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

[S-SS15] Fault Rheology and Earthquake Physics

convener: Hideki Mukoyoshi (Department of Geoscience Interdisciplinary Graduate School of Science and Engineering, Shimane University), Wataru Tanikawa (Japan Agency for Marine-Earth Science and Technology, Kochi Institute for Core Sample Research), Takanori Matsuzawa (国立研究開発法人 防災科学技術研究所, 共同), Keisuke Yoshida (Tohoku University)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

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

*Kazuya Tateiwa¹, Tomomi Okada¹ (1. Research Center for Prediction of Earthquakes and Volcanic Eruptions, Graduate School of Science, Tohoku University)

Dependence 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 (T_1 and T_2 , respectively), the slope of the two lines (B_1 and B_2 , 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 (T_1 , T_2 , B_1 and PL) and magnitude. On the relation between B_1 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 T_1 , T_2 , B_1 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 T_1 , T_2 and B_1 vs. magnitude. There are the following possible causes of estimating T_1 , T_2 and B_1 much smaller or larger than these parameters of other earthquakes: the analytical methods, the station characteristics and individual events' characteristics. Examining these matters, we cannot find big problems with analytical methods and stations. Therefore, the cause of estimating T_1 , T_2 and B_1 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 T_1 , T_2 and B_1 . Hence, the characteristics of individual events could make T_1 , T_2 and B_1 off the trend (large break down stress drop and/or small slip-weakening distance make T_1 small and B_1 large).