Insights on earthquake source processes from the azimuthal variation of the 2019 Ridgecrest earthquake source spectra

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The 2019 Ridgecrest, CA earthquake sequence has provided a unique opportunity and a rich dataset to understand earthquake source properties and near-fault structures. Using the high-quality seismic data provided by the SCEC Stress Drop Validation group we first estimate the corner frequency for M2.0-4.5 earthquakes by applying the spectral ratio method based on empirical Green's function (Liu et al., 2020). We relate corner frequency estimates to stress drops assuming the Brune source model and circular cracks. Our preliminary results show increasing stress drops with magnitude for both P and S waves, from 1 MPa for M2.0 events to 10 MPa for M4.0 events, though the limited frequency bandwidth may cause underestimation for small events. The estimated moment magnitude is proportional to the catalog magnitude by a factor of 0.72, which is close to 0.74 estimated by Trugman (2020) for the Ridgecrest earthquake sequence. In the second part of the study, we examine the impact of fault zone structure on the azimuthal variation of the spectra. Using kinematic simulations and observations of the 2003 Big Bear earthquake sequence, Huang et al (2016) showed that fault damage zones can act as an effective wave guide and cause high-frequency wave amplification. We use clusters of M1.5-3 earthquakes in the Ridgecrest region to further examine the azimuthal variation of the stacked spectra and investigate if the near-source structure can affect our corner frequency estimates. We aim to develop robust methods that utilize high-quality seismic data to illuminate earthquake source processes and fault zone properties.