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The 29th March 2017 Kamchatka earthquake: fault activity in extension of the East Kamchatka Ridge as constrained by InSAR observations

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The Differential Interferometric Synthetic Aperture Radar (DinSAR) technique has been exploited to characterized the fault rupture characteristics of the 29 March 2017 Mw 6.6 South-Ozernogo Kamchatka earthquake with the aim to contribute for a better understanding of the complex tectonic regime in this region. The high seismicity along the south-east coast of Kamchatka Peninsula related to oceanic-continental plate collision and the consequent subduction process and high volcanic activities, makes this remote region be of relevant scientific interest for global Earth processes comprehension. While the subduction zone and mechanism had been thoroughly constrained, not much is known about the complex tectonic setting north of the slab. This region had long been considered aseismic, however, in recent past some strong events occurred which have made scientist to reevaluate its seismic and tsunamigenic hazard.

The South-Ozernogo earthquake occurred exactly north of the Pacific subduction zone. The ground shaking had been registered by global and regional seismic networks. In this study we focused our investigation on the coseismic surface displacement exploiting InSAR measurements to retrieve the seismic source geometry and kinematic parameters. ALOS-II ascending and descending and Sentinel-1 descending deformation maps have been jointly inverted using elastic half-space fault modeling.

Predominant uplift deformation have been detected from both geometries, amounting to around 20 cm near the shoreline. The nonlinear inversion suggested a north-west-dipping oblique thrust faulting with right-lateral rupture. The model fault geometry is consistent with the seismic data, however there is a conspicuous disagreement in epicenter location. Our fault model suggests new fault structure which we interpret as the extension of the East Kamchatka Ridge.