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Surface rupture and vertical deformation associated with 20 May 2016 M6 Petermann Ranges earthquake, Northern Territory, Australia

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Surface-rupturing earthquakes in stable continental regions (SCRs) occur infrequently, though when they occur in heavily populated regions the damage and loss of life can be severe (e.g., 2001 Bhuj earthquake). Quantifying the surface-rupture characteristics of these low-probability events is therefore important, both to improve understanding of the on- and off-fault deformation field near the rupture trace and to provide additional constraints on earthquake magnitude to rupture length and displacement, which are critical inputs for seismic hazard calculations. This investigation focuses on the 24 August 2016 M6.0 Petermann Ranges earthquake, Northern Territory, Australia. We use 0.3-0.5 m high-resolution optical Worldview satellite imagery to map the trace of the surface rupture associated with the earthquake. From our mapping, we are able to trace the rupture over a length of $\sim$20 km, trending NW, and exhibiting apparent north-side-up motion. To quantify the magnitude of vertical surface deformation, we use stereo Worldview images processed using NASA Ames Stereo Pipeline software to generate pre- and post-earthquake digital terrain models with a spatial resolution of 1.5 to 2 m. The surface scarp is apparent in much of the post-event digital terrain model. Initial efforts to difference the pre- and post-event digital terrain models yield noisy results, though we detect vertical deformation of 0.2 to 0.6 m over length scales of 100 m to 1 km from the mapped trace of the rupture. Ongoing efforts to remove ramps and perform spatial smoothing will improve our understanding of the extent and pattern of vertical deformation. Additionally, we will compare our results with InSAR and field measurements obtained following the earthquake.