Bending-Related Topographic Structures of the Subducting Plate in the Southeastern Pacific Ocean

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Oceanic plates bend near trenches before subduction. The bending causes elongated topographic structures such as ridges and escarpments on the incoming oceanic plate. The elongated topographic structures facilitate the infiltration of seawater into the oceanic plate. The amount of water in the subducting plate is one of the important properties controlling subduction. Therefore, the study of bending-related topographic structures on the incoming plate is one of the imperative studies of the subduction zone.

The strike of bending-related topographic structures on the oceanward trench slopes is parallel to the trench axis or inherited seafloor spreading fabric (Kobayashi et al.,1995,1998). Nakanishi (2017) pointed out the following rule for the topographic structures.

1. Most of bending-related topographic structures near the trenches in the northwestern Pacific Ocean are limited to less than about 80 km from the trench axis.

2. Seafloor spreading fabric is reactivated where the angle between the fabric and trench axis is less than about 30˚.

3. The above rules are not applicable to curved trenches and trenches near seamounts or other volcanic edifices constructed by off-ridge volcanism.

To find out that the above rule is appropriate to the whole trenches in the southeastern margin of the Pacific Ocean, we made the bathymetric maps and described the bending-related topographic structures from Middle America Trench to Peru-Chile Trench.

The bending-related topographic structures are limited to less than 60 km from the trench axis for the Peru Trench and the northern part of the Peru-Chile Trench. In the southern part of Peru-Chile Trench, elongated topographic structures parallel to the magnetic anomaly lineation are confirmed more than 150 km from the trench axis. The throw of the structures doesn’ t increase toward the trench axis, implying that it is difficult to distinguish the structures are made by reactivation of seafloor spreading fabric. Elongated topographic structures in the Middle America Trench are found more than 250 km from the trench axis. The structures are parallel to the magnetic anomaly lineations. The throw of the structures starts to increase from the distance of 150 km to the trench axis. This indicates that the elongated structures are grown by reactivation of seafloor spreading fabric and the bending-related topographic structures are limited to less than 150 km from the trench axis in the Middle America Trench.

The bending-related topographic structures in the Middle America Trench and the southern part of the Peru Trench are parallel to the magnetic anomaly lineations. The angle between the structures and the trench axis is less than 30˚. The bending-related topographic structures in the northern parts of the Peru and Peru-Chile Trenches are parallel to the trench axis. The angle between the structures and the trench

axis is more than 30˚. Our study concluded that the rule proposed by Nakanishi (2017) is applicable to the trenches of the southeastern margin in the Pacific Ocean.

Keywords: plate bending, Bending-related fault topography, abyssal hill, subduction zone

