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

[S-SS15]Fault Rheology and Earthquake Physics

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The goal of this session is to integrate theoretical, experimental, observational, and numerical perspectives from various fields such as seismology, geodesy, geology, mineralogy, and so on, to define what is known about earthquake source processes and the physical and chemical elementary processes of faulting. This session welcomes studies that address such issues as pre-, co-, and post-seismic processes, the rheology of seismogenic faults and fault rocks, laboratory experiments on elementary processes, numerical models based on frictional laws, and estimates of the stress field in the seismogenic zones. We also welcome studies on fault-zone drilling projects and in situ stress measurements.

[SSS15-P15]The dependence of the initial part of the peak displacement amplitude of P-wave on magnitude

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Dipendence of the final size of an earthquake on the rupture nucleation process have been discussed. As one of these studies, Colombelli et al. (2014) investigated the relation between the rise of the peak displacement amplitude of P-wave and magnitude. In details, they measured the peak displacement amplitude of filtered P-wave signals (P_d) and fit the logarithm of P_d with a piecewise linear function (using 3 segments of which the third segment is plateau). Then, they determined the corner time of the first and second straight line (T1 and T2, respectively), the slope of the two lines (B1 and B2, respectively) and the final plateau level (PL) and analyzed the relation between these parameters and magnitude. The result showed that there is scaling between these parameters (T1, T2, B1 and PL) and magnitude. On the relation between B1 and magnitude, Colombelli et al. (2014) suggested that magnitude will be larger if a rupture starts at the region of larger slip-weakening distance (D_c) on the fault. This means the nucleation process controls the final size of an earthquake.
The purpose of this study is to examine the method of Colombelli et al. (2014) to other events and to check whether the results consistent with them of Colombelli et al. (2014) or not. In this study, new earthquakes, which have not been analyzed by Colombelli et al. (2014), were analyzed and the scaling between T1, T2, B1 and PL and magnitude was found as same as the results Colombelli et al. (2014) obtained, while a few events were off the trend of T1, T2 and B1 vs. magnitude. There are the following possible causes of estimating T1, T2 and B1 much smaller or larger than these parameters of other earthquakes: the analytical methods, the station characteristics and individual events' characteristics. Examing these matters, we cannot find big problems with analytical methods and stations. Therefore, the cause of estimating T1, T2 and B1 much smaller or larger may be the characteristics of individual events. By the previous researches (Ampuero et al. (2002), Ohnaka and Shen (1999), Ohnaka (2003)), the break down stress drop, the stress drop averaged over the entire fault area and slip-weakening distance can affect the value of T1, T2 and B1. Hence, the characteristics of individual events could make T1, T2 and B1 off the trend (large break down stress drop and/or small slip-weakening distance make T1 small and B1 large).