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Aftershock Activities of Slab Earthquakes in the Japanese Islands Based on the JMA's Hypocenter Database (January 1983 – June 2003)

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We investigated aftershock activities of slab earthquakes in and around the Japanese Islands during the period from January 1983 through June 2003 by using the hypocenter database prepared by the Japan Meteorological Agency (JMA). Beneath the Japanese Islands, the Pacific (PAC) and the Philippine Sea (PHS) plates are being subducted, and many slab earthquakes take place within the downgoing lithospheric slabs of the two oceanic plates. The aftershock activity of slab earthquakes has generally been considered not to be high. This feature is, combined with the tendency of compact source regions and higher stress drops of slab events, important to understand the generating mechanisms of slab earthquakes and the dynamics of subducted plates, but the true nature has been obscure. We picked up 36 slab earthquakes of M_{JMA} (magnitude assigned by JMA) 5 or larger and investigated each aftershock activity under uniform conditions of detectability and assigned 'aftershock region.' Table 1 summarizes our results for the events of M_{JMA} larger than 7. The 2003 Miyagi-Oki earthquake was accompanied by extraordinarily large number of aftershocks. Aftershock activities of slab earthquakes didn't show any simple dependence on size or depth of the main shock. However, there seem to be some local characteristics. For example, in the Kanto district, where the PAC and PHS slabs are colliding with each other, aftershock activities are relatively high. Within the PHS slab beneath the Kii Peninsula, aftershock activities are considerably low. We thank JMA, whose hypocenter database has been used in this study.

Keywords: slab earthquake; aftershock activity; Japan; JMA; hypocenter database.

Table 1. Number of aftershocks (N) of M_{JMA} 3 or larger, which took place during the 30-day period after the main shock within the 3-D 'aftershock region' of each main shock. 'Plate', 'Depth' and 'M_{JMA}' are for the main shock. The fourth earthquake (*), a shallow crustal event, is listed for comparison.

Earthquake	Plate	Depth [km]	M_{JMA}	N
1993 Kushiro-Oki	PAC	101	7.5	48
2003 Miyagi-Oki	PAC	72	7.1	247
1984 Hyuga-Nada	PHS	33	7.1	93
*2000 Tottori-Ken-Seibu	Eurasian	9	7.3	232