Rupture characteristics of the 2019 North Peru intraslab earthquake (Mw8.0)

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According to GlobalCMT, the 2019/05/26 North Peru earthquake is the largest event since 1976 in the wide depth range between 70km and 550km. Its hypocentral location (at about 130km depth) inside the Nazca slab geometry, together with its normal focal mechanism, favor an origin related to slab bending. Owing to its magnitude and depth, this earthquake generated large coseismic displacements over a broad area, that were geodetically measured by InSAR and GNSS. By combining these observations with regional and teleseismic data, we invert for the rupture process of the event, and first focus on the actual focal plane. Inversion reveals that the steeper plane (dipping 55-60° to the East) is preferred. A clear northward propagation is also imaged, with rupture traveling ~200km in 60s, and with little extent in the dip direction. This narrow rupture aspect implies that the stress drop is significant, even if a simple duration-based measurement would not indicate so. These inversion results obtained at relatively low frequency (below 0.2Hz) are then thoroughly compared with back-propagation images obtained at higher frequency (at 0.5-4Hz), which also highlight the dominantly northward rupture propagation with an average rupture speed of about 3 km/s. Implication in terms of earthquake rupture dynamics and occurrence of such large intermediate depth earthquakes in slabs will finally be discussed.