AOB Seminar

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場　　所: 地震・噴火予知研究観測センター　別館第１会議室

講演題目&要旨：

Diversity of Deep Earthquakes

Recent studies of large deep earthquakes showed dramatic diversities in rupture characteristics. The 9 June 1994 Bolivia earthquake (Mw 8.3, Depth=647 km) had a high static stress drop of about 100 MPa and a low radiation efficiency, about 0.03, indicative of a highly dissipative source process. The main rupture was preceded by a small event with a normal rupture speed characteristic of a brittle failure. In contrast, the 24 May 2013 Sea of Okhotsk earthquake (Mw 8.3, Depth=611 km) ruptured rapidly over a 100+ km long zone at 4.0 km/s with a static stress drop of 15 MPa that is comparable to that of shallow intraplate events. This event had a high radiation efficiency, 0.6. An aftershock of this event (Mw 6.8, Depth=605 km) ruptured at a super-shear speed of 8 km/s. For the recent 30 May 2015 Ogasawara (Bonin) Is. Earthquake (Mw 7.9, Depth=681 km), Ye et al. (2015) showed that the mainshock ruptured a shallowly-dipping fault plane with patchy slip that spread over a distance of ~40 km with a multi-stage expansion at time varying rupture speed (5+ km/s down-dip initially and 3 km/s up-dip later). The stress drop was about 38 MPa and the radiation efficiency is moderate, 0.34, intermediate to that of the 1994 Bolivia and 2013 Sea of Okhotsk earthquakes. These studies indicate that source processes of large deep earthquakes sample a wide range of behavior from dissipative, more viscous failure to very brittle failure. Currently favored ideas for nucleation and growth of deep-focus earthquakes include transformational faulting triggered by metastable olivine transforming to spinel in the cold, stressed core of the slab, thermal instability and run-away shear melting, and dehydration. The diversity of deep earthquakes is a manifestation of complex combination of these distinct physical mechanisms.