Plotting Earthquake magnitude vs time

In [704]:

```
import json
import requests
import pandas as pd
import datetime
import time
import pytz
import numpy as np
import matplotlib.pyplot as plt
from pandas.plotting import register_matplotlib_converters
import urllib
import dateutil.parser
from datetime import datetime
from pytz import timezone
import os
```

In [705]:

```
!pip install folium
import folium
from folium.plugins import TimestampedGeoJson
import seaborn as sns
from folium import plugins
```

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In [753]:

```
data=pd.read_csv("Project3PlateTectonics.csv")
data.shape

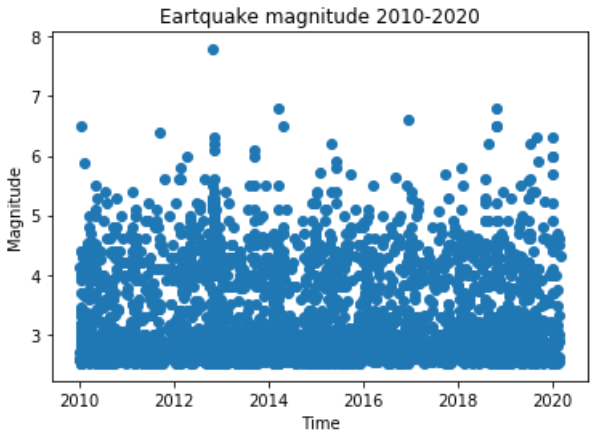
time=data.time
magnitude=data.mag
latitude=data.latitude
longitude=data.longitude
```

In [767]:

```
time1=pd.to_datetime(time, format='%Y-%m-%dT%H:%M:%S.%fZ')
plt.scatter(time1,mag)
plt.ylabel('Magnitude')
plt.xlabel('Time')
plt.title('Eartquake magnitude 2010-2020')
```

Out[767]:

```
Text(0.5, 1.0, 'Eartquake magnitude 2010-2020')
```



In [772]:

```
print("minimum", min(mag))
```

```
minimum 2.5
```

In [773]:

```
print("maximum", max(mag))
```

```
maximum 7.8
```

In [782]:

```
avg = sum(mag)/len(mag)
print("average", avg)
```

```
average 3.3513366802635796
```

Earthquake locations (lat and lon) on a map with magnitude

In [ ]:

```

```

In [694]:

```
m=folium.Map(location=[47.7589 , -130 ], zoom_start=5)


for index, row in data.iterrows():
    folium.CircleMarker([row['latitude'], row['longitude']],
                        radius= [row['mag']],
                        popup=print(row['mag']),
                        #fill_color="#3db7e4", # divvy color
                       ).add_to(m)
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2.5
2.57
2.95
2.84
2.51
2.8
3.42
2.73
4.4
4.0
2.97
3.36
2.69
4.0
4.0

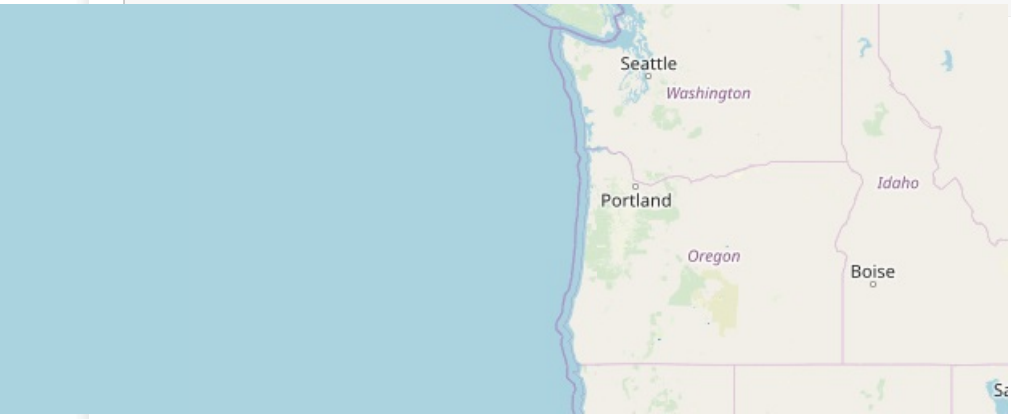
2.72
4.0
2.78
3.6
5.3
2.7
3.9
5.0
2.8
3.7
4.3
4.1
3.2
4.2
3.9
4.5
5.1
2.7
5.5
4.5
3.4
2.5
2.56
2.69
2.71
2.91
2.94
2.65
2.64
2.98
4.5
3.24
2.87
4.52
2.55
3.91
2.81
2.72
4.2
2.6
4.7
4.5
3.1
2.65
2.76
3.3
3.9
3.2
4.13
2.8
3.0
2.57
3.6
3.7
2.68
3.27
4.1
3.74
3.9
4.8
4.3
3.1
2.87
2.7
4.0
4.2
5.0
4.3
4.2
3.26
4.1
2.51
2.77
3.7
4.5
4.53
2.96

2.76
3.9
2.81
2.85
2.55
2.55
3.12
2.7
2.86
2.7
2.66
3.37
2.83
2.53
2.9
3.1
2.64
4.4
2.87
2.74
2.58
3.16
2.65
3.63
3.32
2.77
2.7
2.91
5.88
2.79
2.8
3.0
2.67
2.94
2.7
4.3
2.99
2.61
2.51
2.74
2.62
2.63
3.33
2.89
3.15
4.4
2.98
2.52
3.18
2.81
3.12
2.87
2.75
4.05
2.69
2.66
2.52
2.65
2.69
2.66
2.52
2.73
2.79
2.83
3.91
2.76
4.12
2.7
2.86
2.74
2.99
2.76
2.85
2.95
3.97
2.79
4.41

```
2.69
2.96
2.64
2.74
2.67
3.39
2.63
2.71
3.15
3.32
2.94
3.71
3.46
6.5
4.0
3.09
2.6
2.61
2.59
2.57
2.7
4.12
2.59
```

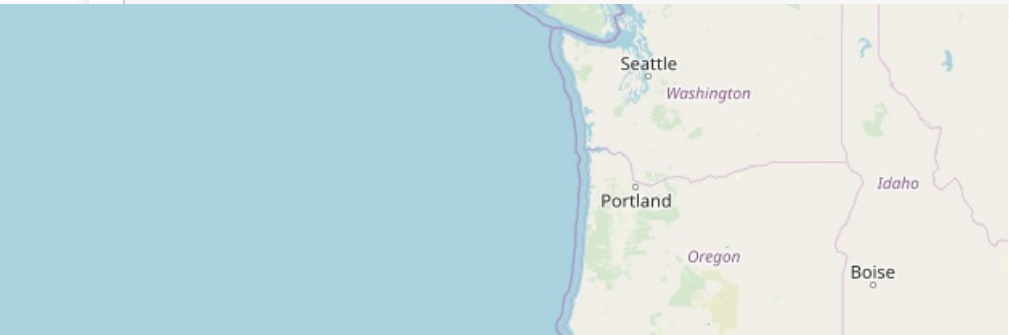
In [745]:

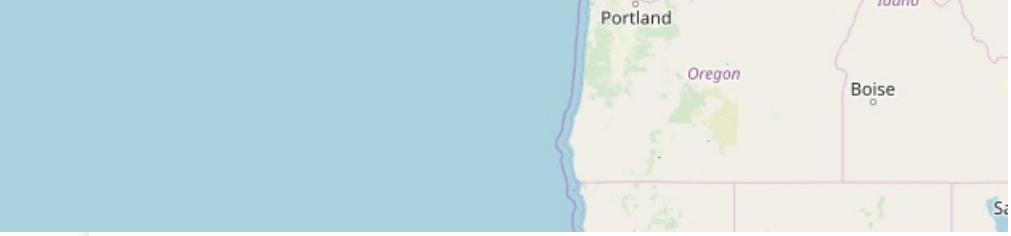
```
coordinates=[(40.5, -128.040335),(40.5, -124)],[(45, -130.040335),(43, -126)]
aline=folium.PolyLine(locations=coordinates,weight=2,color = 'red')
m.add_child(aline)
```



In [744]:

```
m
```





In [697]:

```
for index, row in data.iterrows():
    folium.CircleMarker([row['latitude'], row['longitude']],
                        radius='magnitude',
                        #popup=row['name'],
                        fill_color="#3db7e4", # divvy color
                       ).add_to(m)
```

EXTRA CREDIT (Interactive Map with scroll to move)

In [698]:

```
df=data
def create_geojson_features(df):
    print('> Creating GeoJSON features...')
    features = []
    for _, row in data.iterrows():
        feature = {
            'type': 'Feature',
            'geometry': {
                'type':'Point',
                'coordinates':[row['longitude'],row['latitude']]
            },
            'properties': {
                'time': row['time'],
                'style': {'color' :'red'},
                'icon': 'circle',
                'iconstyle':{
                   # 'fillColor': row['color'],
                    'fillOpacity': 0.8,
                    'stroke': 'true',
                    'radius': row['mag']
                }
            }
        }
        features.append(feature)
    return features
```

In [699]:

```
def make_map(features):
    print('> Making map...')
    coords_US=[50.5039, -130]
    pollution_map = folium.Map(location=coords_US, control_scale=True, zoom_start=5)

    TimestampedGeoJson(
        {'type': 'FeatureCollection',
        'features': features}
        , period='P1M'
```

```
        , add_last_point=True
        , auto_play=False
        , loop=False
        , max_speed=1
        , loop_button=True
        , date_options='YYYY/MM'
        , time_slider_drag_update=True
    ).add_to(pollution_map)
    print('> Done.')
    return pollution_map

def plot_pollutant(df):
    #print('Mapping {} pollution in Belgium in 2013-2015'.format(pollutants[pollutant_ID]
['name']))
    #df = load_data(pollutant_ID)
    # df = clean_data(df)
    #df = prepare_data(df, pollutant_ID)
    features = create_geojson_features(df)
    return make_map(features), df
```

In [700]:

```
pollution_map, df = plot_pollutant(df)
pollution_map
```

```
> Creating GeoJSON features...
> Making map...
> Done.
```

Out[700]:

In [22]:

```
BBox = ((data.longitude.min(),   data.longitude.max(),
    data.latitude.min(), data.latitude.max()))
print(BBox)
```

```
(-133.0153, -123.13566670000002, 38.6885, 52.9)
```

In [ ]:

Map earthquake April 2015

In [749]:

```
data=pd.read_csv("Project3Ocean_2015data.csv")
data.shape

#T_raw=data.loc[:,'time']
#Time = []
#new_format= "%Y-%m-%d %H:%M:%S"
#for i in range (len(T_raw)):
#    datecheck=datetime.strptime(T_raw[i],"%Y-%m-%dT%H:%M:%S.%fz").replace(microsecond=0)
#    datecheck.strftime(new_format)
#    Time.append(datecheck)

time1=data.time1
mag1=data.mag1
latitude=data.latitude
longitude=data.longitude


m1=folium.Map(location=[47.7589 , -130 ], zoom_start=3)


for index, row in data.iterrows():
    folium.CircleMarker([row['latitude'], row['longitude']],
                        radius= row['mag1'],
                        #popup=print(row['mag']),
                        # divvy color
```

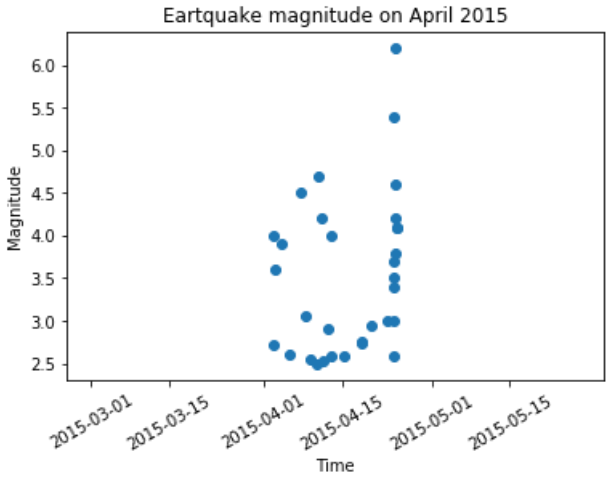
In [750]:

```
time2=pd.to_datetime(time2, format='%Y-%m-%dT%H:%M:%S.%fZ')
```

```
plt.scatter(time2,magnitudee)
plt.xticks(rotation=30)
plt.ylabel('Magnitude')
plt.xlabel('Time')
plt.title('Eartquake magnitude on April 2015')
```

Out[750]:

```
Text(0.5, 1.0, 'Eartquake magnitude on April 2015')
```



Transform Boundary

In [712]:

```
data=pd.read_csv("Divergrent_and_Boundarydata.csv")
data.shape

#T_raw=data.loc[:,'time']
#Time = []
#new_format= "%Y-%m-%d %H:%M:%S"
#for i in range (len(T_raw)):
#    datecheck=pd.to_datetime(time2, format='%Y-%m-%dT%H)
#    Time.append(datecheck)

time3=[]
for i in range (len(data)):
    time3.append(dateutil.parser.isoparse(data['time3'][i]))


#time2=data.time1
mag3=data.mag3
latitude=data.latitude
longitude=data.longitude

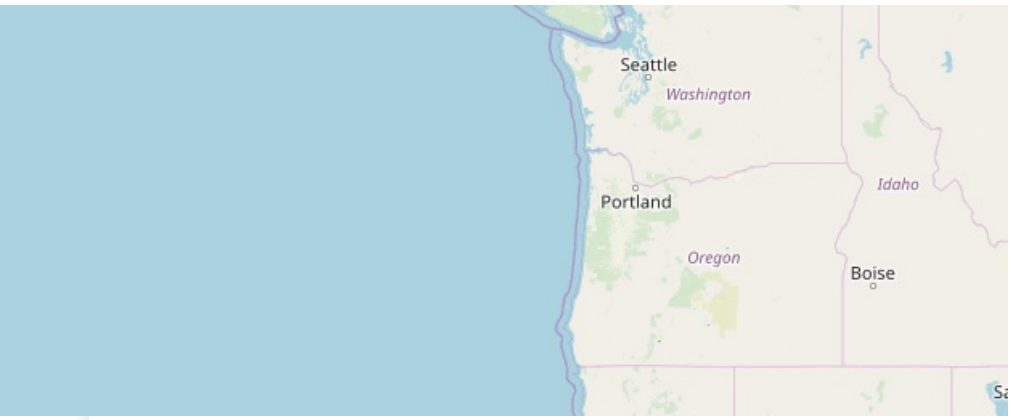

m1=folium.Map(location=[47.7589 , -130 ], zoom_start=5)


for index, row in data.iterrows():
    folium.CircleMarker([row['latitude'], row['longitude']],
                        radius= row['mag3'],
                        #popup=print(row['mag']),
                        #fill_color="#3db7e4", # divvy color
                       ).add_to(m1)

    coordinates=[(40.5, -128.040335),(40.5, -124)],[(45, -130.040335),(43, -126)]
    aline=folium.PolyLine(locations=coordinates,weight=2,color = 'red')
    m1.add_child(aline)
```

In [714]:

```
m1
```

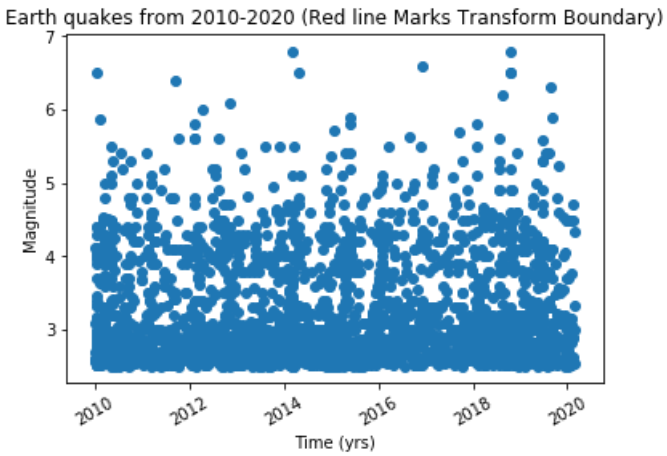


In [717]:

```
plt.scatter(time3,mag3)
plt.xticks(rotation=30)
plt.ylabel('Magnitude')
plt.xlabel('Time (yrs)')
plt.title('Earth quakes from 2010-2020 (Red line Marks Transform Boundary)')
```

Out[717]:

```
Text(0.5, 1.0, 'Earth quakes from 2010-2020 (Red line Marks Transform Boundary)')
```



Divergent Boundary

In [751]:

```
data=pd.read_csv("Divergrent_and_Boundarydata.csv")
data.shape

#T_raw=data.loc[:,'time']
#Time = []
#new_format= "%Y-%m-%d %H:%M:%S"
#for i in range (len(T_raw)):
```

```
#     datecheck=pd.to_datetime(time2, format='%Y-%m-%d %H)
#     Time.append(datecheck)

time3=[]
for i in range (len(data)):
    time3.append(dateutil.parser.isoparse(data['time3'][i]))


#time2=data.time1
mag3=data.mag3
latitude=data.latitude
longitude=data.longitude


m1=folium.Map(location=[45.7589 , -128 ], zoom_start=5)


for index, row in data.iterrows():
    folium.CircleMarker([row['latitude'], row['longitude']],
                        radius= row['mag3'],
                        #popup=print(row['mag']),
                        #fill_color="#3db7e4", # divvy color
                       ).add_to(m1)

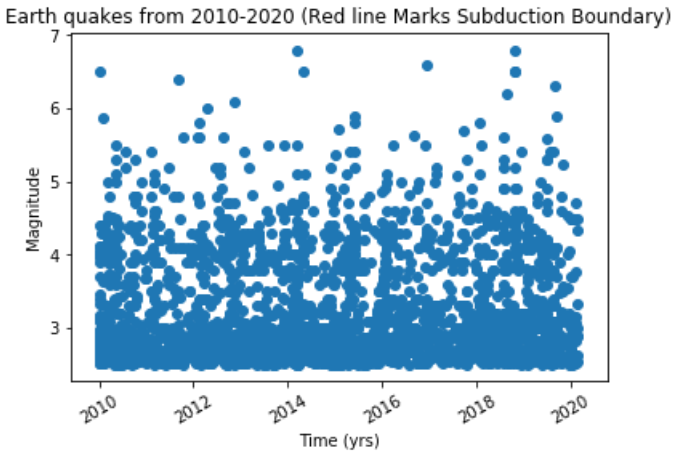
    coordinates=[(40.5, -127.040335),(42.5, -126.5)],[(45, -130.040335),(49, -128)]
    aline=folium.PolyLine(locations=coordinates,weight=2,color = 'green')
    m1.add_child(aline)
```

In [741]:

```
plt.scatter(time3,mag3)
plt.xticks(rotation=30)
plt.ylabel('Magnitude')
plt.xlabel('Time (yrs)')
plt.title('Earth quakes from 2010-2020 (Red line Marks Subduction Boundary)')
```

Out[741]:

```
Text(0.5, 1.0, 'Earth quakes from 2010-2020 (Red line Marks Subduction Boundary)')
```


Earth quakes from 2010-2020 (Red line Marks Subduction Boundary)
Magnitude
Time (yrs)
7
6
5
4
3
2010
2012
2014
2016
2018
2020

In [ ]: