Dear Prof. Humphries,

We are grateful for your handling of our manuscript entitled ‘Depths in a day - A new era of rapid-response Raman-based barometry using fluid inclusions’. However, we respectfully disagree with the decision to reject and would like to ask that our manuscript be reconsidered, on the basis that many of the reviewer comments were either ill-informed/incorrect, or very easy for us to rebut with some more text and additional figures (our original submission was well below the letter limit). We describe these briefly below, and in more detail in the response to reviewers.

1. **Method is very sensitive to temperature through the equation of state:**

One of the major advantages of the fluid inclusion method is that the CO2 EOS is remarkably unsensitive to temperature, and CO2 density is far more sensitive to pressure. This contrasts strongly with mineral thermobarometry, where P-T are closely correlated and difficult to deconvolve and melt inclusion solubility models which can show strong temperature sensitivity. For example, even considering a very wide range of plausible temperatures in Hawaii (1350-1100 ˚°C), temperature only induces an uncertainty of ±10%. We do not feel there is any volcanic system on Earth which is poorly understood enough and without analog with well-studied systems that temperatures could not be estimated within a far smaller range based on mineral compositions. The olivine thermometer we use here would not be difficult to adapt for other systems with any literature data at all. We include a new figure demonstrating just how temperature insensitive the EOS is.

1. **Method is not applicable in H2O-dominated systems, where the fluid is not** CO2**-rich.**

We completely agree with the reviewer that this method is not applicable to arc magmas. We do not think a petrological method needs to be applicable to every volcano in every tectonic setting to have worth, or to be of interest to readers of the Journal of Petrology. For example, Amphibole thermobarometry/chemometry cannot be applied in MORB or OIB magmas. Clinopyroxene thermobarometry cannot be applied to Hawaiian shield volcanoes, which rarely erupt Cpx. Different tectonic settings and different volcanoes require different tools. Arguably, fluid inclusions are one of the most versatile tools, as they are insensitive to the composition of the host and have broad applicability to CO2-dominated magmas in MORBs and OIBs (e.g. Hawaii, Galapagos, Azores, Canaries, Iceland, Reunion). These systems are some of the largest and most active volcanoes in the world and have captured the world’s attention with recent eruptions: 2018 Kilauea, 2021 La Palma, 2021-2024 Reykjanes activity, 2022 Mauna Loa. Basaltic CO2-poor eruptions have also resulted in significant human impacts in the past (e.g., Laki, Iceland), and likely will again. To rebut this concern, we have added a section in the text discussing the effect of **H2O** and what it means for the applicability of this method, using a compilation of the relative proportion of CO2 and **H2O** in the fluid phase at different volcanoes around the world informed from melt inclusion measurements.

1. **Method is not new, can be done with Microthermometry.**

It is well documented in the literature that microthermometry is not possible on fluid inclusions with the low densities examined here, which dominate at many of the most active volcanoes around the world. Further evidence for this fact is that no one has ever managed to conduct, and thus publish such measurements - prior to the Raman technique being developed, no one had investigated magma storage using fluid inclusions in Hawaii, despite it being one of the most popular areas in the world to conduct petrological research. Published fluid inclusion work using Microthermometry was focused on the Atlantic island chains dominated by deeper storage. In a recent paper (DeVitre and Wieser, 2024), we discuss in detail the pros and cons of the Raman vs. Microthermometric method.

1. **What is the value of doing it quickly?**

This study was performed in close collaboration with Hawaii Volcano Observatory, because this information has clear value for their operations during eruptions (see also Gansecki et al. 2019). The Community Network for Eruption Response (CONVERSE), a close collaboration between observatories and academics, has highlighted the operation value of petrological research at numerous points. They encourage academics and observatories to test workflows during times of quiescence, so the community is better prepared to respond when the next large eruption occurs. We believe this work will provide an excellent example in the literature of such a ‘stress test’, motivating additional work in other systems. We have added a paragraph directly addressing the value to observatories and communities in more detail. The purpose of doing this exercise at Kīlauea was to demonstrate its speed and validity in the context of a well-understood volcanic system, where the stakes were relatively low.

We have addressed these comments in detail in the response, and we believe the expanded version of the manuscript will clarify our position on the value of this method. We hope that you will reconsider.