Post-seismic deformation of the 2010 Mw 7.4 Ogasawara Islands outer-rise earthquake evidenced by Repeating Earthquakes.

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Although far from the Japanese main island of Honshu, the Izu-Bonin area is a very active seismic zone. It experienced two major earthquakes in the past decade: (i) the 2010 Mw 7.4 Ogasawara Islands intraplate earthquake that occurred on the 2010/12/22 in a normal-fault, in the outer-rise of the trench of the Pacific plate that subduct underneath the Philippine Sea plate, (ii) the Mw 7.9 Bonin island very-deep focus earthquake that occurred on the 2015/05/30 that was preceded by an acceleration of the seismicity at large depth. The aftershocks of the outer-rise earthquake were distributed in a NW-SE belt and formed subparallel lines along a fracture zone in the Pacific plate. The aftershocks were first located in the surroundings of the main shock rupture and migrated over the following days beyond or into the Ogasawara Plateau and the Uyeda Ridge. Due to its location in the sea and with only a few GPS and seismic stations around, it is difficult to assess the extent of the post-seismic deformation of this earthquake.

In that context, the analysis of repeating earthquakes as a proxy for slip on the fault is very useful. Using ten seismic stations, we detected 130 repeating earthquakes. Their number increased in the next few days following the main shock and are located in the northern branch of the fault. Ten days later, another increase of repeating earthquakes occurs on the subduction interface concomitant with a displacement to the east seen by GPS stations, indicating that the outer-rise earthquake might have triggered a slow slip event on the subduction interface. The main shock was also followed by an extremely rapid migration of the seismicity at depths up to 80km showing that it perturbed the entire outer-rise structure of the slab at depth.