Permeability and seismicity rate changes at an inflating submarine volcano caused by dynamic stresses

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Our understanding of dynamic earthquake triggering in submarine environments is limited due to the lack of offshore observations. Here, we analyze the triggering susceptibility of a magmatically robust, seismically active submarine volcano (Axial Seamount), located at the intersection of the Juan de Fuca ridge and the Cobb hotspot in the northeast Pacific Ocean. Axial Seamount hosts a cabled network of geodetic and seismic instruments since late 2014. Axial Seamount last erupted in April 2015 and has continued to inflate since. We utilize a high-resolution micro-seismicity catalog to evaluate the triggering response from July 2015 to July 2022 based on seismicity rate change estimates for potential triggering sources. We report statistically significant episodes of dynamic earthquake triggering for ~16% of cases, including instances of both instant ($0 < t < 2$ h) and delayed ($2 < t < 24$ h) increases in local earthquake rate following the arrival of teleseismic waves. Initial results do not show any obvious dependence of triggering strength on the amplitude of the peak ground velocity. To evaluate the possible influence of permeability change on dynamic earthquake triggering, we compute the phase lag between vent-fluid temperature and tidal loading for the 3-day periods before and after the arrival of teleseismic waves. We report permeability changes for both triggering and non-triggering cases. Our findings provide useful insights into the physical mechanisms controlling the dynamic earthquake triggering at submarine volcanic environments.