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1 Load datasets

In [ ]:
```
## Clone data from our GitHub repository
! git clone https://github.com/sdyinzhen/GS240_resources.git
```

In [ ]:
```
pip install geopandas
```

In [4]:
```
%matplotlib inline
%config InlineBackend.figure_format = 'retina'
import numpy as np
import matplotlib.pyplot as plt
import matplotlib
import pandas as pd
from shapely.geometry import Point
import geopandas as gpd
from geopandas import GeoDataFrame
import datetime
```

```
/usr/local/lib/python3.6/dist-packages/statsmodels/tools/_testing.py:19: FutureWarning: pandas.util.testing is
deprecated. Use the functions in the public API at pandas.testing instead.
  import pandas.util.testing as tm
```

2 Overview of Earthquake dataset

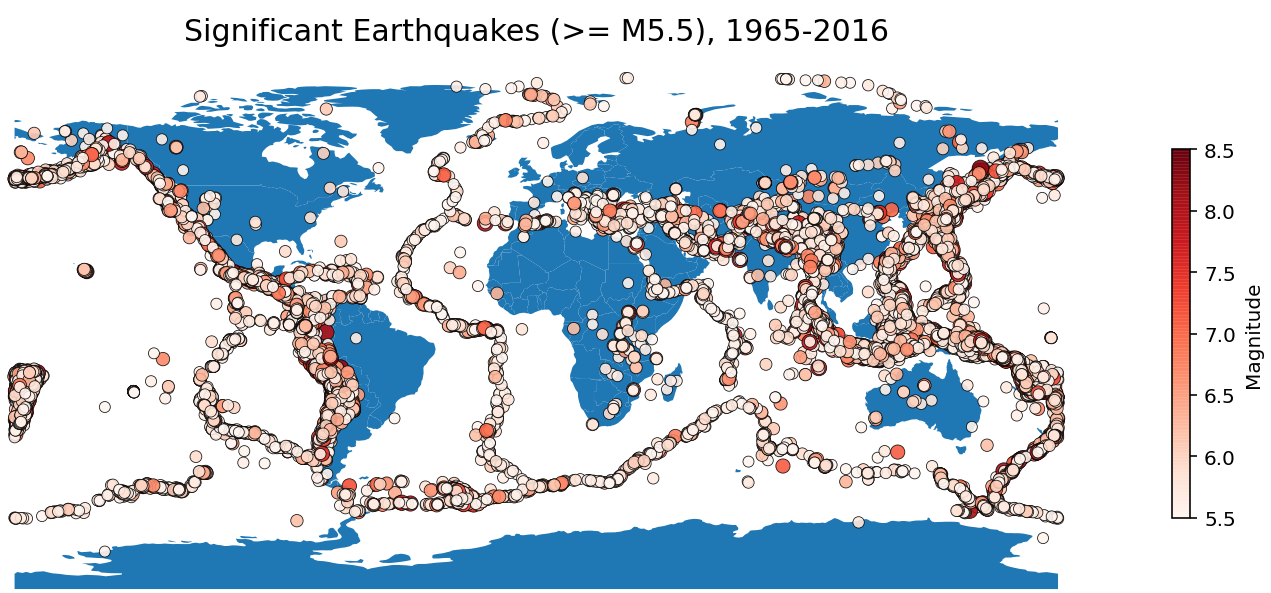
We plot distributions of the global earthquake dataset

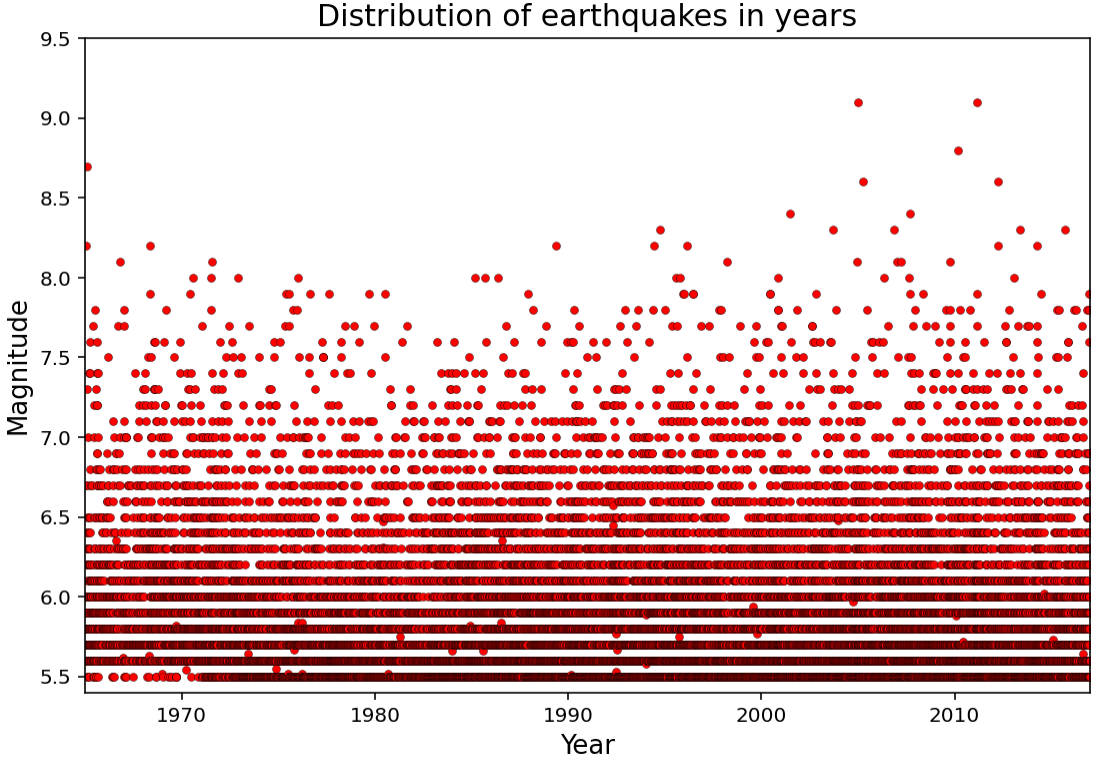
2.1 Global

In [ ]:
```
earthq_data = pd.read_csv('/content/GS240_resources/EVS_Earthquakes/global_database.csv')
```

In [6]:

```
world = gpd.read_file(gpd.datasets.get_path('naturalearth_lowres'))
geometry = [Point(xy) for xy in zip(earthq_data['Longitude'], earthq_data['Latitude'])]
gdf = GeoDataFrame(earthq_data[['Longitude', 'Latitude']], geometry=geometry)
world = gpd.read_file(gpd.datasets.get_path('naturalearth_lowres'))
# gdf.plot(ax=, marker='o', color='red', markersize=15);

world.plot(figsize=(11, 6))
plt.scatter(earthq_data['Longitude'], earthq_data['Latitude'], marker='o',
         c=earthq_data['Magnitude'],cmap='Reds', vmin = 5.5, vmax= 8.5, alpha=0.9,
         s=earthq_data['Magnitude']**2, linewidths=0.4, edgecolors='k')


plt.colorbar(label='Magnitude',fraction=0.015)

plt.title('Significant Earthquakes (>= M5.5), 1965-2016', fontsize = 15)
plt.axis('off')
plt.show()

plt.figure(figsize=(9,6))
plt.scatter(pd.to_datetime(earthq_data['Date']), earthq_data['Magnitude'], s=16, c='r', edgecolors='k', linewi
plt.title('Distribution of earthquakes in years', fontsize=15)
plt.ylabel('Magnitude', fontsize=13)
plt.xlabel('Year', fontsize=13)
plt.ylim(5.4,9.5)
plt.xlim([datetime.date(1965, 1, 2), datetime.date(2016, 12, 30)])
plt.show()
```


Significant Earthquakes (>= M5.5), 1965-2016
8.5
8.0
7.5
7.0
6.5
6.0
5.5
Magnitude

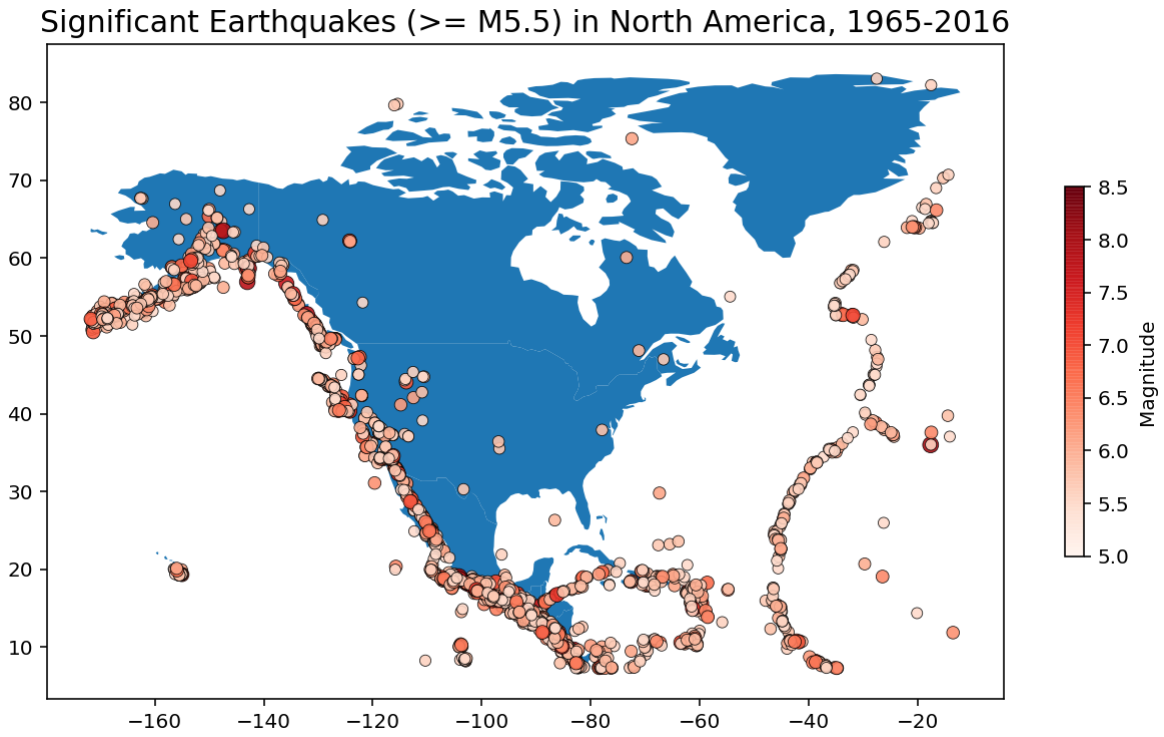

Distribution of earthquakes in years
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
Magnitude
1970
1980
1990
2000
2010
Year

2.2 North America

In [7]:
```
nor_am_earthq = pd.read_csv('/content/GS240_resources/EVS_Earthquakes/north_america_earthquakes.csv')
```

In [8]:
```
print('Total {} earthquake events >= M5.5 '.format(len(nor_am_earthq['Longitude'])))
world[world.continent == 'North America'].plot(figsize=(11, 6))
plt.scatter(nor_am_earthq['Longitude'], nor_am_earthq['Latitude'], marker='o',
        c=nor_am_earthq['Magnitude'],cmap='Reds', vmin = 5, vmax= 8.5, alpha=0.9,
        s=nor_am_earthq['Magnitude']**2, linewidths=0.4, edgecolors='k')
plt.colorbar(label='Magnitude',fraction=0.015)
plt.title('Significant Earthquakes (>= M5.5) in North America, 1965-2016', fontsize = 15)
plt.show()
```

```
Total 2152 earthquake events >= M5.5
```



2.3 Asia

In [9]:
```
asia_earthq = pd.read_csv('/content/GS240_resources/EVS_Earthquakes/asia_earthquakes.csv')
```

In [10]:
```
print('Total {} earthquake events >= M5.5 '.format(len(asia_earthq['Longitude'])))
world[world.continent == 'Asia'].plot(figsize=(11, 6))
plt.scatter(asia_earthq['Longitude'], asia_earthq['Latitude'], marker='o',
         c=asia_earthq['Magnitude'],cmap='Reds', vmin = 5, vmax= 8.5, alpha=0.9,
         s=asia_earthq['Magnitude']**2, linewidths=0.4, edgecolors='k')
plt.colorbar(label='Magnitude',fraction=0.015)
plt.title('Significant Earthquakes (>= M5.5) in Asia, 1965-2016', fontsize = 15)
plt.show()
```

```
Total 8039 earthquake events >= M5.5
```