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The effect of seismic network geometry on moment tensor inversions

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Active volcanoes are often covered with a sparse seismic network. In the case of a volcanic crisis, this number can even be more reduced due to noise saturated data at certain stations, electrical failures, or stations being destroyed by volcanic events. Using numerical tests we examined how well different source mechanisms (isotropic, double-couple, CLVD) with varying orientations and different depths can be resolved using moment tensor inversion, where number of stations used in the moment tensor inversion is varied mimicking an eruption scenario. As a case study we use the seismic network configuration at Soufriére Hills volcano, Montserrat. We show that for a reduced number of stations in our seismic network, even though we can resolve the time histories of the surface displacement, the source moment tensor components are not well resolved. Additionally, we show how different slip directions at the same fault can affect the moment tensor components, i.e. making it impossible to resolve moment tensor components for certain source orientation at certain depths. These results show the importance of taking seismic network geometry into account.