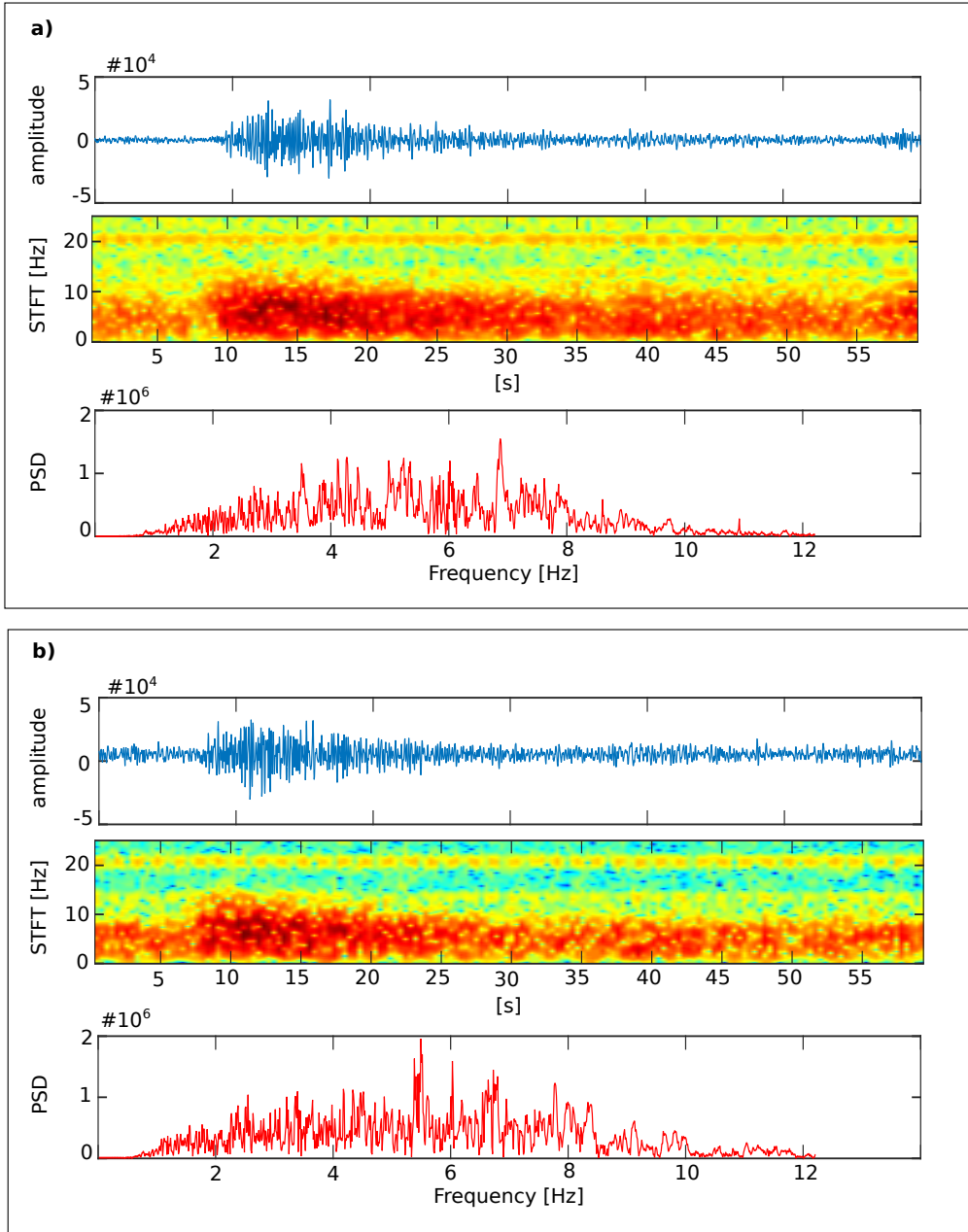
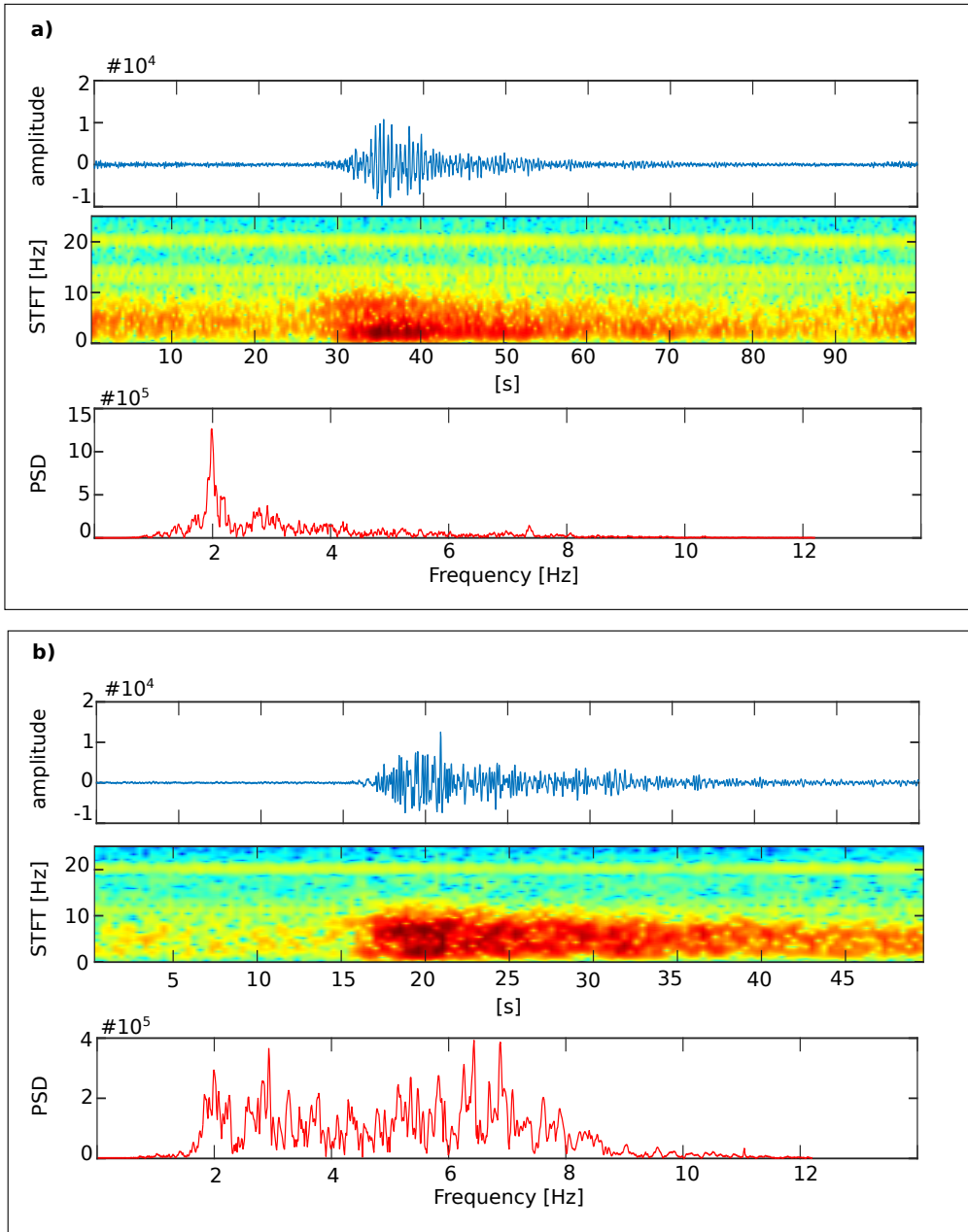
Supplementary Figure F1. Example of event annotated as GARs followed by LPC1 and VT in the catalogue being classified as TRE for our models.

Supplementary information

This section contains supplementary figures supporting our findings.

Weakly supervised learning

Among the seismological community, there is a marked interest in associating different types of seismo-volcanic signals with models of seismic sources in order to better understand the physics of the underlying processes. At present, there are two main complementary lines of research within volcano seismology: a) the detection and identification of different types of volcanic events using machine learning (ML) and b) the investigation of physical source models that explain the origin of these signals. As scientific knowledge has advanced, a paradoxical situation has developed: there is a lack of uniformity in the naming of observed seismic signals. Therefore, these classifications and the resulting models are often non-uniform across different volcanoes and scientists; as a consequence we lack universal exportability of the results and we are still far from reliable operational forecasting. Supplementary Figures F5, F6, and F7 provide illustrative examples that support our findings.

Supplementary Figure F2. Two examples of event annotated as VT in the catalogue being classified as TRE for our models. Clear high frequency package waves have been attenuated.

Supplementary Figure F3. a) Example of event annotated as VT in the catalogue being miss-classified as LP for our models. According to (Ibañez et al, 2000), after a detailed review, we can conclude that this event could correspond to a VT with high frequencies attenuated or even classical LP. Although in the spectrogram, we can find energy up to 10 Hz, reviewing the Power Spectral Density we can observe high energies only at low frequencies. b) Example of event annotated as LPC1 in the catalogue being miss-classified as VT for our models. According to (Ibañez et al, 2000), after a detailed review, we can conclude that this event could correspond to a VT with high frequencies attenuated. The probability outputted by the model to belong to Earthquake category reached 75%.