A relation between seismicity and characteristics of plate boundary in Japan Trench region.

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In the Japan Trench region, many destructive earthquakes as well as microearthquakes have occurred. These earthquakes are derived from the Pacific plate subduction. Seismic activities are not uniform in space. There are aseismic regions around latitude 39 degrees north, that is, the seismic activity is not uniform along the trench axis. It is suggested that the seismic coupling of the Pacific Plate and the Continental Plate is not uniform along the trench axis.

We conducted seismic reflection/refraction survey in 1996 in this region. One of the main objectives of this experiments was investigation of the relation between seismicity and crustal structure. A velocity structure model was obtained by travel-time inversion. Although there does not seem to be distinct relationship between seismicity and the bulk velocity structure, we found a good relationship between seismicity and variation of reflective amplitude. Large amplitude reflected waves generated at the plate boundary were observed at low seismicity region and vice versa.

Large amplitude reflected waves indicates that there is low velocity materials at that reflector. One possibility for the generation of large amplitude reflected waves is a very thin layer with low velocity at plate boundary. It is difficult for us to specify the minerals constituting the thin layer from only the relationship between seismicity and amplitude of P-wave reflection. However, we can think some possibilities. Though there are several candidates of the minerals in the thin layer, many of them can be soft materials with large Poisson's ratio, which is also ductile. If there are these rocks at the plate boundary, it is easy to release the strain between both plates and the seismicity become low in the large amplitude reflected wave region. In this presentation, we are going to propose some models which explain the observation facts.