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A thinned portion of the Philippine Sea slab and the Quaternary crustal deformation at the Kanto region

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Recently, it has revealed that strange geometry of the Philippine Sea slab (=the PH slab) underlying the Boso Peninsula; eastern Tokyo metropolitan area in Japan. The upper surface of the PH slab has a dent sharply there. At this area, the upper surface and the underside of the PH slab touches the North American plate and the Pacific plate respectively. So there is no space for deformation like this.

Then, in this study, I formulate and test two hypotheses that the Philippine Sea slab (= the PH slab) is locally thinned under the Boso peninsula. And moving the PH slab holding its geometry has caused the noticeable Quaternary crustal deformation in this area. If it is true that the PH slab is locally thinned, a depth of upper surface of the PH slab deepens and shallows with the slab subducts. Therefore, it is presumed that the noticeable crustal deformation appears to the hanging wall as it subducts. Then, I calculate the crustal deformation of the hanging wall which caused by moving the thinned part of the PH slab. And so, I try to test that hypothesis by whether the calculated data are coincident with the observed Quaternary crustal deformation or not. I approximate moving the thinned portion of the PH slab by opening and closing dozens of rectangle faults along the upper surface of the PH slab. Thus, I calculate the crustal deformation by a program of the dislocation model. As a result, the calculated crustal deformation corresponds very well with the Quaternary crustal deformation at southeastern Kanto region; a subsidence area at the Tokyo bay, the Kashima-Boso uplift zone and rapid uplift zone at southern part of the Boso Peninsula; in terms of the pattern, relative amount, location, course of movement of the pattern and velocity of movement of one. It also shows the same pattern as the uplift of the 1703 Genroku earthquake at the southern Boso Peninsula.

The most possible reason why this part of the PH slab was thinned is that the oceanic crust was torn off the PH plate and accreted to the hanging wall several years ago. In other words, the subduction boundary of the PH plate was shift to more offshore; southern off the Boso peninsula. I try to restore the PH plate and the Central Japan plate; at Kanto and Tokai region from present to 5Ma according to the Euler pole on the paper. Then I reach one assumption that the oceanic (arc) crust was torn off the PH plate and accreted to the southern part of the Boso peninsula and southeastern off the southern tip of the Boso peninsula; the area enclosed between the Kamogawa fault belt and the Sagami trough, from 5Ma to 0.5Ma. In this area there is the age-old oceanic crust in the Mineoka tectonic zone. The existence of this age-old oceanic crust at this location confirms the existence of the thinned part of the PH slab paradoxically.

Keywords: thinned slab, Quaternary crustal deformation, stripping a oceanic crust, sifting of a subduction boundary, subcidence area at the Tokyo bay, Kashima-Boso uplift zone