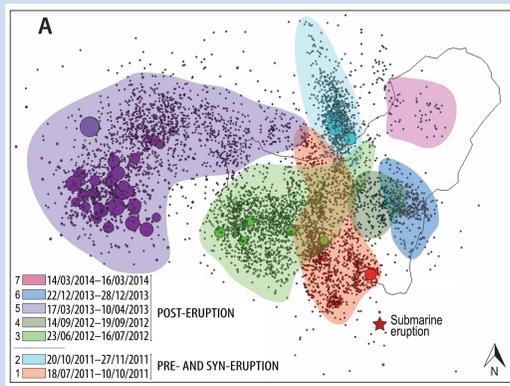


Abstract

The unrest process under EL Hierro caused high seismic and volcanic activity in the island area during the first part of the last decade. The limited access to seismic databases motivated the processing of data recorded in Malpaso station by the group of volcanology of IPNA-CSIC in order to quantitatively analyze the characteristics of the event. We briefly describe the evolution and distribution of earthquake tremor amplitude and present the most remarkable results of the time evolution of the process. A description of database and its processing is included.

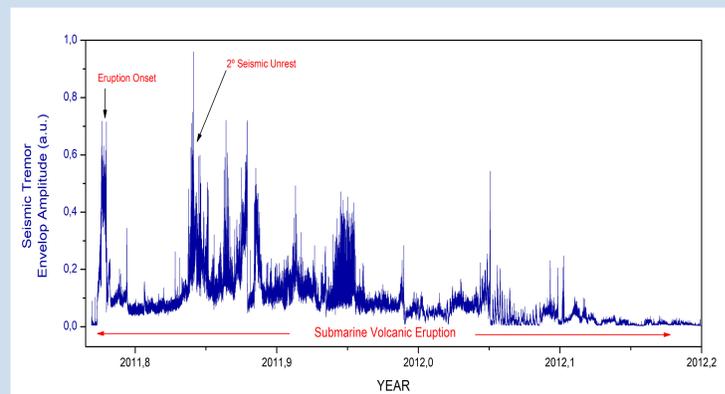
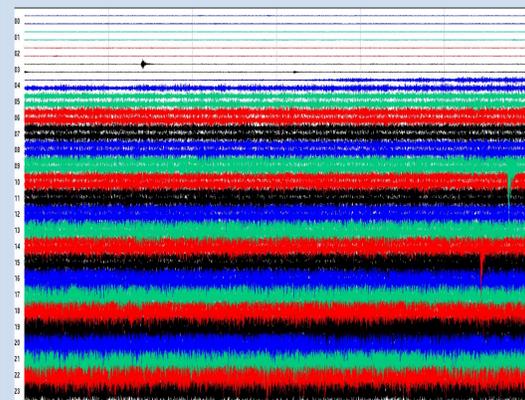
The Events of El Hierro



Date	Mag.	Depth (km)
2011/11/11	4.6	21
2013/03/27	4.7	19
2013/03/29	4.7	20
2013/03/31	4.9	20
2013/12/27	5.1	12

Figure 1. Distribution of earthquakes during the last period of activity of El Hierro (2011-2014) (Figure taken from Earth-Science Review [1]). The magnitude of the events is represented by the size of the circles. Data was obtained from IGN catalog (<https://www.ign.es/web/ign/portal>). The table resumes the most remarkable earthquakes detected.

Evolution of the seismic activity



Figures 2,3. The figure on the left (2) shows the beginning of the volcanic activity, characterized by a quasicontinuous seismic tremor (2011/10/10). The figure on the right (3) shows the evolution of the envelope of the signal during the early months of activity; data from the IPNA CSIC seismic station located in Malpaso, in the central part of the island. The strong growth of the tremor amplitude on 2011/11/03 supports the hypothesis regarding a volcanic system refeeding, postulated in [1].

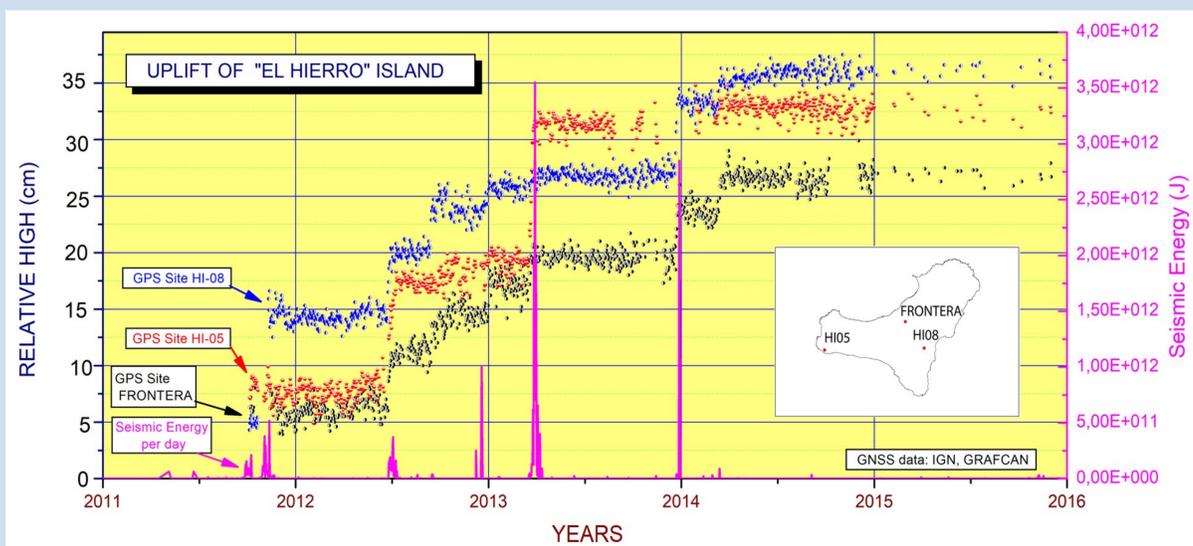


Figure 4. A close correlation among the island uplift and the seismic events with eruptions is observed. During the period of seismic activity without eruption, a differential uplift is detected between GNSS stations. GNSS data was obtained from <https://www.grafcan.es> and <https://www.ign.es>.

References

[1] The 2011–2012 submarine eruption off El Hierro, Canary Islands: New lessons in oceanic island growth and volcanic crisis management, Carracedo et al, 2015, Earth-Science Review.

Processing of database

1. **3C-seismic:** Analysis of changes in the position of El Hierro during a seismic event.

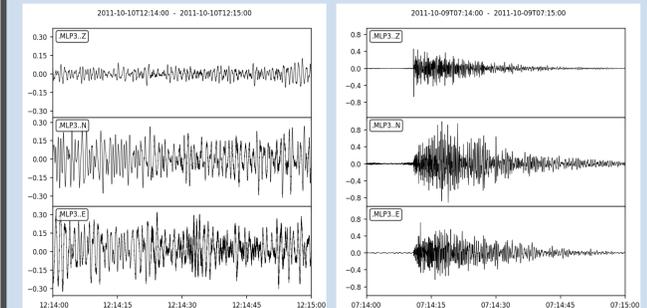


Figure 5. Example of a tremor (left) and an earthquake (right) observed during the eruption in 2011. 3C-plot shows that the amplitude of the event is greater in the horizontal plane than in the vertical one.

2. **Seismic spectra:** Characterization of the main frequencies involved in seismic events.

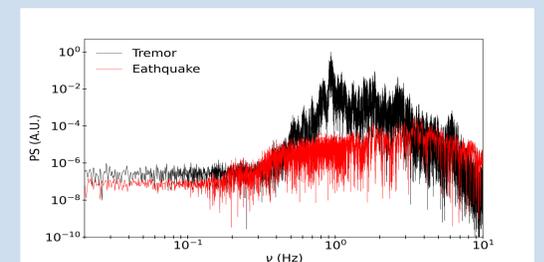


Figure 6. Comparison among a tremor and an earthquake. A tremor is a continuous event with a strong component at low frequencies whilst an earthquake is a short time event and energy is distributed in a larger band.

3. **The importance of filtering signals:** The limits of the system's design introduce the need to filter the signal. To deconvolve it to recover the natural signal is necessary to counts to displacement conversion.

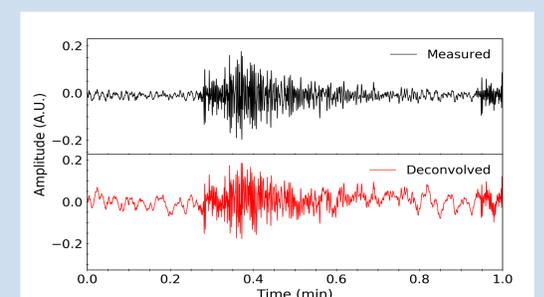


Figure 7. Comparison among the measured signal and the expected natural signal. Low frequency components of the signal are more sensitive to filtering process.

Acknowledgements

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