Reviewer#1:

Dear Dr. Gordon Woo,

We appreciate your response and are pleased to reply with the same sincerity and commitment.

1. **Willingness to cooperate and the need for open data**: We would like to emphasize that we fully agree with the reviewer that volcano monitoring should be, and indeed is being conducted from a multiparametric perspective (seismology, geodesy, gas, modeling...). Our experience in the field and our collaboration with various volcanological observatories around the world, as well as our experience in monitoring volcanoes during Antarctic campaigns, are evidence that we share this same approach. **However, from a purely scientific perspective, we believe that the field of volcanology must finally address the issue of Open Science**. Data acquisition is currently an expensive and intensive process, both in economic and temporal terms, primarily funded through national and supranational projects. However, the use of data is often closely guarded by the owners or managers of different observatories, which imposes significant limitations on data usage unless there is a strong connection with the observatories or data owners.Indeed, European data ownership and management policies hinder open access, limiting the natural development of disciplines like volcanic signal recognition. Unlike automatic speech recognition, which has seen significant growth over the past two decades, this field remains stagnant due to data access barriers.
2. **Need for robust catalogs:** Even assuming that monitoring data are publicly available, we still face the limitation of the scarce availability of robust catalogs that are exhaustively prepared and analyzed by specialists in the respective volcanoes, which serve as a comparative basis for our work. For example, IRIS has seismic records available for many volcanoes, but there are no robust labeled catalog associated with them, so we cannot validate the results of our approach without expert supervision. In addition, It is important to note that while there are many available and public seismic catalogs, many of them only correspond to very specific events like earthquakes. Although these catalogs are public, they do not offer the possibility to download and analyze continuous seismic waveforms. They simply report the occurrence of an event at a specific time and location. As we mentioned earlier, even in the case of public repositories managed by national and supranational entities, it is practically impossible to access the recorded seismic data. This issue is even more pronounced in Europe (in the United States, there is a clear trend towards sharing and making data available in public, durable, and high-quality repositories). Many volcanological observatories, despite being funded by public money, still have restricted access to their data. In some cases, this restriction lasts a couple of years, but it is not always enforced. **Therefore, we conclude that we are completely open to testing our proposal with as much data as the reviewer deems necessary. However, to do so, we need to know where to obtain such data and, of course, robust catalogs that can serve as a master reference for comparison**. In our work, we have used the Deception Island database and cataloged it as a master reference because its

development was carried out under the supervision of several experienced volcanic seismologists who specialize in the seismic monitoring of that volcano. Therefore, this database and catalog have been extensively reviewed and analyzed, serving as the basis for many other published works.

3. **Scope and limitations of our work:** our work does not aim to be a universal tool for creating catalogs for any volcano. Instead, it seeks to highlight a significant issue in volcanic monitoring from a seismic perspective and to provide a methodology through which, using techniques purely based on seismic observations, we can develop a robust tool that can easily adapt to different volcanic environments, creating effective and reliable catalogs that enhance our understanding of volcanic dynamics. To achieve this, each observatory will need to set up its system based on the available data or the similarities of its volcano with others that have public data and catalogs that support the development of the tool.
    a. To facilitate understanding of the proposed methodology, we suggest the following analogy based on speech recognition systems: Imagine we have a database and various semantic fields in a language with Latin roots. Now, suppose we train a speech recognition system using this database. If that system were used to recognize these semantic fields in other languages with Latin roots, we would achieve robust recognition because many of the words share roots and meanings. However, if the same system were used to recognize semantic fields in Icelandic, which has Old Nordic roots, our recognition would likely be very poor. To achieve proper recognition, we would need to apply a system trained in a related language, but even then, the methodology could remain the same for Latin cases.

    This is the foundation of our proposal: provide a methodology that allows for the creation of catalogs and the inference of dynamics in a flexible and scalable manner. The goal is not to create a universal tool that can recognize all volcanoes. This is impossible, as a volcano—continuing with the language analogy—could exhibit various “languages” during different eruptive stages and under different volcanic dynamics. Our work, therefore, simply offers a concise and reliable methodological framework from which knowledge can be created.

4. **Transferability and robustness**: Regarding transferability to other volcanic environments, a preliminary approach that served as a foundation for this work has been applied to the Bezymianny[1] and Peteroa[2] volcanoes, and is currently being applied to the La Palma volcano(in construction). In all scenarios, the results have been very satisfactory, and the outcomes are sufficiently robust and competitive compared to classical techniques. As mentioned earlier, this work improves such cited references by incorporating a self-adaptation mechanism that enables the creation of robust catalogs with less human intervention**.**