Detailed structure of the transition zone on the subducting plate boundary beneath the southern part of Kii Peninsula, SW Japan

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The Nankai trough region, where the Philippine Sea Plate is subducted beneath the SW Japan arc, is a well-known seismogenic zone of interplate earthquakes (e.g. the 1944 Tonankai Earthquake (M=7.9) and the 1946 Nankai Earthquake (M=8.0)) . A detailed crustal and upper mantle structures of the subducting Philippine Sea Plate and the overlying SW Japan arc is inevitably important to constrain the physical process of earthquake occurrence. Resent results of seismic experiments have gradually revealed the relation between the crustal structure and the seismogenic zone. However, there is still little known about the physical properties of the deeper part of the plate boundary, especially the transition zone on the subducting plate. To reveal the detailed structure of the transition zone on the subducting plate, we conducted a deep seismic profiling in the southern part of Kii Peninsula, southwestern Japan. In this experiment, 280 seismometers were deployed on a 60-km-long line in the east-west direction with about 200 m spacing, on which three explosives shots were fired as controlled seismic sources. Charge size of the shots is 100 kg. Each seismograph system consisted of a 4.5 Hz, vertical component seismometer and a single channel data recorder. The recorder has 24-bit analogue-to-digital converter and records data at 250 Hz sampling rate. We obtained high signal-to-noise ratio data along the entire length of the profile. The most remarkable feature of the record sections is that extremely high amplitude reflections, which are interpreted as a reflected wave from the top of the subducting Philippine Sea plate, can be recognized. The seismic reflection method was applied to these data to obtain a detailed and clear image of deeper structure. The stacked image shows several features of the deeper part of the crust including the subducting plate boundary at 9 sec in two way travel time. The reflectivity of the subducting plate boundary changes laterally.