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Observing and categorising unconventional volcano seismic signals in the Irazú-Turrialba volcanic complex

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Seismic signals recorded in volcanically active locations provide valuable insight into the evolutionary, migratory and potentially eruptive processes existing within the system. The twin-system complex of the Irazú and Turrialba volcanoes in Costa Rica exist on the volcano-plutonic arc caused by subduction of the Cocos plate beneath that of the Caribbean. This provides an example of two differing volcanic settings, the closed system of Irazú and actively venting open conduit system of Turrialba. From this, an opportunity to monitor potential interactivity between the two volcanoes and observe any variations in their respective responses to local and regional processes is presented. A network of 20 broadband seismic stations covering approximately a 50km2 area shall be deployed, (incorporating the already existing OVSICORI and RSN monitoring networks) to investigate unconventional seismic signals and to shed light on the geometries and depth of the magmatic reservoirs.

Data from the Irazú-Turrialba volcanic complex reveals tremor-like events that do not correspond with their defined namesake, for example as various periodic, fluctuating bursts of activity with a wider range of dynamic frequencies (5-30Hz). By identifying these unconventional signals, a database of the defining characteristics is established. The observed signals are categorised by their duration, frequency content, and unique wave-envelopes, the latter providing an interpretation of the magmatic or hydrothermal processes responsible for their occurrence. Using a cross-correlation algorithm we locate these events, revealing their position relative to both volcanoes.

The intention of this network is to establish an improved understanding of the whole-system plumbing dynamics existing within the Irazú-Turrialba volcanic complex.