

An example of slip on a capable fault: Near-field co-seismic deformation of the 30th October Central Italy earthquake (6.6 Mw) measured using low-cost GNSS

Maxwell Wilkinson¹, Laura Gregory², Richard Walters³, Luke Wedmore⁴, Ken McCaffrey^{3,1}, Richard Jones¹, Gerald Roberts⁴, *Robert Holdsworth^{1,3}

1. Geospatial Research Limited, Department of Earth Sciences, Durham University, Durham, DH1 3LE, 2. School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, 3. Department of Earth Sciences, Durham University, Durham, DH1 3LE, 4. Department of Earth and Planetary Sciences, Birkbeck, University of London, London, WC1E 7HX

Capable faults and the ground motions they produce in the near-field are of great importance to the construction of major infrastructure facilities such as nuclear plants, yet few datasets exist to constrain these effects. Here we present a record of co-seismic displacement of the 30th October Central Italy earthquake measured in the near-field using low-cost GNSS, an example of co-seismic slip on a capable fault. Four low-cost GNSS units were installed across the causative Mt. Vettore fault as two footwall-hangingwall pairs with baselines of 1,286 m and 1,870 m with an along-strike separation of 6.2 km. The displacement records reveal near-synchronous co-seismic displacement along each baseline, values of finite co-seismic displacement, rise-time and rupture velocity. A rigorous comparison of these values has been conducted using independent datasets of displacement and acceleration derived from regional GPS, InSAR, a local strong motion station and mapping of surface ruptures which intersect the two baselines. This comparison and analysis, whilst not without discrepancy, validates low-cost GNSS for the first time as an appropriate method for the temporal measurement of near-field co-seismic displacement. The derived empirical values will benefit the process of fault rupture modelling and accurate ground motion prediction in the near-field of capable faults worldwide.

Keywords: capable fault, surface ruptures, near-field co-seismic deformation , low-cost GNSS, 30th October Central Italy earthquake

