



Experimental study of volcanoes and hydrothermal reservoirs triggered by earthquakes

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Evidences are increasing that tectonic earthquakes may trigger volcanic activity. Some volcanoes erupt immediately after a tectonic earthquake occurred. Other volcanoes merely show signs of unrest, but no eruption. Still other volcanoes show no response, even though they are in a state of a generally high activity. The problem in volcano-earthquake interaction research is that the physical processes of the triggering are only poorly understood. Some recent studies suggest a combination of (quasi)static and dynamic triggering, associated with permanent crustal strain or the short term passing of seismic waves, respectively. However, no consensus exists concerning the type of waveform most effective for the triggering process, or about the time delays often observed between the passage of the seismic waves and unrest occurrence. In order to better understand the way earthquakes may trigger volcanoes, we first collected empirical data and re-evaluate the empirical database. Second, we designed laboratory experiments to simulate selected real scenarios as recorded by geophysical instruments. Our analog reservoir is situated on an earthquake simulator, constructed to allow systematic exploration and scenario simulation of empirical observables. For instance, we evaluate how the frequency and amplitude of seismic waves affects a bubbling fluid, leading to fluid mobilization, mixing and ultimately to the increase of a reservoir pressure. The implications of the results are wide, and may apply to volcanoes triggered by earthquakes, as well as other fluid reservoirs containing different fluids and/or gaseous phases.