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Interelationship between earthquakes and volcano eruptions

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Earthquakes have been shown to trigger volcano eruptions, when large events are involved, i.e. for M$\geq$7, VEI$\geq$5 for earthquakes and volcano eruptions respectively (e.g. Linde et al., 1998; Marzocchi, 2002; Marzocchi et al., 2004). When analyzing worldwide catalogue for M$\geq$4.8 seismicity and VEI$\geq$0 volcano eruptions, 1973-2006, we find that there is significant increase (when tested against catalog randomizations) of eruption onsets on the earthquake day. This result emerges when stacking over the whole seismicity and eruptions for couple of events where the (Distance/Eqs-size) ratio is smaller than 10., the distance being the eqs-volcano distance, and the Earthquake size is measured by its rupture length. This result suggests that smaller than M=7 earthquakes do matter for triggering a volcano eruption.

Similarly, when stacking over the whole eruption onsets, 732 events on 231 volcanoes, there are significant changes in seismicity rate 10-50 days from the eruptions. These increase and decrease of seismicity rate 5-10 days before and up to 50 days after eruption onsets respectively, mimic the pattern found before and after earthquakes (Omori, 1906; Molnar and Jones, 1979; Helmstetter and Sornette, 2003). We recover the direct and inverse Omori' laws that suggest the volcano eruptions induce similar brittle damage to the earth crust to the one contemporary to earthquakes. The identification of seismic foreshocks and aftershocks to volcano eruptions questions for the apparent dynamic triggering of eruption onsets at t=0.