Deep low-frequency events in southwest Japan

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Deep low-frequency (DLF) events have been discussed in association with fluid (magma) activity around volcanoes. In this paper, however, we will show several examples of DLF activity that are far from volcanoes. In Japan, dense seismic network with high sensitivity was established after the 1995 Southern Hyogo Earthquake, which enabled us to detect other examples of DLF activities.

In general, there are two types of low-frequency events that are newly detected. One is the low-frequency tremors in the fore-arc region especially those along the Nankai trough reported by Obara (2002), which is attributed to the transport of fluid caused by the dehydration process of the subducting slab.

The other is the low-frequency earthquakes associated with active faults in the backarc region. Examples in southwest Japan are in western Tottori prefecture, mid Kyoto prefecture, and some other regions. In the focal region of the 2000 Western Tottori Earthquake (Mw6.7), DLF earthquakes were detected before the mainshock and the activity was enhanced after the mainshock. They are located beneath the seismo-genic zone around the Moho discontinuity. Focal mechanism of a DLF earthquake indicates the transport of fluid (Ohmi & Obara, 2002). Seismic tomography analysis (e.g. Zhao et al., 2003) indicates the existence of a low-velocity body at depths from the lower-crust to the upper-mantle in the focal region of these DLF's, that supports the existence of fluid. Resistivity structure (e.g. Oshiman et al., 2003) also indicates the fluid activity in the focal region of the DLF's.

In both cases, deep low-frequency events are likely to be attributed to the fluid activity caused by the dehydration process of the subducting slab. Since the pressure-temperature condition of the subducting slab in the forearc and backarc region is different, nature of the fluid will be much different. It is an important issue to investigate the generation process, components, and mechanism of transport of the fluid to understand the nature of the low-frequency events.