

Change of the depth of seismic layer in and around the focal region of intraplate large earthquakes

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We investigated change of the depth of the seismogenic layer in the crust associated with occurrence of large intraplate earthquakes. For all of the cases we took up, i.e., the 2000 western Tottori Prefecture earthquake (M7.3), the 2003 northern Miyagi Prefecture earthquake (M6.4), and the 2004 central Niigata Prefecture earthquake (M6.8), we found that the depth range of aftershocks extended to the area shallower than that observed in the activity before the occurrence of main shocks. Extension of the seismic zone to the deeper side was also observed, but it was not so much conspicuous as that to the shallower side. It was commonly seen in the three cases that the seismicity in the extended area, which appeared after the main shocks, disappeared gradually from the shallower and deeper sides. Consequently, a pattern is recognized that the seismogenic region was concentrated to some depth range as the time passed by. The extension of the seismogenic zone to the shallower area was seen in activities induced around the focal region as well. Why the seismogenic zone was extended to the area where no seismicity was observed before the main shock occurrence? We think the feature shows that swift increase of stress could generate brittle fracture in the region where it does not occur when stress increases slowly. It is expected that we can get information about the relaxation process of stress in the crust and the associated change in the brittleness of the rocks that constitute the crust from the pattern that the induced seismicity disappeared gradually from both the shallower and deeper sides.

It should be noted here that we will make a wrong estimate on the range of fault motion if we evaluate it from the depth range of the usual seismicity around active faults.