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Double-Planed Shallow Seismic Zone in the NE Japan Forearc Region

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Modifying the method developed by Umino et al. (1995), we determined focal depths of earthquakes in the offshore region of northeastern (NE) Japan by using sP phase for the period from January 2000 to April 2003. Relocated focal depth distribution of earthquakes clearly shows the configuration of double-planed shallow seismic zone in the whole regions of the NE Japan subduction zone. The upper seismic zone initially subducts at an extremely low dip angle, and then the dip angle abruptly increases up to ~30 degree at about 90 km away from the Japan trench. The lower plane earthquakes occur within the subducting Pacific plate, and form almost the same shape as that of the upper plane earthquakes. The separation between the upper and lower plane is 25-30 km. Focal mechanisms of events in the double-planed shallow seismic zone were determined by using P wave first motion data observed by the Tohoku University network, JMA network and Hi-net. Although P wave first motion data are not ideally distributed on a focal sphere, typical focal mechanism of upper plane events and lower plane ones are a normal fault type and a thrust fault type, respectively. Hasegawa et al. (1978) showed that the upper plane events of double-planed deep seismic zone beneath the NE Japan arc have down-dip compressional type and the lower plane ones down dip tensional type focal mechanisms. Bending and unbending process would be one of the plausible mechanisms explaining the observed focal mechanism distribution within the Pacific plate. In the aftershock area of the 1933 Sanriku earthquake (M8.1), current seismicity is relatively high and earthquake swarms occur repeatedly. Focal depths of those earthquakes determined by sP phase range from 13 km to 45 km beneath the Japan trench. Focal mechanisms of those events are a normal fault type. Since the 1933 M8.1 Sanriku earthquake is a normal fault type event (Kanamori, 1971), those earthquakes occurring there beneath the Japan trench would be aftershocks of the 1933 Sanriku earthquake. The aftershock sequence of the 1933 Sanriku earthquake might still continue for such a long period more than 70 years.
Keywords: Hypocenter determination; sP phase; Plate boundary; Pacific plate.

References

[1] A. Hasegawa, N. Umino and A. Takagi, *Tectonophysics.* **47**, 43-58 (1978).
[2] H. Kanamori, *Phys. Earth Planet. Inter.* **4**, 289-300 (1971).
[3] N. Umino, A. Hasegawa and T. Matsuzawa, *Geophys. J. Int.* **120**, 356-366 (1995).