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Near-field directionality of earthquake strong ground motions measured by displaced geological objects

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Coseismically displaced rock fragments (chips) in the near-field (less than 5 km) of the 2016 moment magnitude (M_w) 6.1 Petermann earthquake (Australia) preserve directionality of strong ground motions. Displacement data from 1437 chips collected over an area of 100 km² along and across the Petermann surface rupture is interpreted to record combinations of co-seismic directed permanent ground displacements associated with elastic rebound (fling) and transient ground shaking, with intensities of motion increasing with proximity to the surface rupture. The observations provide a proxy test for available models for directionality of near-field reverse fault strong ground motions in the absence of instrumental data. This study provides a dense proxy record of strong ground motions at less than 5 km distance from a surface rupturing reverse earthquake, and may help test models of near-field dynamic and static pulse-like strong ground motion for dip-slip earthquakes.