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Surface rupture and slip distribution of the 2016 Mw7.8 Kaikoura earthquake (New Zealand) from optical satellite image correlation using MicMac

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Remote sensing techniques, like optical satellite image correlation, are very efficient methods to localize and quantify surface displacements due to earthquakes. In this study, we use the french sub-pixel correlator MicMac (Multi Images Correspondances par Méthodes Automatiques de Corrélation). This free open-source software, developed by IGN, was recently adapted to process satellite images. This correlator uses regularization, and that provides good results especially in near-fault area with a high spatial resolution. We use co-seismic pair of ortho-images to measure the horizontal displacement field during the recent 2016 Mw7.8 Kaikoura earthquake. Optical satellite images from different satellites are processed (Sentinel-2A, Landsat8, etc.) to present a dense map of the surface ruptures and to analyze high density slip distribution along all major ruptures. We also provide a detail pattern of deformation along these main surface ruptures. Moreover, 2D displacement from optical correlation is compared to co-seismic measurements from GPS, static displacement from accelerometric records, geodetic marks and field investigations. Last but not least, we investigate the reconstruction of 3D displacement from combining InSAR, GPS and optic.