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Spatial distribution of aftershock decay property beneath Japan Trench

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We analyzed the aftershock sequences for individual M6-9 class inter-plate earthquakes and intra-plate earthquakes in Japan Trench for the period between October 1997 and March 2013 using JMA hypocenter catalog (final solution). The purpose is to examine a spatial relationship between the slip zone by the M9 earthquake and activity of aftershock series before the M9 and to understand the mechanism of aftershock. We approximated time variation of the number of aftershock sequences for each earthquake by the modified Omori ' s Law. Each aftershock sequence was identified from its spatial and temporal distribution. K and P parameters of Omori ' s Law were obtained by fitting the logarithmic Time-Frequency graphs of the aftershock sequence by linear function. We analyzed aftershock sequences for 44 events and adopted 17 whose K values are larger than 10 as available results because the results with smaller K values than 10 had large uncertainties due to lack of data. The results showed negative correlation between P values and Mj of the mainshocks. Before and after the M9 earthquake, there was no significant change in the aftershock parameters. However, we found a depth-dependent spatial distribution of aftershock decay properly. In the plate boundary, the aftershock sequence lasts for longtime without significant decay in the deeper portion, in contrast that the aftershock decays quickly at the shallower portion. It is known that the deeper part of plate boundary tends to slip aseismically without earthquakes. Taking this slow slipping property into account, our result suggests that the inter-plate frictional property should be responsible to the delay and decay property of the aftershocks.

Keywords: Aftershocks, Modified Ohmori's Law, Tohoku-Oki earthquake, Seismicity