

Interactive
Comment

Interactive comment on “Investigating volcanic hazard in Cape Verde Islands through geophysical monitoring: network description and first results” by B. Faria and J. F. B. D. Fonseca

B. Faria and J. F. B. D. Fonseca

brunofaria@sapo.cv

Received and published: 31 December 2013

Thank you very much for your comments and suggestions. We will take them in account for the final version.

Please find below the responses to the main suggestion and comments:

We will try to fit a table in the text, despite some of the required information were not yet studied, and therefore are not published anywhere;

At this point it is not yet possible to have objectives criteria to distinguish the “normal behaviour” and a “crisis”. More data and observation are needed, especially for the

C2165

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Brava and S. Antão. However, in the text we tried to describe what is usual background rate of the seismic activity, in the sense of what is more frequently observed.

Regarding the suggestions:

Page 4998, lines 1 and 15: The tilt stations were operational in November 2012, and the first draft of this paper was written in May 2013. Thus, at that time we had only six months of data, which is insufficient for any significant results. However, some words will be added to the text about the layout of the stations.

Page 5001, lines 1-5: At the scale (and size) of the figure 2 it is very hard to map the numerous scoria cones that exist in the rift zones. We will instead add in the figure the extension of the three main rift zones.

Page 5001, line 18: The paper by Amelung and Day 2002 will be added in the references.

§2.2: It is unlikely that Fogo and Brava are emerging parts of the same edifice, because: 1- The bathymetry between the two islands displays depths that reach more than 1500 m (Mason et al., 2008; Grevemeyer et al., 2010); 2- the ages found by Madeira et al. (2010) of uplifted carbonatite sequences at the basement of Brava are 2.1 Ma, and those for Fogo are older than 3.5 Ma (Foeken et al., 2009). These arguments suggest that they are two distinct edifices. Anyway this question is beyond the scope of this paper. Furthermore, at this stage there are no evidences that enable to infer whether Brava is related or not to the west rift zone of Fogo.

Page 5004, line 21: "...fresh to very fresh scoria cones" means virtually uneroded scoria cones. We will add "(e.g. youthful cones of unweathered)" to the text.

Page 5005, line 23: The bandwidth of the seismometers will be changed to Hz. Page 5007, line 6: Fonseca et al. (2003) is referred in the caption of figure 2. Fonseca et al. 2013 will be added to the references.

Page 5006, line 5: Concerning the automatic processing, RSAM is a standard tool in

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



the volcanic observatories, which is described in several papers. The others algorithms that we are implementing, namely automatic events detection and classification in the time-frequency domain are still very incipient and being tested. Therefore, it is not suitable, at this stage to describe them and will be presented in others publications.

Page 5007, lines 20-25: S. Vicente seismic station is represented in figure 5.

Page 5008, line 10: The volcanic seismic events referred in the text are described in the published literature. But anyway, we can add a description of them if required.

Page 5008, line 8: In figure 8, the two peaks that occur in January and March reflect some rain that occurred outside the main rainy season. Thus, if they are not taken in account, a peak of the seismic rate is visible in November. The text will be changed to better explain this behaviour. The deployment of the network was finished in April 2011. From May to August 2011, we were implementing the analysis routines and establishing a frame for the events classification. Therefore we started to analyse data systematically in September and when our database became systematic. It is for this reason the figure 8 starts in September. Adding more data into the figure will render it too tight, thus less clear.

Page 5011, lines 6-9: The uplift of the islands was inferred from older submarine volcanic and intrusive that are found up to 300m above present sea level. We will add this small sentence to the main text. Ramalho et al. 2010 Nature Geoscience reports the results of the modelling the origin of the uplift. Nevertheless, we will replace the Phd thesis by the book publish by Springer in 2011, which has the same text the as the thesis.

Page 5012, lines 14-19: The difference between the behaviour of S. Antão and Brava is likely due to form of the intrusions. In Brava there is evidence of uplift, which was interpreted as the result of magmatic intrusion in form of sills or laccoliths (see for example Madeira et al., 2010; Ramalho, 2011). In this case the movement of the magma should be very slow. In Santo Antão there is no evidence of uplift and it was

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



inferred several rift zones. The low-frequency volcanic tremor episodes recorded on the island suggest that there is also magma intrusion, and the epicentres of the volcano-tectonic events, recorded just after these episodes, were located in the one of the rift zones, which suggest that in the case of the Santo Antão the magma is intruding in form of dykes. In this case the movement of the magma should be faster, which may cause some turbulence in the flow and thus some oscillation of the crack walls (see for example Chouet, 1996), accompanied of some shearing in a regime of reduced shear modulus, due to the heat (see for example Aki and Richards, 2002). This is probably the mechanism of the production of the medium frequency events.

Regarding the comment to the figures:

Some figures (particularly fig. 1, 2, 4, 5) are being improved.

In fig. 6 and 7 we didn't included the horizontal components because they don't bring any additional information, as they the have a similar waveform, and their spectral contends are also similar.

Regarding fig. 8 and 13, as it was said above, at this point it is not yet possible have objectives criteria to distinguish "normal behaviour" or "crisis", since more data are needed. In the text is used "background levels" to refer what is observed more frequently. Some more years of observation are still needed to achieve such distinction.

In figures 11 and 14 the power spectra were truncated to enhance the peaks in low frequencies (in figure 15 the spectrogram and the power spectra span the same frequency interval), Showing the entire frequency interval ([0 25]) Hz will render these peaks unclear. The feature in figure 11 at about 12. Hz is due likely to the wind noise (it is observed only this station and it is not permanent).

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/1/C2165/2013/nhesd-1-C2165-2013-supplement.pdf>

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 4997, 2013.

NHESSD

1, C2165–C2169, 2013

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

C2169

