Quakes: A Predictive Analysis on Earthquakes off Mt. Fuji

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DSC 630: Predictive Analytics

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March 27, 2021

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Figure 1

Japan: Fuji, Mount

"**Mount Fuji**, Japanese **Fuji-san**, also spelled **Fujisan**, also called **Fujiyama** or **Fuji no Yama**,…" is the highest mountain in Japan in which it rises to 12,388 feet (or 3,776 meters) (Britannica). Mt. Fuji (for short) is located near the Pacific Ocean coast in the Yamanashi and Shizuoka *ken* prefectures of central Honshu, approximately 60 miles (or 100 kilometers) west of the Tokyo-Yokohama metropolitan area (Britannica). Mt. Fuji is not just a mountain but an active volcano, although, its last eruption occurred in 1707 (Britannica).

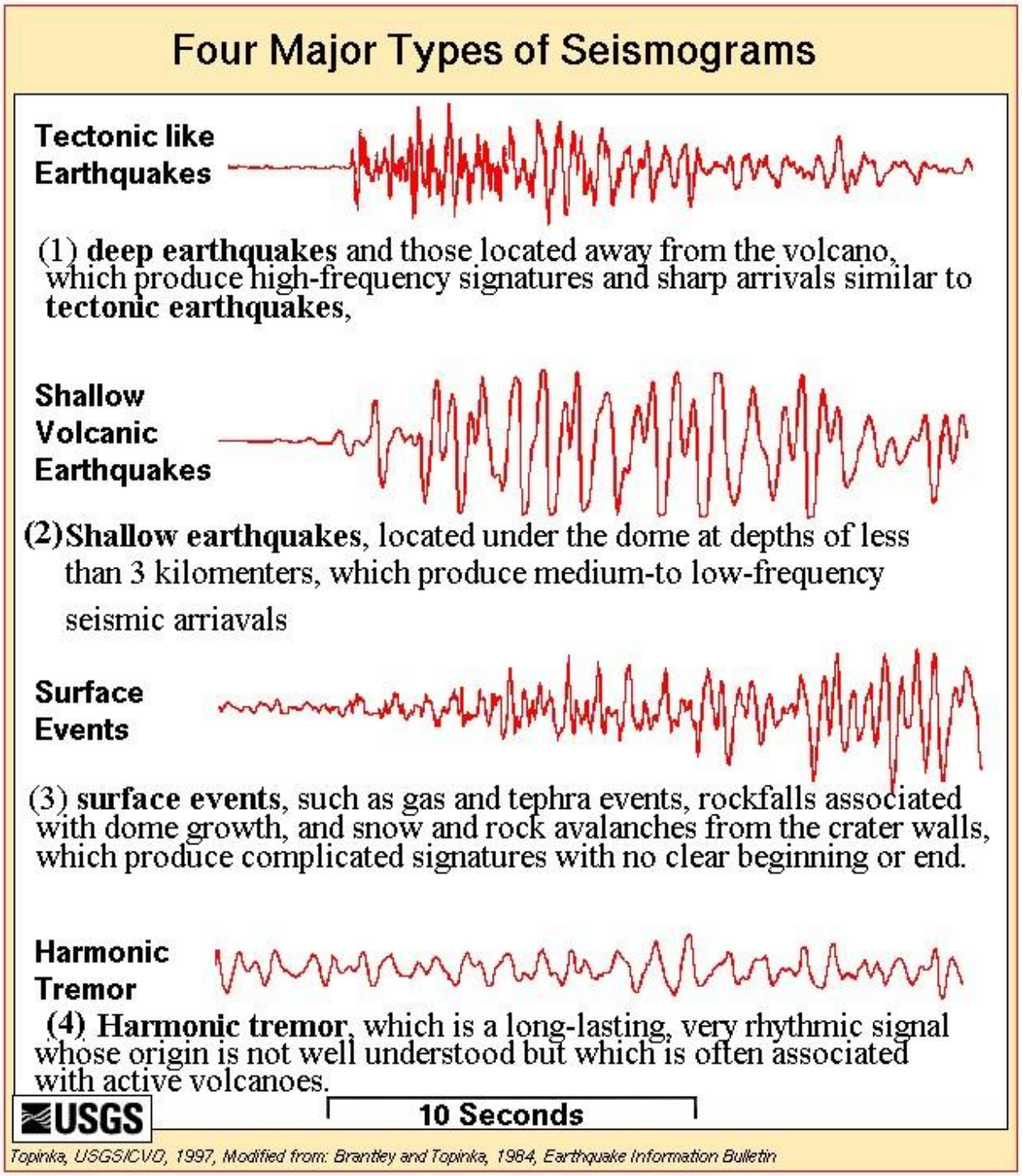
Figure 2

Mount Fuji

Mt. Fuji has a graceful conical form and from Japanese tradition, the volcano was formed in 286 BCE from an earthquake (Britannica). This brings us to a dire question: can earthquakes trigger volcanic eruptions? Based on the example of Mt Fuji's 1707 volcanic eruption (AKA Hōei), we can assume the correlation between earthquakes and volcanic eruptions is possibly linked to one another.

Figure 3

Four Major Types of Seismograms



The Hōei eruption was proceeded by an 8.6 magnitude (based off the Richter scale) earthquake and a tsunami followed right after the volcanic eruption (Oregon State University). Deferring to Figure 3, the Hōei falls under the harmonic tremor to detect earthquakes on the seismograph.

Due to the long overdue eruption to befall Mt. Fuji, a predictive analysis should be performed to determine what seismic activity could cause a potential catastrophic natural disaster to chance in the country of Japan.

Table 1

quakes.csv dataset

	lat	long	depth	mag	stations
0	-20.42	181.62	562	4.8	41
1	-20.62	181.03	650	4.2	15
2	-26.00	184.10	42	5.4	43
3	-17.97	181.66	626	4.1	19
4	-20.42	181.96	649	4.0	11

- lat (Latitude of event)
- long (Longitude)
- depth (Depth in km)
- mag (Richter Magnitude)
- stations (Number of stations reporting)

<u>Business Questions</u>

1) How does the depth from an earthquake relate to volcanic activity?
2) How does the magnitude from an earthquake relate to volcanic activity?

3) Can the latitude and longitude be used to predict seismic activity which in turn could predict volcanic activity?

Assumptions

I. Due to Mt. Fuji having two magma chambers, the shallow reaching 8 km while the deeper reaches 20 km, the depth of an earthquake as determined by USGS will fall more into a deeper earthquake which would result in a possible volcanic eruption (USGS).

II. With magnitudes not reaching its highest since 1707, based off the data for seismic activity up to the year 1964, earthquakes in the mid-Richter scale will not contribute to volcanic eruptions (GitHub).

III. The latitude and longitude for Mt. Fuji is about 35° N and 138° E, with coordinates exact or close to the proximity to Mt. Fuji as well as near the fault line that is underneath the active volcano, could potentially predict where an earthquake may strike resulting in a possible volcanic eruption.

Model

To perform this predictive analysis of whether seismic activity relates to volcanic eruptions, a clustering model should be built on the depth and magnitude of an earthquake while a regression model should be built on latitude and longitude.

Evaluation

After building clustering models for depth and magnitude of an earthquake as well as a regression model for the latitude and longitude, a performance check on the models must be executed to deliberate whether seismic activity correlates to volcanic eruptions.

Conclusion

Since the quakes.csv dataset is structurally formatted in a way where there is not much data preparation or wrangling that needs to be done, the more legwork will be building the models based off of the business questions proposed to the business problem which is: does seismic activity relate to volcanic eruptions? Following the CRISP-DM process, after the models have been built, a performance check of whether the models are up to par for answering the business problem needs to be administered. Lastly, conclusions from the final results can be drawn but the only drawback to considering that seismic activity has a correlation with volcanic eruptions is due to the fact that the quakes.csv dataset is not current or has recent recordings of earthquakes near or around Mt. Fuji.

References

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