Monitoring Diffuse Volcanic Degassing with Seismic Ambient Noise

Summary

Seivane and Schimmel discuss the potential of Rayleigh wave ellipticity (RWE) for monitoring the shallow subsurface in a volcanic setting on La Palma. They compare the RWE results of three seismic stations with tides, CO_2 release, and precipitation. They use the terdiurnal (3cpd, E3) cycle because E3 is the only cycle just showing up in atmospheric pressure and therefore is independent of earth and ocean tides as well as air temperature. A semi-annual variability of E3 is discussed regarding seasonal precipitation pattern but they focused on anomalies in gain, lag time and coherency of the E3 cycle regarding the volcanic swarm onset and the actual eruption onset. RWE has potential in real-time monitoring environments with strongly fluctuating seismic noise sources as volcanos.

General Comments

Not being part of the first round of revision, I'm trying to make sure that previous comments are handled carefully and but also add some personal thoughts. I hope the comments do not sound harsh. I really like the approach, but I'm not fully satisfied by the results, eighter because of the presentation or because of nature. Below, these are suggestions which should help the reader to understand the potential and importance of your work by mainly focusing on essential parts and restructuring the paper.

The current form of the manuscript remains difficult to assess due to issues with structure and length. The paper is dense and sometimes wordy, which obscures the main message and makes it challenging for the reader to clearly follow the workflow and the key findings. In several sections, methodology explanations of study settings are presented that interrupts the narrative (l. 42-47 (study area), l. 324-333 (method), l. 356-361 (method, l. 405-413 (study area)). The authors have responded to previous reviewer concerns by adding substantial explanation regarding the method and the selection of time windows, but the manuscript would still benefit from restructuring and condensation.

More importantly, while the method itself appears promising, the presented results do not yet convincingly demonstrate that volcanic degassing can be reliably monitored or quantified using RWE. The correlations between the ellipticity variations and CO_2 emission remain qualitative. The differences in spatial coverage and temporal resolution make the comparison difficult to interpret. As a result, the causal link between the observed seismic signal and diffuse degassing processes is not yet fully compelling.

Overall, I see potential in the proposed approach, but the manuscript would benefit from a more concise presentation and a clearer, more critical evaluation of what can realistically be inferred from the current results. Strengthening the focus on the main contributions would likely improve both readability and the persuasiveness of the study.

More specific Comments

Handle statements like l. 383, l. 445 (“excellent agreement”), l. 577 (“clear interplay”) with care.

Sometimes, even if this seems contradictory to the concern about wordiness, it is better to be explicit, especially across paragraphs (e.g. this capability, very near surface, this area, this station, the other two stations, this component).

The “boundary” between “Introduction” and “Study Area” is not entirely clear to me. There might be a clearer way to separate the two sections and reduce repeating. Also: If degassing prior to eruption is rear (l. 31-33), why do we care? I thought that is the goal to monitor degassing to potentially predict eruptions. Additionally, I would mention the sensor types (velocity, acceleration) in the “Study Area” section. The rock permeability is discussed in the “Study Area” then in “Materials and Methods” but in “Results and Discussion” the permeability of the different lavas is not discussed although the three stations are placed in different areas.

In the “Results and Discussion” section are some sentences or paragraphs which I think should be mentioned in the methods part (see general comments). Maybe adding some subsections can help the reader to understand the results and the causing processes better (e.g. Precipitation, Tidal forcing, Degassing). Regarding the permeability comment above, I would like to compare Gain… across sites/stations. Could be a supplement figure.

Conclusion, the last sentence needs to be embedded.

Code availability, please provide the link also in this paper.