Geometry of protothrust zone along the Nankai Trough revealed by red relief image mapping and seismic reflection survey

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Great earthquakes with tsunamis with recurrence intervals of 100–200 years have occurred along the Nankai Trough near central Japan. To predict the exact height of the tsunami on the coast region generated by these large ruptures, it is important to estimate the vertical deformation that occurs on the seaward end of the rupture area.

Recent drilling results have also yielded evidence not only of splay faults that generate tsunamigenic rupture, but also new evidence of tsunamigenic rupture along the frontal thrust at the trench axis in the Nankai Trough.

In order to understand the deformation around the frontal thrust at the trench axis, high-resolution seismic reflection surveys were conducted by Japan Agency for Marine-Earth Science and Technology during 2010-2016.

Clear seismic reflection images of frontal and previous thrusts in the accretionary prism, trench-fill deposits and subducting Shikoku Basin, image deformation along the trench axis. We evaluate the seaward structure for understanding the future rupture distribution from the mapping of protothrust zone (PTZ). The PTZ consisting of many incipient thrusts is identifiable in the portion of trough-fill sediments seaward of the frontal thrust. To image the spatial distribution of the PTZ, we merged topographic data using all seismic survey around the trough axis. In order to emphasize the characteristics of frontal thrust and PTZ, we construct the detailed red relief image map for focusing on the lineated slope of the PTZ at the trough axis. We identified the clear bathymetric lineament along the trough axis within the protothrust zone by this map. It is important to understand the distribution of PTZ along the Nankai Trough.

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