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Multiplet Based Time Lapse Velocity Changes Prior to the 2018 Eruption of Sierra Negra Volcano, Galapagos Island Observed with Coda Wave Interferometry

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Changes in external stress state and fluid content alter the mechanical properties of a geological media. Variations in seismic wave velocity can be used as proxies for changes in stress the onset of mechanical damage and/or possible fluid ingress. Temporal variations in seismic wave velocity have previously been monitored and observed prior to volcanic eruptions. In the absence of additional constraints related to stress or fluid changes on the volcano, these pre-eruptive changes are difficult to interpret and hence the causes of them are often not well understood. In this study, Coda Wave Interferometry (CWI) is used to measure time-lapse changes in seismic velocity on seismic multiplets (repeating similar earthquakes). In particular, we focus our analysis on using this technique to calculate the velocity changes on the data recorded prior to the 2018 eruption of Sierra Negra volcano, Galapagos Island. On 26th June 2018 at 09:15 UTC, a magnitude 5.3 earthquake occurred near the south-west caldera rim and an intense seismic swarm started around 17:15 UTC. Seismic tremor dominated at about 19:45 UTC, which marked the onset of the eruption. A very large seismicity sequence preceded the eruption. The precise relationship between the magnitude 5.3 event and the eruption is not fully constrained. Here we search for multiplets in order to achieve high time resolution velocity change information in the hours between the large earthquake and the eruption. Our aim is to understand whether changes in seismic velocity measured with CWI on multiplets method provide new insight into the physical processes related to the eruption.