

Subplinian eruption of Calbuco volcano (Chile), April 22th, an example of VEI-4 explosive eruption with few precursor signals

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Two main challenges of worldwide volcano observatories are to establish permanent and local multiparametric networks at active volcanoes with a high potential to affect infrastructure and communities living within hazard zones, as well as to establish a scientific team with the capability to monitor, interpret, and model network data in order to forecast the size, type, timing and probability of eruptive processes with high potential to damage infrastructure or affect communities. Most well-documented large (VEI 4+) eruptions have some kind of precursory activity, such as seismicity, steaming, and/or deformation that preceded the eruption by days, months or even years that can be identified and used to forecast the eruption. However, in a few cases, there are no clear precursory signals even within the last few hours before explosive activity, complicating an observatory's ability to forecast an eruption, let alone to manage the potential crisis. The April 22 2015 Calbuco eruption is one of such eruptions, where after many decades a VEI 4 eruption occurred with few and weak precursory signals. In the days before the eruption, there were just a few small ($ML < 1.0$) volcano-tectonic (VT) earthquakes. Three hours before the eruption, a shallow VT swarm began, rapidly increasing in both number and magnitude of events, and evolving into an LP swarm. Based on the short and minimal precursory signals and petrological analyses, we discuss two potential eruption mechanisms: the first one related to a second boiling process of a shallow magma body, and the second one related to a fast-rising deep-sourced magma.