

Interactive comment on “Periodicity in the BrO/SO₂ molar ratios in the volcanic gas plume of Cotopaxi and its correlation with the Earth tides during the eruption in 2015” by Florian Dinger et al.

Anonymous Referee #1

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The discovery of a 14 day cycle in the BrO/SO₂ ratio is very interesting and has the potential to shed some light into mechanisms that link the outgassing to triggering phenomena. The introduction outlining the history of DOAS measurement is also interesting, but given its length and weight, is slightly beside the point. The interpretation of the volatile ratio in terms of the tidal potential, however, is somewhat naive, and in places strictly wrong.

- The semi diurnal peak-to-peak modulation between S₂(K₂) and M₂ is depicted in Fig1 and has a period of 14.7 days as the excitation mechanism, while the periodogram in

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Fig 3 reveals a period of 13.7 days describing the response. What is your take on the difference.

- The statement " The North-South component of the tide has no unique periodicity but a mean periodicity of 13-14 days" in Fig1 reveals the partial understanding of the authors about the tidal potential; this general statement should be removed.

- Other peaks in the periodogram in Fig 3 are attributed to "probable just artifacts due to spectral leakage" without any further comment. Spectral leakage is caused by the taper length of the time window, and could have been properly defined, if it is indeed the reason for the additional peaks.

- Fig 5: the expectation of a phase shift between excitation and response is indeed justified and could provide important information about the underlying mechanism. In this way sediment porosity, e.g., has been determined by evaluating the response of water-filled boreholes to the tidal potential. After applying a phase shift of about 1.7 and 10 days, respectively, the resulting correlation between tides and volatile ratio is merely 0.47, which is not convincing at all. Fig 6 (left panel) demonstrates the weak significance. In the conclusions the authors describe the correlation with humidity as only 33% while 36% is considered a promising explanation??

- Appendix A: Addressing the response of the Earth to the tides "The water in the oceans responds..." the authors seem to confuse the amplitude response with the phase. Ocean tides can be completely out of phase with the body tides due to eigen oscillations in bays and estuaries, while the response of solid rock in the crust is smaller than 1 degree, because it is elastic. Love numbers describe exactly this effect. Hence, the final conclusion about the relative displacement between melt and elastic rock needs to be re-considered in that light.

Hence, the data set is certainly worth investigating, but the tidal analysis presented so far needs mayor improvements.

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