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Crustal structure around the MTL Fault System - Why it was chosen as the northern boundary of the sliver?

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Median Tectonic Line (MTL) Fault System is the greatest arc-parallel fault system cutting the surface of SW Japan for 350 km in length from the central part of the Kii Peninsula to the western edge of Shikoku. It is known as the boundary fault between the Cretaceous Sambagawa metamorphic rocks and Ryoke granitic and metamorphic rocks (Okada, 1973; Earthquake Research Committee, 2003; Tsutsumi et al., 2007; Kubota and Takeshita, 2008). This east-west trending tectonic line divides the SW Japan arc into the Inner zone (back-arc) and Outer zone (fore-arc), where the fore-arc part moves toward west as the Philippine Sea Slab subducts obliquely. As a result, this active fault runs as the northern boundary of the fore-arc sliver. But, the reason why the MTL was chosen as the boundary is not clear.
Seismic velocity structure was obtained by seismic tomography using earthquakes shallower than 50 km depth beneath the land area to investigate detailed crustal heterogeneous structure. Tomography method by Zhao et al. (JGR, 1992) was applied to arrival time data from selected local earthquakes recorded by the Kiban Seismic Network and compiled by JMA during 2001-2009. Selection was conducted to get even spatial distribution of seismicity. The 1-D model JMA2001 was taken as an initial velocity model. The Conrad and the Moho discontinuities (Katsumata, 2010) were introduced into the inversion. Grid spacing is 0.2 degrees in horizontal directions and 5 km in depth.
Obtained 3D velocity structure images are generally in good correspondence with the results of previous tomography studies. Velocity anomalies are very prominent along the MTL. It is clear that high-velocity zone is distributed belt-like in the southern part of MTL of about 30 km wide near the earth's surface, i.e. high-velocity northern part of the Outer zone. It corresponds to Sambagawa belt concerning its location. Then at the depth of 5 km and deeper about 30 km wide belt-like high-velocity zone gradually transforms to the northern part of MTL, i.e. high-velocity southern part of the Inner zone. This high-velocity zone follows to the 20 km depth. In cross-sections it gets narrow in width obtaining wedge-like shape with depth. It corresponds to Ryoke belt regarding its location.
Another belt-like prominent low-velocity anomaly is observed at depths more than 15 km along the MTL. In cross-sections this low-velocity zone extends almost vertically as if it reflects trace of ascending crustal fluids, from the hypocenter locations of deep low-frequency earthquakes (low-frequency micro-tremors along the plate boundary along with low-frequency microearthquakes in the vicinity of the island arc crustal Moho) at the depth of about 30 km to the bottom of the fault. The seismogenic layer becomes locally thin just beneath the MTL (and/or a bit south) avoiding this broad low-velocity zone below. Slab-derived fluids thus supplied may weaken the crust in this area. The present observations suggest that this might be a possible reason why the MTL was chosen as the northern boundary of the sliver.

Keywords: MTL fault system, seismic tomography, seismic velocity structure, deep low-frequency earthquakes, crustal fluids, sliver