Anomalous distribution of intraslab earthquakes beneath Kanto and phase transformation depth

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Recently, we have proposed a new plate model beneath the area from Kanto to Kyushu, central and southwest Japan, based on seismic tomography studies and a study on focal mechanisms of earthquakes (Hirose et al., 2007a,b; Nakajima et al., 2008). In the present study, we investigated intraslab earthquakes occurring in the Pacific (PAC) slab and in the Philippine Sea (PHS) slab beneath the whole Japan based on this plate model and the plate model of the PAC slab beneath northeast (NE) Japan (Kita et al., 2006; Nakajima & Hasegawa, 2007), and found that intraslab earthquakes beneath Kanto have an anomalous distribution perhaps caused by the collision between the PAC and PHS slabs. A belt of intraslab earthquakes in the PAC slab crust parallel to the iso-depth contours of the plate interface has been found beneath NE Japan (Kita et al., 2006). This seismic belt does not run parallel to but obliquely to the iso-depth contours beneath Kanto due to the contact with the overlying PHS slab (Hasegawa et al., 2007). Present results clearly show that this seismic belt completely avoids the slab contact zone and distributes obliquely to the iso-depth contours beneath Kanto in accord with the expectation. DD seismic tomography results (Tsuji et al., 2008) show that low seismic velocity areas in the slab crust, perhaps corresponding to that before eclogite-forming phase transformation, also extend in the whole slab contact zone, suggesting the delay of phase transformation in this area caused by thermal shielding of the overlying PHS slab. Intraslab earthquakes in the PHS slab crust distribute anomalously and attains to depths of ˜90km in the slab contact zone. Lower plane earthquakes in the PHS slab mantle occur only beneath the Kanto region, and concentrate in the area where the PAC slab is locally dented downward. These observations strongly suggest that intraslab earthquakes are caused by dehydration embrittlement and their anomalous distribution beneath Kanto is caused by the collision between the two slabs there.