

# La Palma Earthquakes

Steve Purves

Rowan Cockett

2025-03-21

In September 2021, a significant jump in seismic activity on the island of La Palma (Canary Islands, Spain) signaled the start of a volcanic crisis that still continues at the time of writing. Earthquake data is continually collected and published by the Instituto Geográfico Nacional (IGN). ...

## 1 Introduction

Introduction and Motivation: What is the problem you are trying to solve? Why is this problem interesting? What has been tried before? What have been the shortcomings of those approaches that necessitate your efforts? Often, this section will conclude with a subsection (or paragraph) outlining “our contributions.” What is the new knowledge that this paper contributes?

Source: [Article Notebook](#)

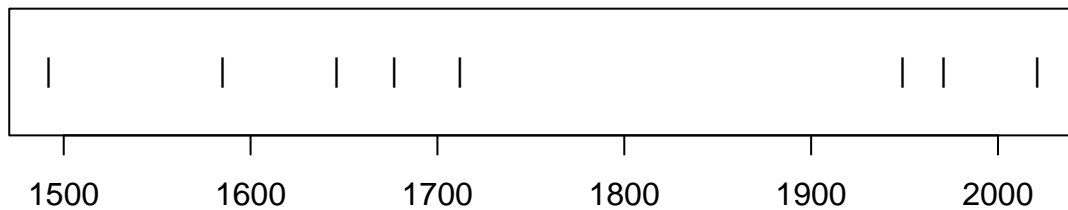


Figure 1: Timeline of recent earthquakes on La Palma

Source: [Article Notebook](#)

Source: [Article Notebook](#)

Based on data up to and including 1971, eruptions on La Palma happen every 79.8 years on average.

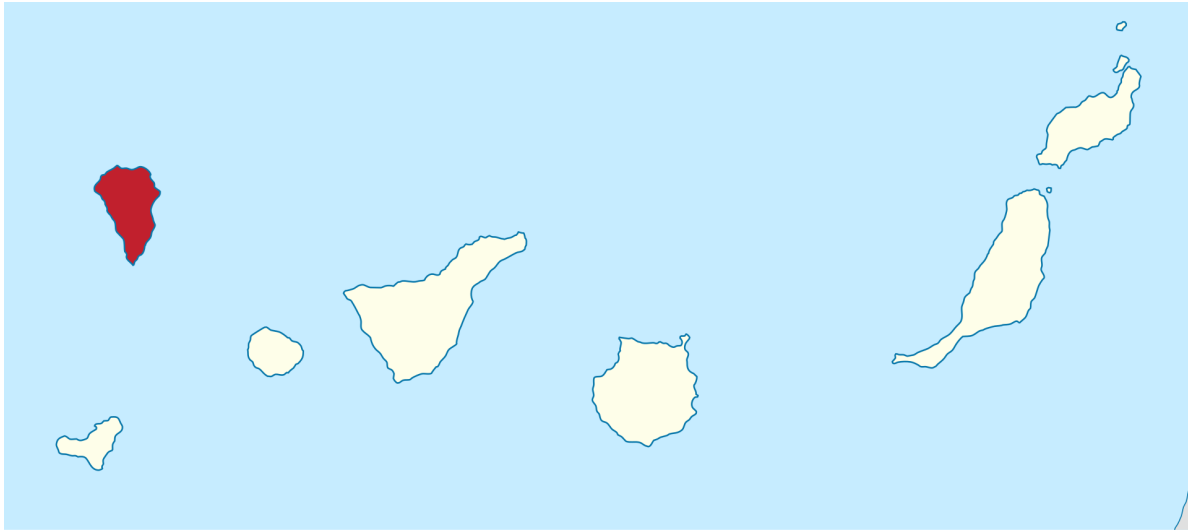


Figure 2: Map of La Palma

La Palma is one of the west most islands in the Volcanic Archipelago of the Canary Islands (Figure 2).

## 1.1 Relevant work

Studies of the magma systems feeding the volcano, such as Marrero et al. (2019), have proposed that there are two main magma reservoirs feeding the Cumbre Vieja volcano; one in the mantle (30-40km depth) which charges and in turn feeds a shallower crustal reservoir (10-20km depth).

Eight eruptions have been recorded since the late 1400s (Figure 1).

## 1.2 Our contribution

Data and methods are discussed Section 2 and Section 3, respectively.

# 2 Data

Data: Where did it come from? What are some basic summary statistics, variable definitions, and/or visualizations that help the reader understand the data you are working with?

Read a clean version of data:

Source: [Article Notebook](#)

Create spatial plot:

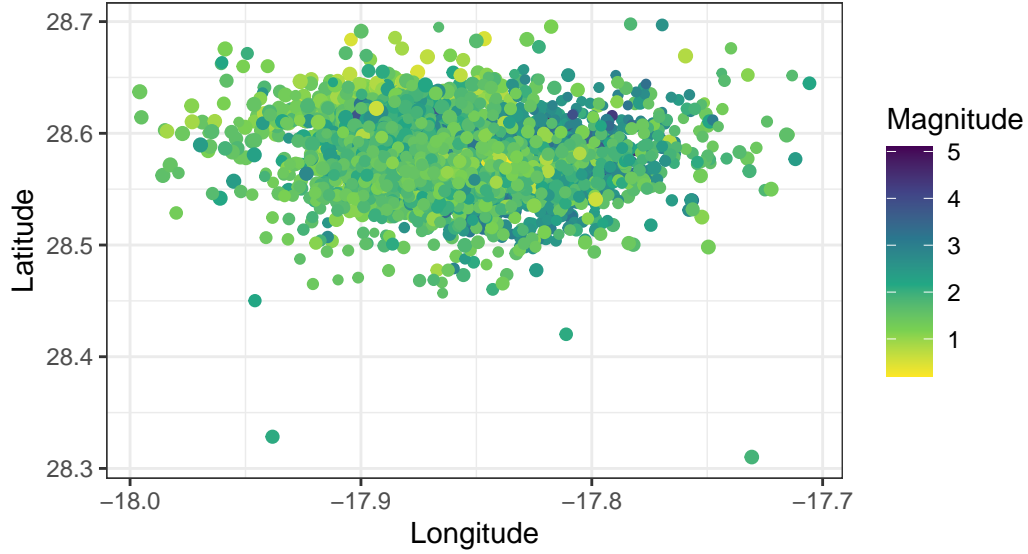


Figure 3: Locations of earthquakes on La Palma since 2017

Source: [Article Notebook](#)

Figure 3 shows the location of recent Earthquakes on La Palma.

### 3 Methods

Methods: What did you actually do? What techniques or methods did you employ? What were the specifications for any statistical models you used? What software or packages did you use or develop?

Let  $x$  denote the number of eruptions in a year. Then,  $x$  can be modeled by a Poisson distribution

$$p(x) = \frac{e^{-\lambda} \lambda^x}{x!} \quad (1)$$

where  $\lambda$  is the rate of eruptions per year. Using Equation 1, the probability of an eruption in the next  $t$  years can be calculated.

Table 1: Recent historic eruptions on La Palma

Name	Year
Current	2021
Teneguía	1971
Nambroque	1949
El Charco	1712
Volcán San Antonio	1677
Volcán San Martin	1646
Tajuya near El Paso	1585
Montaña Quemada	1492

Table 1 summarises the eruptions recorded since the colonization of the islands by Europeans in the late 1400s.

## 4 Results

Results: What did you learn about the problem you identified in Section 1? This is where you put the tables, figures, and analytics by-products of your work.

## 5 Conclusion

Conclusion: What are the limitations of your work? What are some next steps that someone (either you or another research group) should consider in attempting to further your work? Remind us one last time about what you did.

### 5.1 Limitations

### 5.2 Future work

### 5.3 Final thoughts

## 6 Ethical statement

Drawing on what you have learned about data science ethics in this class, discuss any ethical considerations in your project. For some projects, this statement could

be quite short (one paragraph may suffice). For other projects, more detail may be needed (no more than 2 pages).

Be expansive and creative in your thinking about **possible** ethical considerations. One way to do this assignment poorly would be to write a short statement asserting that there are no ethical considerations, only to have me think of several fairly obvious ones.

## 7 Acknowledgements

Were there any people or organizations who helped you that you would like to acknowledge?

## References

References: Every reference (except for books) needs a DOI (strongly preferred) or URL. Use [Google Scholar](#) to help with BibTeX. Every book needs publisher location (e.g. “City, ST: Publisher”). See [SDS 100: Bibliographies](#)

Marrero, José, Alicia García, Manuel Berrocoso, Ángeles Llinares, Antonio Rodríguez-Losada, and R. Ortiz. 2019. “Strategies for the Development of Volcanic Hazard Maps in Monogenetic Volcanic Fields: The Example of La Palma (Canary Islands).” *Journal of Applied Volcanology* 8 (July). <https://doi.org/10.1186/s13617-019-0085-5>.