Crustal Structure obtained from Seismic Surveys in The Nankai Trough -Role of structure in megathrust earthquake occurrence-

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Among subduction zones, the Nankai subduction zone off southwest Japan is known as one of the best-suited convergent plate margins for studying subduction zone earthquakes. Historic, large subduction thrust earthquakes have occurred with a recurrence interval of 100-200 years along the Nankai Trough. The last two large earthquakes that occurred off the Kii Peninsula were the 1944 Tonankai (M 8.1) and 1946 Nankai (M 8.3) events. Seismic imaging of deep structure is a very important seismological method and may help explain the mechanisms that control megathrust earthquake occurrence around the Nankai Trough seismogenic zone. To obtain an fine image, we performed seismic studies from 1997 to present. Remarkable results are summarized as follows. 1) An onshore-offshore wide angle seismic profile off Muroto provide a fine image of a subducted seamount that might act as the barrier in 1946 Nankai earthquake. 2) Multichannel seismic (MCS) reflection profiles obtained in 2001 show splay faults developed around the updip limit of the rupture area of the 1944 Tonankai earthquake. This splay fault may have experienced slip during the 1944 Tonankai event, and control the rupture process of this event. 3) A cyclic ridge subduction which may control the rupture zone of both the 1944 event and future Tokai earthquake is imaged by an onshore-offshore wide-angle profile from the western edge of the Izu-Ogasawara arc to the northern coast of central Japan crossing the Tokai district.

As mentioned above, in recent seismic experiments, we have succeeded imaging high resolution irregular characteristics of the subducting plate and coseismic slip zone such as a subducting seamount, subducting ridge, offshore splay faults, etc. While, in analyses of historical earthquakes, the high energy asperities obtained around the subducting seamount area indicate that the seamount acts as a complementary asperity in the 1946 and 1707 megathrust earthquakes [Kanda & Takemura, 2002]. These results suggest that irregular structure may control rupture asperities by acting as a rupture inhibitor or high slip zone during the megathrust earthquake cycle.