



Is the seismicity of Tenerife (Canary Islands) increasing?

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The volcanic island of Tenerife (Canary Islands, Spain), comprises at least 4 distinct volcanic systems: the Teide complex, the Abeque dorsal (North West), the Pedro Gil dorsal (North East) and the Adeje dorsal (North South). The last eruption occurred in 1909, on the NW dorsal. Currently the volcano is in a quiescent state, showing only a moderate seismicity, weak fumaroles and diffuse soil gas emissions.

However, in recent years, different geochemical and geophysical indicators are showing a departure from the previous background state of the volcano. In particular, since 2017, the occurrence rate of earthquakes located beneath the island, has shown a marked increase. This is only partially due to the technological improvement of the seismic networks operating on the island. In this work we demonstrate quantitatively that the observed increase is not an artifact due to the lower completeness magnitude of the catalogue.

We computed the time varying a and b parameters of the Gutenberg-Richter distribution using a recently developed multiscale approach. This allowed us to obtain an unbiased estimate of the number of earthquakes having a magnitude higher than 0. We applied this approach on two independent seismic catalogues: the first coming from Red Sísmica Canaria (C7), managed by INVOLCAN; and the second from Instituto Geográfico Nacional (IGN). We show that the observed variations are consistent for both catalogues.

The increase in the seismicity rate can be linked to the parallel rise in the diffuse emission rates of CO_2 from the crater of Teide volcano. Both quantities started increasing after a significant swarm of long-period events (more than 700 detected) recorded in Tenerife on Oct. 2, 2016. This suggests that a massive injection of magmatic fluids into the island hydrothermal system is causing an increase of the pore pressure, triggering the microseismicity.

At the this time the island is not showing significant ground deformation. This implies the absence of ongoing magmatic intrusion processes at shallow depth. However, the observed variations highlight an internal dynamic of the magmatic/hydrothermal system of Tenerife, indicating the need for a continuous improvement of the volcanic surveillance of the island.