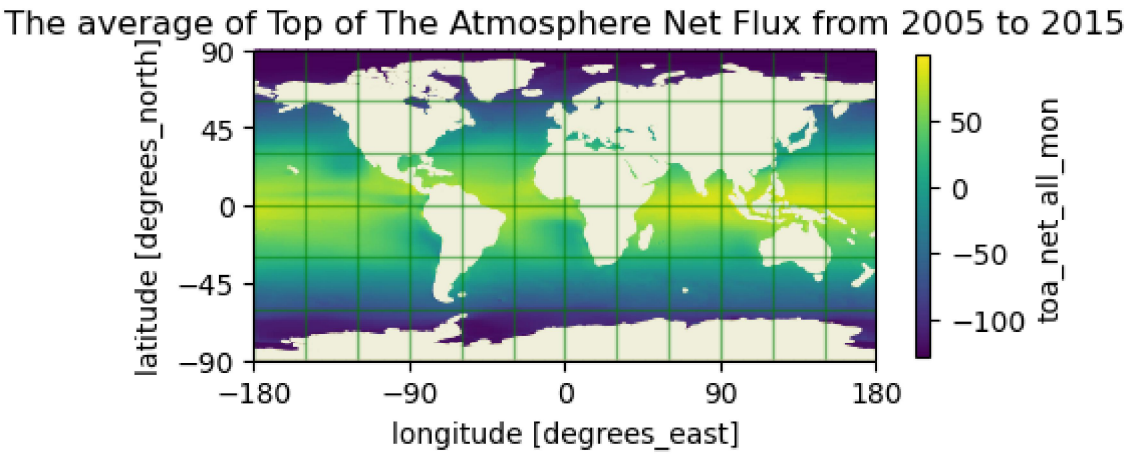
```
ds1=ds.toa_net_all_mon.mean(dim="time")

ds1_min=ds1.min()
ds1_max=ds1.max()

ds2=ds.toa_sw_all_mon.mean(dim="time")
ds2_min=ds2.min()
ds2_max=ds2.max()
```

In [5]:

```
# 建立绘图面板
plt.figure(figsize=(5,5), dpi=100)

# 确定投影类型
proj = ccrs.PlateCarree()
ax = plt.axes(projection=proj)
ax.tick_params(labelsize=10)
ax.set_xticks(np.linspace(-180, 180, 5), crs=ccrs.PlateCarree())
ax.set_yticks(np.linspace(-90, 90, 5), crs=ccrs.PlateCarree())

# 绘制高空云区域时间平均TOA长波2D图
ds1.plot(ax=ax, transform=ccrs.PlateCarree(),
         vmin=ds1_min, vmax=ds1_max, cbar_kwargs={'shrink': 0.4})

# 增加国家边界
ax.add_feature(cfeature.NaturalEarthFeature(category='cultural',
                                            name='admin_0_countries',
                                            scale='110m',
                                            facecolor='none',
                                            edgecolor='yellow',
                                            linewidth=0.5))

# 增加经纬线
gl = ax.gridlines(crs=ccrs.PlateCarree(), linewidth=1, color='green', alpha=0.5)

# 设置经纬线间距
gl.ylocator = mticker.FixedLocator(np.arange(-90,90,30))
gl.xlocator = mticker.FixedLocator(np.arange(-180, 180, 30))
#添加陆地
ax.add_feature(cfeature.LAND, zorder=1)
#图题
plt.title("The average Top of The Atmosphere Net Flux from 2005 to 2015")
```

Out[5]:

```
Text(0.5, 1.0, 'The average of Top of The Atmosphere Net Flux from 2005 to 2015')
```



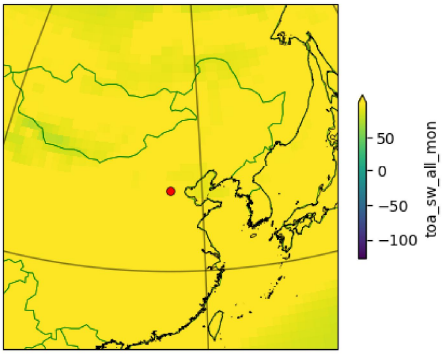
2.2

In [31]:

```
# 建立绘图面板
plt.figure(figsize=(5,5), dpi=100)

# 选择保定区域
central_lon, central_lat = 115.47, 38.87 # Baoding

# 选择地图类型
proj = ccrs.Orthographic(central_lon, central_lat)
ax = plt.axes(projection=proj)

# 设置区域并绘图
extent = [central_lon-20, central_lon+20, central_lat-20, central_lat+20]
ax.set_extent(extent)

# 绘制Ttoa_sw_all_mon
ds2.plot(ax=ax, transform=ccrs.PlateCarree(),
         vmin=ds1_min, vmax=ds1_max, cbar_kwargs={'shrink': 0.4})

# 增加边界
ax.add_feature(cfeature.NaturalEarthFeature(category='cultural',
                                            name='admin_0_countries',
                                            scale='110m',
                                            facecolor='none',
                                            edgecolor='green',
                                            linewidth=0.5))
ax.coastlines(resolution='10m', linewidth=0.5)
ax.stock_img()

#标记保定的位置
ax.scatter(115.47, 38.87,s=30,c='r',marker='o',zorder=5,edgecolors='k', linewidths=0.5)

# 增加经纬线
gl = ax.gridlines(crs=ccrs.PlateCarree(), linewidth=1, color='black', alpha=0.5)

# 设置经纬线间距
gl.ylocator = mticker.FixedLocator(np.arange(-90,90,30))
gl.xlocator = mticker.FixedLocator(np.arange(-180, 180, 30))

#覆盖陆地
#ax.add_feature(cfeature.LAND, zorder=1)运行不出来，就加了#

#给图形添加要素
ax.text(0.995,
 -0.13,
 "The average Top of The Atmosphere Shortwave Flux around the Baoding  from 2005 to 2015",
 horizontalalignment='left',
 transform=ax.transAxes,
 fontsize=12,
 bbox=dict(boxstyle='square, pad=0.25',
 facecolor='white',
 edgecolor='yellow'))
```

Out[31]:

```
Text(0.995, -0.13, 'The average Top of The Atmosphere Shortwave Flux around the Baod
ing  from 2005 to 2015')
```



The average Top of The Atmosphere Shortwave Flux around the Baoding from 2005 to 2015

In [ ]:

In [ ]: