

Review of “Depths in a day – A new era of rapid-response Raman-based barometry using fluid inclusions” by DeVitre et al.

Dear editors and authors

Please accept my apologies for the somewhat delayed review of “Depths in a day”. The review request landed exactly on exam and dissertation marking season, which unfortunately had to take priority. The authors of the manuscript allowed themselves some remarks about the bottlenecks in academic publishing and I am sorry to have caused yet another hold-up in this manuscript’s journey through the review process.

I read this manuscript with great interest. A notable feature of melt and fluid inclusion barometry papers over the past few years has been the hopeful promise of developing these approaches for real-time application during volcanic crises, but until now I’m not aware of any study that has actually attempted this. It was refreshing to read a manuscript that has actually been able to demonstrate a proof-of-concept that near-real-time petrological monitoring using fluid inclusions is a viable route towards providing information on magma storage depths to volcano observatories. I agree with the original reviewers that the approach itself is not novel; however, in my opinion there is great scientific value in having a published account of this first demonstration that magma storage pressures can be measured and communicated in near-real time. The readership of JPet will include many scientists using melt and fluid inclusion barometry approaches in their own research, so a JPet letter demonstrating a case study of rapid-response fluid inclusion barometry will reach an interested audience. The letter is well written, clearly explained, and reaches beyond the immediate case study of the September 2023 Kilauea eruption into a well-articulated discussion of the types of volcano and volcanic setting where rapid-response barometry has genuine potential as a near-real-time monitoring tool. I recommend to publish the letter with minor revisions.

In my view the authors have done an excellent job responding to the comments of the original reviewers. Specifically, they have explained and quantified the uncertainties in their temperature estimates; they have addressed concerns regarding EOS for pure CO<sub>2</sub> fluid vs a mixed H<sub>2</sub>O-CO<sub>2</sub> fluid, and the effect of variable XH<sub>2</sub>O on the calculated pressures; justified their choice of Raman densimeter; and justified the types of images used in their workflow. I would have appreciated specific direction to the changed text in the revised manuscript where these concerns were addressed.

I thought the authors did not quite address the concern of Reviewer 1 “How are the data used by decision makers” – and this is also in my mind whenever rapid-response petrological monitoring is discussed. I agree with lines 81-84 (specific recommendations of CONVERSE) that assessing magma storage depth is a key science question in an unfolding eruption, but it’s less clear how observatories would actually use that information to inform the hazard response and management. Perhaps it is as simple as being able to maintain good relationships with local communities by being able to answer questions on where the magma is coming from; how long it may have been stored for; what is its pre-eruptive temperature and viscosity. But are there other ways in which real-time barometry informs ongoing hazard assessments or changes to the crisis response? The case study presented was a low-hazard event so perhaps there are no examples for this particular event, but the discussion or conclusion could usefully include a couple of sentences explaining specifically how the HVO envisages that near-real-time fluid inclusion barometry would feed into their workflows and decisions in a more hazardous scenario.

I’ve attached commented word documents of the manuscript and the supplementary appendix. In the manuscript, please note that “fluid inclusion” and “melt inclusion” almost never need a hyphen – please could this be changed throughout? I picked up a few other typos and grammatical errors. Sorry this is picky, but I think it will aid good communication to sort these out. Almost all the other comments on the mark-up word documents are very minor and should take very little time to fix.

Thanks to the authors for an interesting read, and best of luck seeing this manuscript through to publication.

Best regards,

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