

# Relationship between the 2004 Off-Kii-Peninsula, Japan, earthquake and a slab tear beneath the Kii Peninsula

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On September 5, 2004, a large earthquake of M7.4 took place just beneath the Nankai trough southeast-off the Kii Peninsula, southwest Japan. The earthquake was a rupture within the Philippine Sea (PHS) plate, a rare intra-plate event in this area. In this paper, we show correlation between the 2004 Off-Kii-Peninsula earthquake and a slab tear beneath the Kii Peninsula, and discuss the tectonic significance of this earthquake.

The main shock occurred at a depth of 44 km, though the depth control by the JMA is not good in this offshore area. It was preceded by a M6.9 foreshock on the same day and followed by many aftershocks including two M6-class events. Focal mechanisms of these four large events show E-W striking pure reverse faultings. Judging from these mechanisms and focal depths, a reverse faulting is inferred to have initiated in the deeper part of the PHS plate due to the compression perpendicular to the trough axis, associated with the plate bending.

The aftershock activity occurred along two lineaments. One is in a ENE-WSW direction, the other, in a NW-SE direction. In the ENE-WSW direction, many aftershocks had focal mechanisms of reverse faultings similar to those of larger events. In the NW-SE direction, not a few aftershocks had mechanisms of right-lateral strike-slip with one nodal-plane parallel to the direction of the lineament. According to Yagi (2004), a vertical right-lateral strike-slip faulting along the NW-SE trending aftershock area and E-W striking reverse faulting took place during the main shock, simultaneously. Thus, the NW-SE striking fault along the remarkable branch of aftershock distribution is considered to be significant for this earthquake sequence.

On the other hand, we have pointed out a NW-SE trending large-scale tear within the PHS slab beneath the middle part of the Kii Peninsula (Miyoshi and Ishibashi, 2004). Here, the slab is inferred to be separated into two parts, with the southwestern part underlying the northeastern part. In the present study, we reconfirmed this interpretation based on hypocentral distribution and focal mechanisms of slab earthquakes during the period from Oct. 1997 to Sept. 2004.

By the reflection survey, there are NW-SE trending and southwesterly-dipping normal faults in the aftershock area to the southeast of the main shock epicenter (JAMSTEC, 2004; Earthq. Res. Com., 2004). This structure is in harmony with the feature of the slab tear beneath the middle Kii Peninsula, with the southwestern side being deeper than the northeastern side, but disagrees with the situation of overlapping.

In conclusion, we interpret that there is a NW-SE trending PHS slab tear from the Nankai trough to the area beneath the middle Kii Peninsula and a part of this tear ruptured around the Nankai trough during the 2004 Off-Kii-Peninsula earthquake. Two disastrous slab events, the 1952 Yoshino earthquake and the 1899 Kiwa-Yamato earthquake, occurred along this tear. Further investigation is necessary for clarifying the true of this inferred slab tear.

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