[JJ] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS12]Seismicity

convener:Kei Katsumata(Institute of Seismology and Volcanology, Hokkaido University)

Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session aims to improve our understanding on seismicity. Any contribution on behavior of earthquakes as a cluster, such as regional seismicity and aftershocks, are welcomed. We also welcome contribution on temporal and spatial interactions that control seismicity, and tectonic processes, and geological and thermal structures that regulate seismicity.

[SSS12-P07]Shear strain energy changes and aftershock distributions of the 2016 Kumamoto earthquake sequence

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Keywords:2016 Kumamoto earthquake sequence, shear strain energy, aftershocks

The 2016 Kumamoto earthquake sequence began with an Mj 6.5 earthquake on April 14, and about 28 hours after this event, a larger Mj 7.3 earthquake occurred near the first Mj 6.5 earthquake. Both the two events are characterized by right-lateral strike-slip faulting, and were followed by intense aftershock activity exhibiting various types of focal mechanisms. In the present study, we investigated the influence of the Mj 6.5 and Mj 7.3 earthquakes on the subsequent earthquake sequence. Given the variety of aftershock faulting, we focused on the changes of shear strain energy caused by the two large earthquakes. This could be connected with the change of a stress invariant J2 or the equivalent stress, and an increase of the shear strain energy is considered to correspond to an increase of the averaged amplitudes of shear stresses for randomly-distributed faults (Saito et al., 2017). In the analysis, we used the hypocenters of shallow earthquakes (focal depth <= 20 km, M >= 2.0) listed in the Hi-net catalog for the period from 2012 to 2017. At the location of each earthquake, we calculated the tensor of stress changes caused by the Mj 6.5 and Mj 7.3 earthquakes (Okada, 1992) using the uniform slip fault models of GSI (2016a, b), and evaluated the shear strain energy changes. In this evaluation, we also need the background stress orientations and the stress ratio. Those were estimated from the F-net moment tensor solutions in and around the area based on the ideas of Terakawa and Matsu'ura (2008) and Matsumoto (2016). Immediately after the Mj 6.5 earthquake, the events were distributed within a 40 km long region along the fault strike. 90% of the events occurred at the locations where the amplitudes of equivalent stress changes imparted by the Mj 6.5 earthquake are larger than 0.7 MPa, and 58% of the events experienced positive shear strain energy changes. After the Mj 7.3 earthquake, the area of activity expanded, which spanned about 180 km long and 60 km wide. In this period, we considered both the contributions of the Mj 6.5 and Mj 7.3 earthquakes. 90% of the events occurred in the region with equivalent stress changes larger than 0.3 MPa. 72% of the events lie in the area where the shear strain energy increased by those earthquakes. For the events in the period before the Kumamoto earthquake sequence, on the other hand, almost half (51%) show positive strain energy changes. This suggests that the aftershock distribution can be linked with an increase of the shear strain energy induced by the two large earthquakes.