Relationship between deformation of the forearc wedge of Southwest Japan and the 1707 Hoei earthquake

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We propose a hypothesis that the deformation of the forearc wedge of Southwest Japan and wide varieties of plate boundary earthquakes along the Nankai Trough have been caused by oblique subduction of the undulating Philippine Sea Plate (PSP). Interseismic and coseismic deformations of the forearc wedge of Southwest Japan have been observed by geodetic measurements, however, these deformations have not been accumulating. In contrast, N-S trending uplift zones, namely the Akaishi and Kii mountains, have been growing during the Quaternary periods. The mountains correspond to the zones of PSP trending in NE-SW and the subsiding areas of the Kii strait and Ise Bay to Nobi plain are located above the NW-SE to E-W trending PSP. If the axes of undulations of the subducting slab have been fixed to the PSP, the depth of the PSP trending in NE-SW have been decreasing and that of the PSP trending in NW-SE to E-W have been increasing. The uplifting and subsiding zones correspond to the area of plate depth decrease and increase respectively, thus we infer that the vertical movements of the forearc wedge have been caused by the change of the plate depth. Relative sea level change shown by uplifted sessile assemblage have indicated that uplift during the 1707 Hoei earthquake has been accumulated while those of 1854, 1944 and 1946 plate-boundary earthquakes have not. This fact strongly suggests that there is a strong coupling zone lasting for several hundred years under the Kii Peninsula, and that the break of the coupling triggers the Hoei-type earthquake that ruptured the entire plate boundary. We also point out the possibility that there is another coupling zone under the Akaishi Mountains. The deformation of the forearc wedges of the Southwest Japan and differences of rupture patterns of the plate boundary along the Nankai Trough can be attributed to the change of the depth of the PSP.

Keywords: Nankai Trough, crustal movement, Philippine Sea Plate, 1707 Hoei earthquake

