TITLE:

Generation and Validation of Synthetic HR-GNSS Data for New Zealand Megathrust Rupture Scenarios

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ABSTRACT TEXT:

New Zealand's vulnerability to seismic and tsunami hazards represents a pressing concern that has led to the desire for building a real-time system to alert the community when an earthquake occurs. These large earthquake events occur less frequently, but they can trigger catastrophic tsunamis affecting communities along the coast of the North and South Islands. New Zealand has a robust real-time seismic and geodetic network capable of monitoring moderate-to-large earthquakes. We aim to test approaches that can obtain a rapid characterization of large earthquakes with the aid of Global Navigational Satellite Systems (GNSS) data. For this study we use a database of 350 megathrust ruptures obtained from an earthquake cycle model of the Hikurangi subduction zone by RSQSim earthquake simulator. First, we generate synthetic displacement data at all currently operating high-rate GNSS sites in the country for each rupture scenario. We then validate synthetic observations against known Peak Ground Displacement (PGD) ground motion models to determine that our simulations are performing well. In addition, we follow the same methods of generating and validating synthetic data for kinematic ruptures to compare results. Finally, we ingest synthetic GNSS data into G-FAST, a rapid source characterization suite that can yield rapid magnitude and slip distribution estimates, to show the efficacy of G-FAST in characterizing these megathrust events with the current GNSS network configuration in New Zealand. Results from this study will potentially improve the earthquake and local tsunami warning systems in this region.