Natural disaster Navigator

Joker Members:
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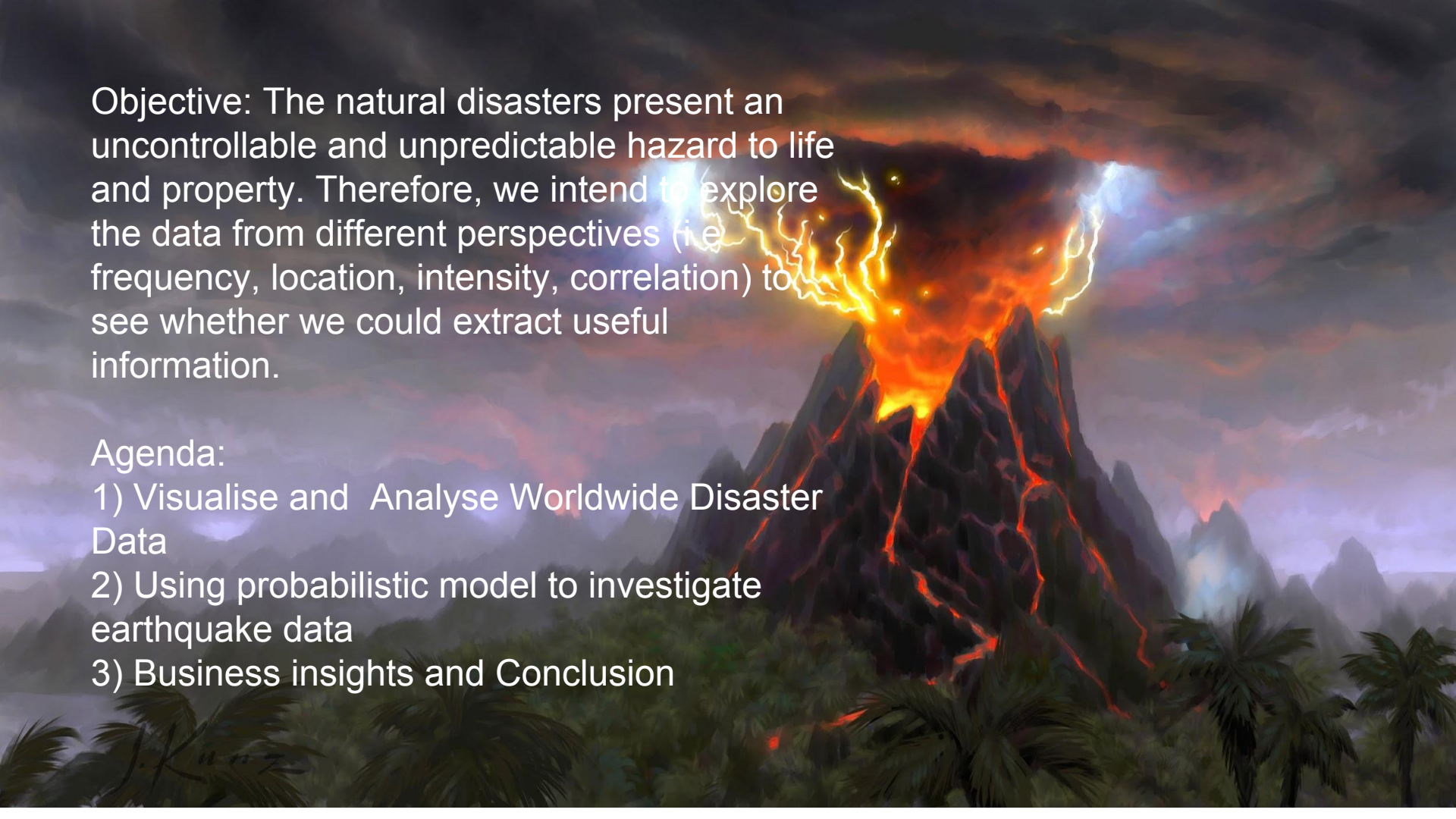


Objective: The natural disasters present an uncontrollable and unpredictable hazard to life and property. Therefore, we intend to explore the data from different perspectives (i.e. frequency, location, intensity, correlation) to see whether we could extract useful information.

Agenda:

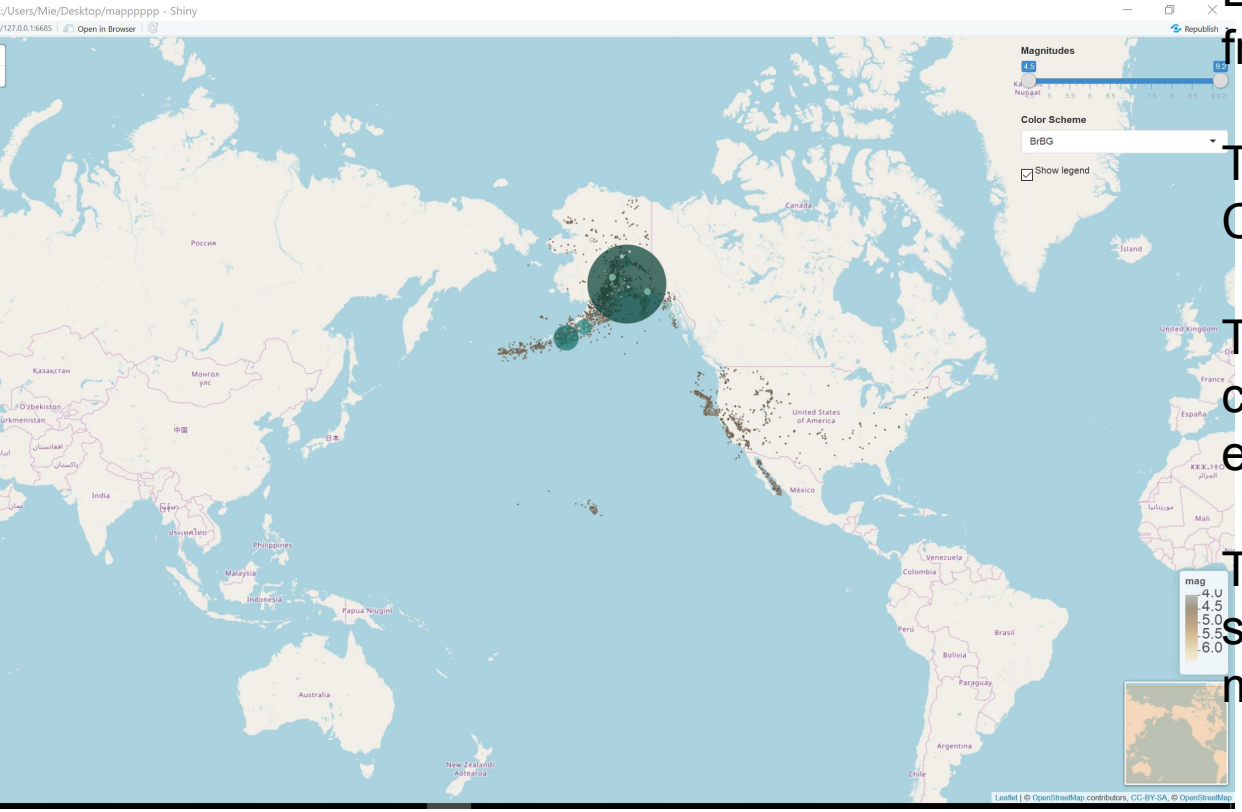
1) Visualise and Analyse Worldwide Disaster Data
2) Using probabilistic model to investigate earthquake data
3) Business insights and Conclusion

LowLevel

MediumLevel

ShinyApp

HighLevel

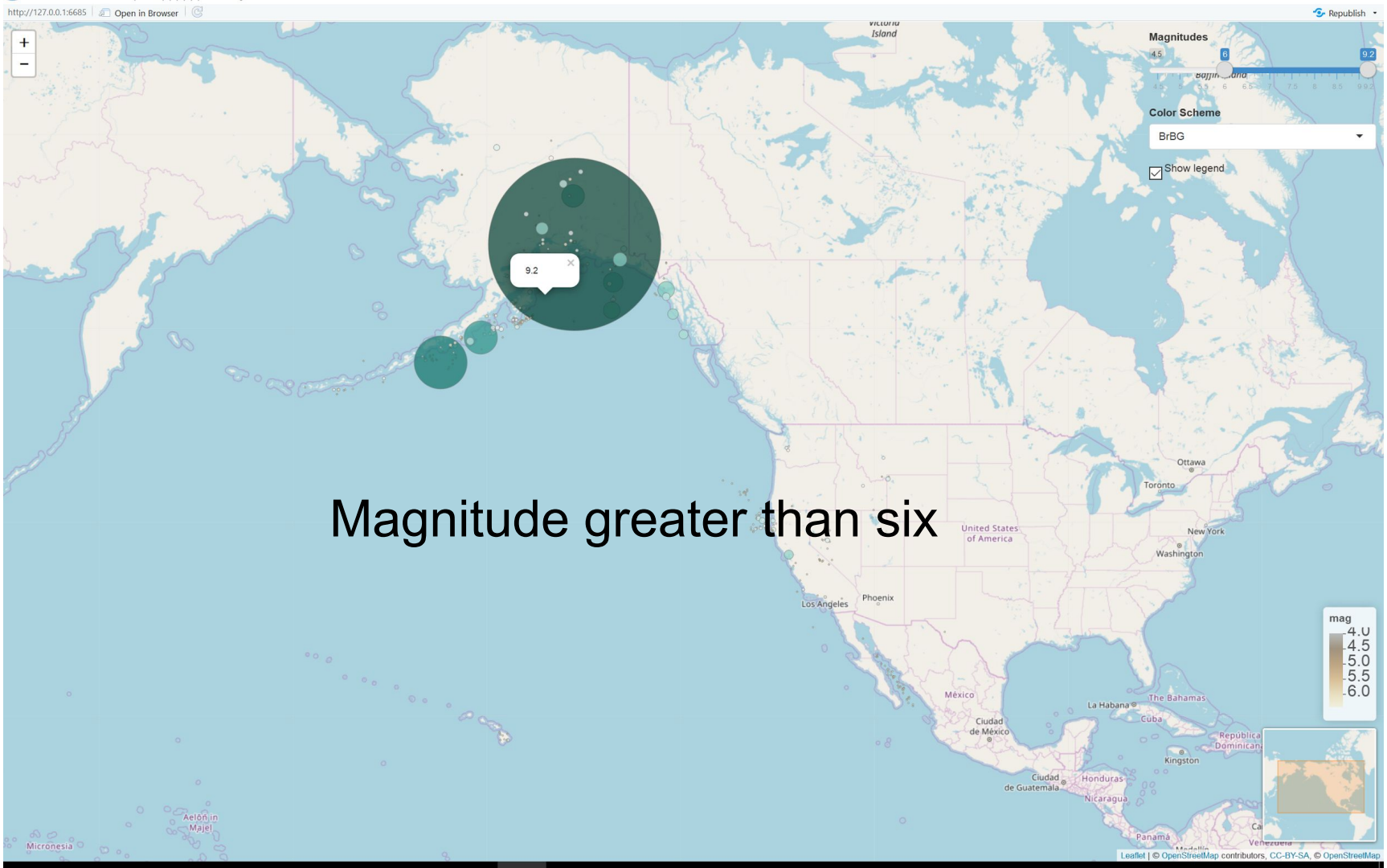


Earthquake in America from 1900 to 2017

Three clusters: Alaska, California, Hawaii

The radius and color of circle: magnitude of earthquake

The larger radius, the stronger color, the larger magnitude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Open in Browser
Republish
Magnitudes
4.5
6
9.2
Color Scheme
BrBG
Show legend
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Magnitude greater than six
Ottawa
Toronto
United States of America
New York
Washington
Los Angeles
Phoenix
México
Ciudad de México
La Habana
The Bahamas
Cuba
Kingston
Ciudad de Guatemala
Honduras
Nicaragua
Panamá
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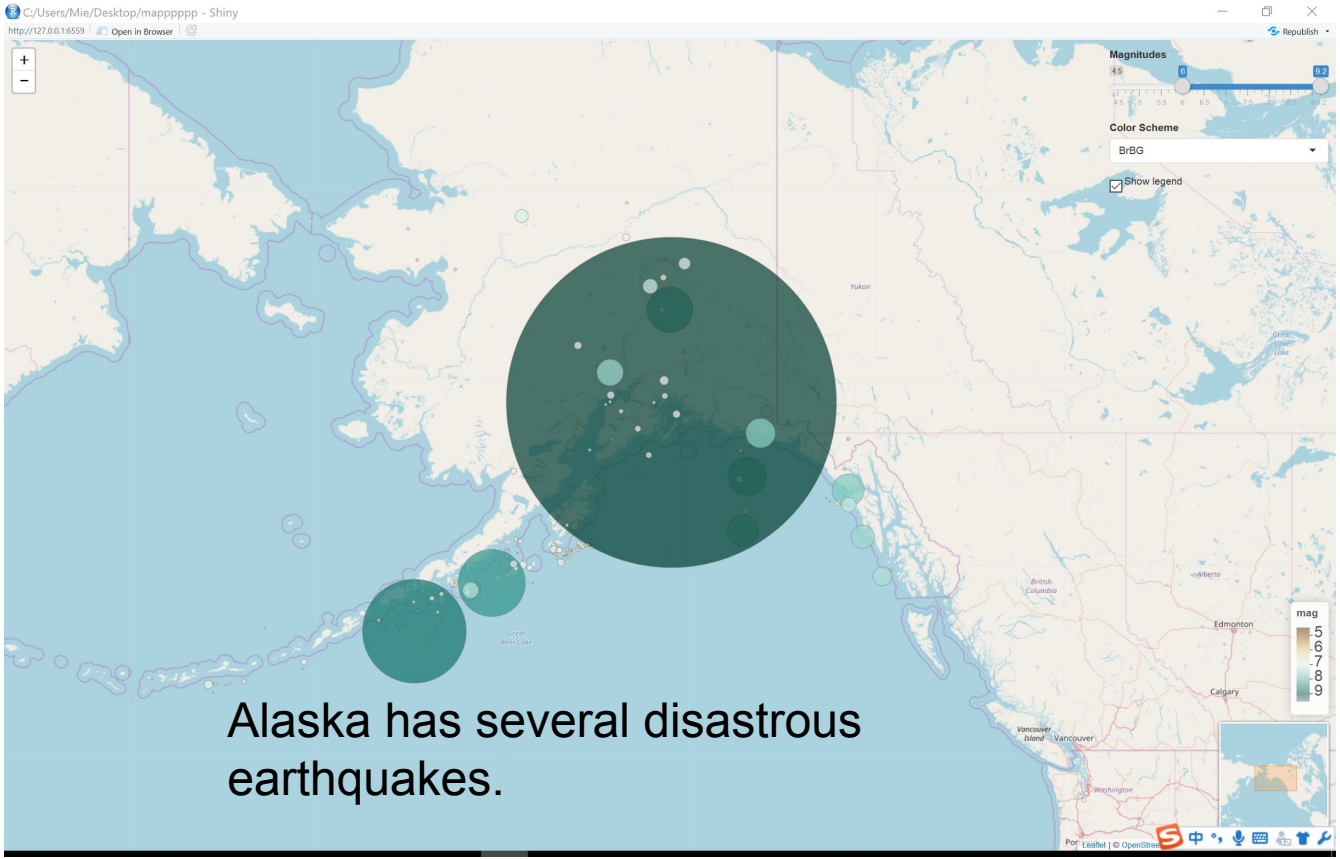
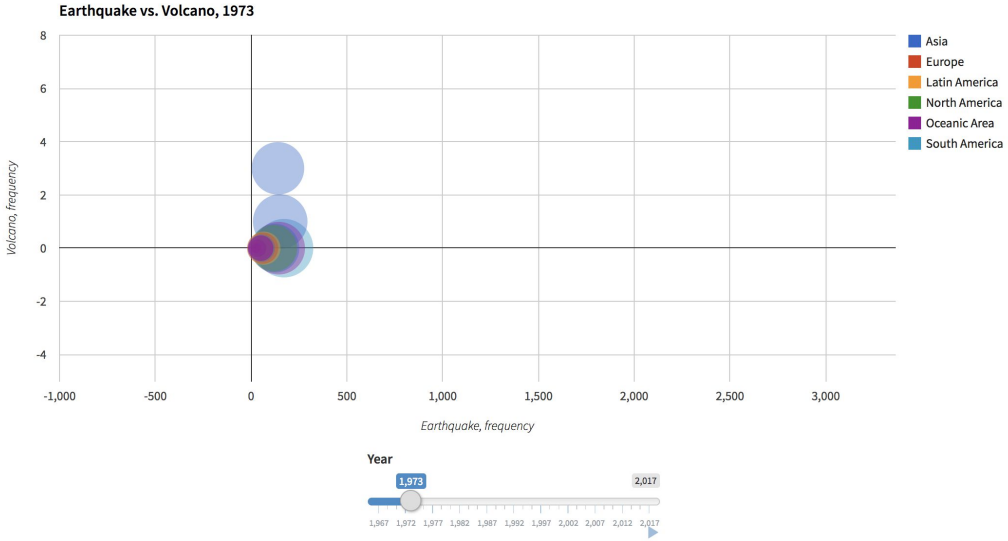


Their magnitude are 7.7, 8.2, 8.6 and 9.2.

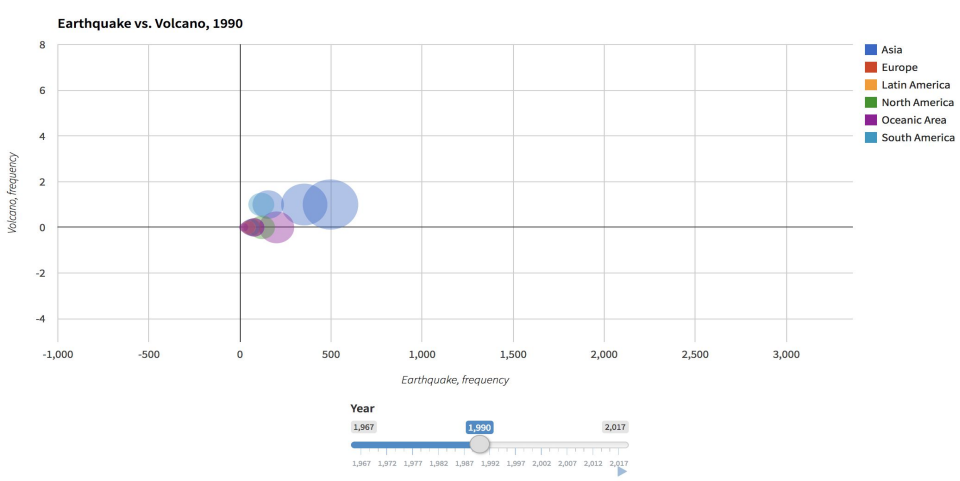

Explored by Countries

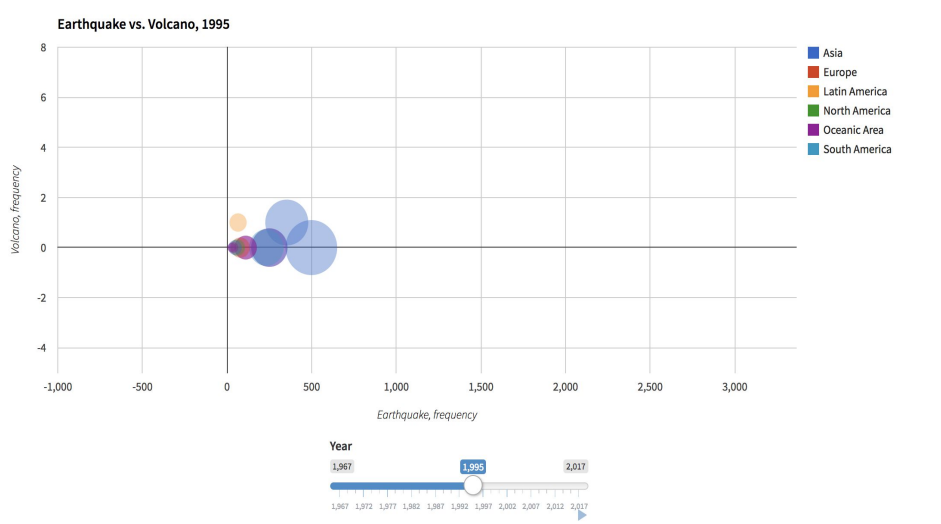
World’s leading disasters

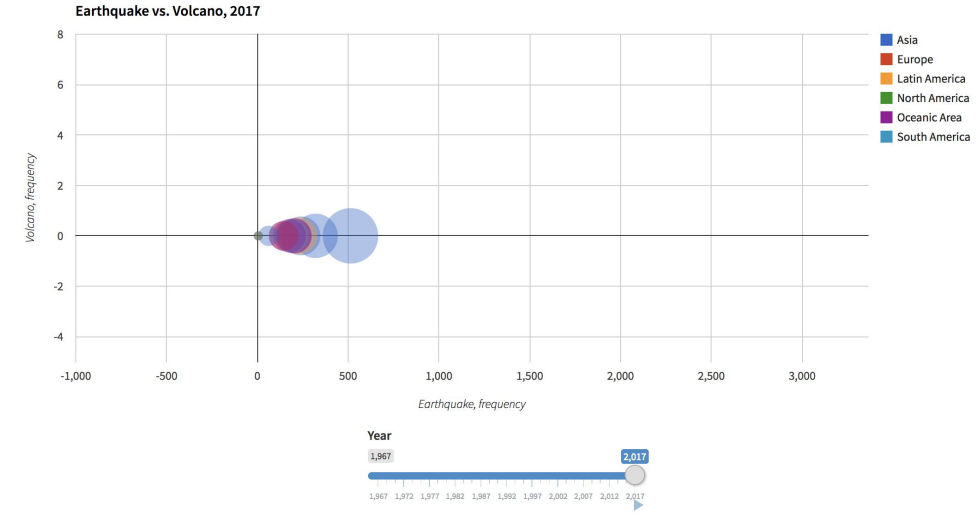


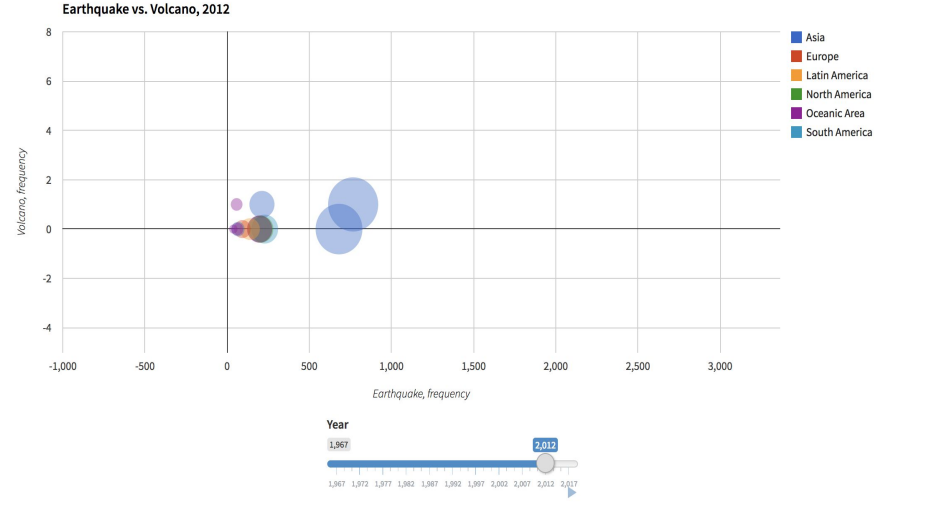
Earthquake & Volcano & Tsunami

* Selected earthquake high frequency countries
* Colored by Region, shaded by country
* Separated by year
* Sized by frequency of Tsunami per year
* 3-D visualization on 3 world disasters
  - No absolute correlation
  - Highly frequency in Asia area

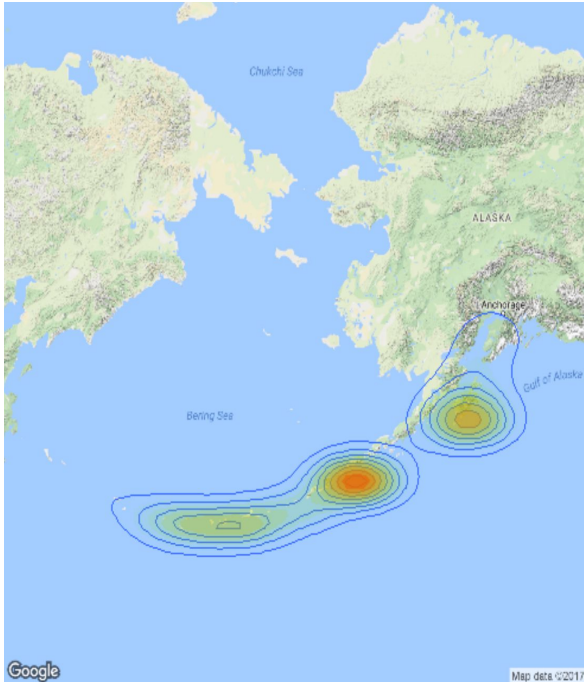

Earthquake vs. Volcano, 1990
Asia
Europe
Latin America
North America
Oceanic Area
South America
Volcano, frequency
Earthquake, frequency
Year
1,967
1,990
2,017

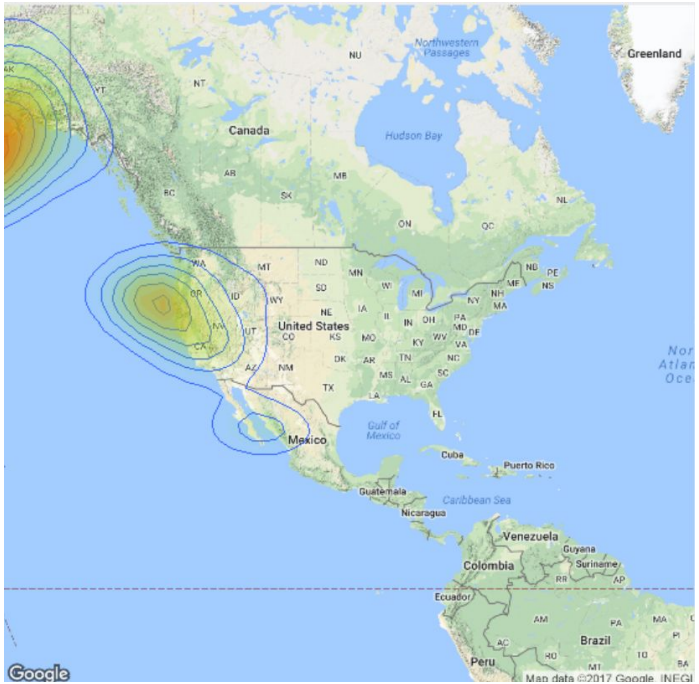

Earthquake vs. Volcano, 1995
Asia
Europe
Latin America
North America
Oceanic Area
South America
Volcano, frequency
Earthquake, frequency
Year
1,967
1,995
2,017


Earthquake vs. Volcano, 2017
Asia
Europe
Latin America
North America
Oceanic Area
South America
Volcano, frequency
Earthquake, frequency
Year
1,967
2,017


Earthquake vs. Volcano, 2012
Asia
Europe
Latin America
North America
Oceanic Area
South America
Volcano, frequency
Earthquake, frequency
Year
1,967
2,012

Hazard Map





logR =-0.2+0.36*mag

*** Earthquake affected area: calculated radius by magnitude**

*** Locate to specific area**

*** Highlight area affected by earthquake: the deeper of the colour, the stronger of the effects**

Reference: Bufe C G, Varnes D J. Predictive modeling of the seismic cycle of the greater San Francisco bay region. J. Geophys. Res.,1993, 98: 9871~9883.

Probabilistic Models

Model 1 Model 2

Methodology: The Gutenberg-Richter Magnitude Frequency
*** Relationship Regression: log(N) = a + b * M**
*** Poisson Distribution : p = 1- Pr(event = 0)**
*** p1 : the of occurrence of at least one earthquake of magnitude >= M in the next t years.**
*** p2: We estimate the affected area of the earthquake by log(R) = -0.2 + 0.36 * M from Bufe C G, Varnes D J. We use the same method to recalculate the probability with the new parameter R.**

N = the number of earthquakes with magnitude larger than M during a time period 50 years.
a = a constant that measures the total number of earthquakes at the given source
b = a measure of the number of small versus large events.
*** a and b are coefficients of the regression**
The number of events N can be divided by the T years in order to get the annual frequency of exceeding the M event magnitude: N1 (M) = N(M) / T

Conclusions

- Help insurance rate adjustments
- Help people become aware of the dangers they might face


Thank you.
Q & A