

# 04b\_python-map-plotting

June 24, 2015

## 1 Plotting the Walrus Data on a map

```
In [3]: import os
import pandas as pd
import numpy as np
```

```
In [4]: filename = os.path.join('Walrus_Data', 'Walruses.csv')
df = pd.read_csv(filename, parse_dates=[1],
                 thousands=',')
df.head(5)
```

```
Out[4]:
```

	Walrus	DateTimeUTC	Xcoord	Ycoord	Behav	Longitude	\
0	271	2008-05-31 19:25:00	95616.95	-528324.60	1.00900	-167.956095	
1	271	2008-06-01 03:24:00	84741.71	-511653.75	1.00050	-168.177987	
2	271	2008-06-01 11:24:00	71834.45	-491176.95	1.00625	-168.444360	
3	271	2008-06-01 19:24:00	65275.80	-478935.62	1.02025	-168.580284	
4	271	2008-06-02 03:24:00	69343.24	-473948.91	1.00775	-168.489215	

	Latitude
0	65.248715
1	65.401217
2	65.587969
3	65.699143
4	65.742984

### 1.0.1 Selecting each Walrus

```
In [5]: wd = df.pivot(index='DateTimeUTC', columns='Walrus') #row, column, values (optional)
w271 = df.ix[df.Walrus == 271]
w281 = df.ix[df.Walrus == 281]
w322 = df.ix[df.Walrus == 322]
```

### 1.0.2 Plotting the walrus behavior

Several steps: 1. Create a map centered around the region 2. Draw coastlines 3. Draw countries 4. Fill oceans and coastline 5. Draw the observations of the walrus on map

```
In [14]: %matplotlib inline

import matplotlib.pyplot as plt
from mpl_toolkits.basemap import Basemap

?Basemap.drawmeridians
```

### 1.0.3 Drawing an empty map of the region

```
In [20]: lons = w281.Longitude.values
        lats = w281.Latitude.values
        lons_c=np.average(lons)
        lats_c=np.average(lats)
        print (lons_c, lats_c)

(-169.59596290181815, 66.676100493272713)

In [21]: #
        map = Basemap(width=1400000,height=1100000,projection='lcc', resolution='h',
                      lat_0=lats_c+2,lon_0=lons_c)

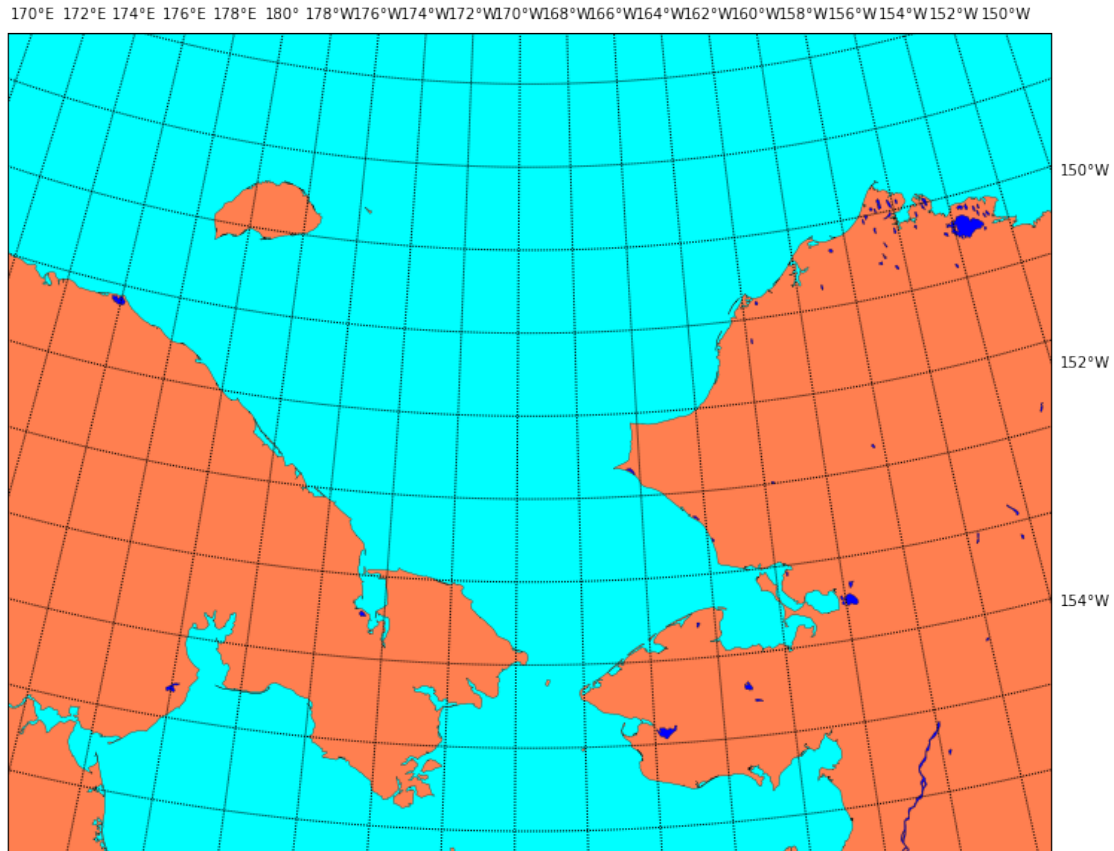
        fig=plt.figure(figsize=(12,9))
        ax = fig.add_axes([0.05,0.05,0.9,0.85])

        # draw coastlines, country boundaries, fill continents.
        map.drawcoastlines(linewidth=0.25)
        map.drawcountries(linewidth=0.25)
        map.fillcontinents(color='coral',lake_color='blue')

        # draw the edge of the map projection region (the projection limb)
        map.drawmapboundary(fill_color='aqua')

        # create a grid
        # draw lat/lon grid lines every 2 degrees.
        map.drawmeridians(np.arange(0,360,2), labels=[False, True, True, False])
        map.drawparallels(np.arange(-90,90,1), lables=[True, False, False, True])

Out[21]: {63: ([<matplotlib.lines.Line2D at 0x11905ef10>,
               <matplotlib.lines.Line2D at 0x11a464cd0>],
            []),
        64: ([<matplotlib.lines.Line2D at 0x118e0c2d0>], []),
        65: ([<matplotlib.lines.Line2D at 0x118e0c890>], []),
        66: ([<matplotlib.lines.Line2D at 0x118e0ce50>], []),
        67: ([<matplotlib.lines.Line2D at 0x118e24450>], []),
        68: ([<matplotlib.lines.Line2D at 0x118e24a10>], []),
        69: ([<matplotlib.lines.Line2D at 0x118e24fd0>], []),
        70: ([<matplotlib.lines.Line2D at 0x118e345d0>], []),
        71: ([<matplotlib.lines.Line2D at 0x118e34b90>], []),
        72: ([<matplotlib.lines.Line2D at 0x11a315190>], []),
        73: ([<matplotlib.lines.Line2D at 0x11a315750>], [])}
```



#### 1.0.4 Plotting one observation

```
In [16]: #
map = Basemap(width=1400000,height=1100000,projection='lcc', resolution='c',
              lat_0=lats_c+2,lon_0=lons_c)

fig=plt.figure(figsize=(12,9))
ax = fig.add_axes([0.05,0.05,0.9,0.85])

# draw coastlines, country boundaries, fill continents.
map.drawcoastlines(linewidth=0.25)
map.drawcountries(linewidth=0.25)
map.fillcontinents(color='coral',lake_color='blue')

# draw the edge of the map projection region (the projection limb)
map.drawmapboundary(fill_color='aqua')

# create a grid
# draw lat/lon grid lines every 2 degrees.
map.drawmeridians(np.arange(0,360,2), labels=[False, True, True, False])
map.drawparallels(np.arange(-90,90,1), lables=[True, False, False, True])

# Walrus 281
```

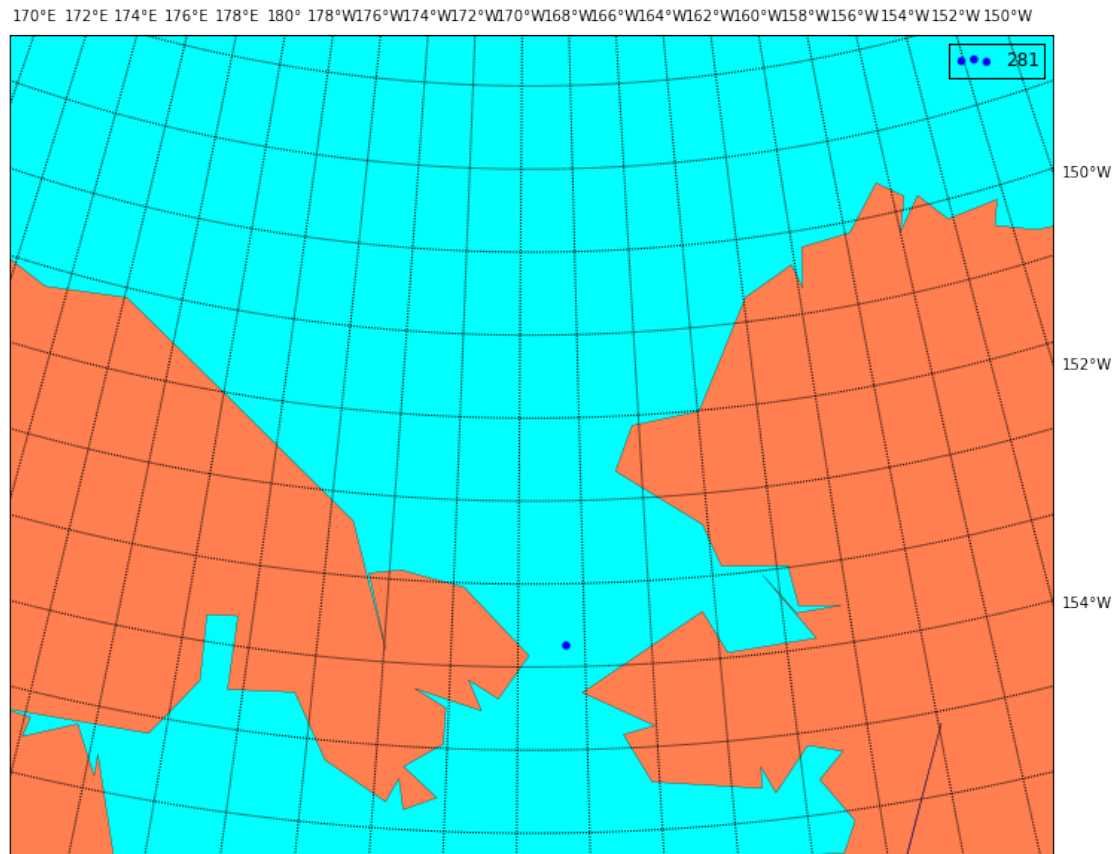
```

x, y = map(lons[0],lats[0])
map.scatter(x,y,color='b',label='281')

plt.legend()

```

Out[16]: <matplotlib.legend.Legend at 0x116da3c90>



### 1.0.5 Plot all walrus observations

```

In [19]: #
map = Basemap(width=1400000,height=1100000,projection='lcc', resolution='h',
              lat_0=lats_c+2,lon_0=lons_c)

fig=plt.figure(figsize=(12,9))
ax = fig.add_axes([0.05,0.05,0.9,0.85])

# draw coastlines, country boundaries, fill continents.
map.drawcoastlines(linewidth=0.25)
map.drawcountries(linewidth=0.25)
map.fillcontinents(color='coral',lake_color='blue')

# draw the edge of the map projection region (the projection limb)
map.drawmapboundary(fill_color='aqua')

```

```

# create a grid
# draw lat/lon grid lines every 2 degrees.
map.drawmeridians(np.arange(0,360,2), labels=[False, True, True, False])
map.drawparallels(np.arange(-90,90,1), labels=[True, False, False, True])

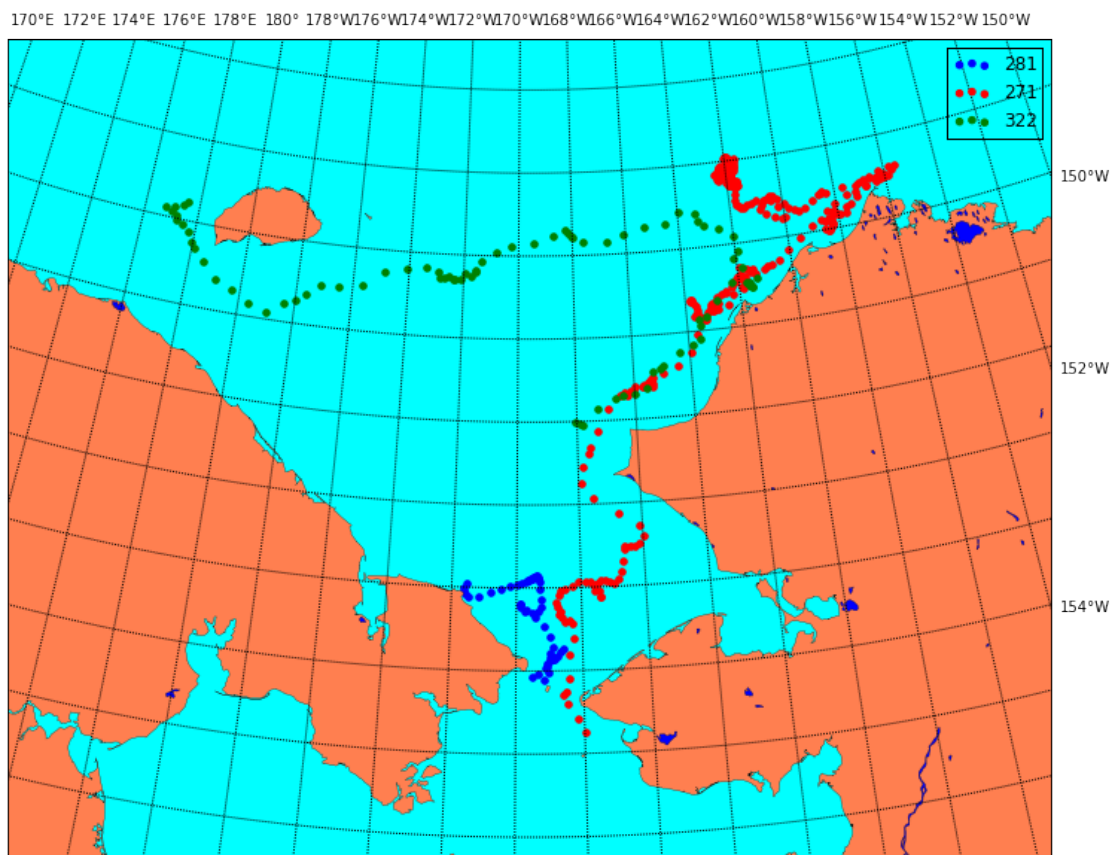
# Walrus 281
lons = w281.Longitude.values
lats = w281.Latitude.values
x, y = map(lons,lats)
map.scatter(x,y,color='b',label='281')

# now for walrus 271
lons = w271.Longitude.values
lats = w271.Latitude.values
x, y = map(lons,lats)
map.scatter(x,y,color='r',label='271')

# now for walrus 322
lons = w322.Longitude.values
lats = w322.Latitude.values
x, y = map(lons,lats)
map.scatter(x,y,color='g',label='322')
plt.legend()

```

Out[19]: <matplotlib.legend.Legend at 0x119002c10>



In [ ]: