

Interactions between earthquake and volcano activity (average picture from worldwide catalogues)

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Using worldwide catalogues for $M > 4.8$ earthquakes and VEI index for eruptions, 1973-2010, we resolve a significant, when tested against catalogue randomizations, increase of eruption onsets the day on the earthquake day.

First, we find this increase is stronger for earthquake-eruption pairs that are within ten fault length distance from the trigger earthquake. For these distance ranges these observations suggest the dynamic triggering of volcano activity by earthquakes.

Second, we observe the clustering in time for earthquake-eruption pairs is not bounded to the earthquake/eruption day. The signal remains above noise level up to 100, 10 days after and before the eruption day, respectively.

These later results suggest the earthquakes map a brittle damage process around eruption times. The brittle damage, as mapped by $M > 4.8$ earthquakes before and after eruption time, is localized within 50 km from the volcano. These patterns in space and magnitude are far beyond the regular definition of VT earthquakes as $M = 3-4$ events within 5-10 km from the volcano. These results, all emerging from mean field analysis, are evidence for a mechanical coupling, as pressure and stress build up within the brittle crust, between earthquake and eruption up to 50 km around the ongoing eruption.

Last, the pre-eruption patterns support the faster the increase in the average earthquake rate, i.e. the exponent of the inverse Omori's law, the larger the VEI of the ongoing eruption.