Possible Evolution of Volcanic Activity of a subducting spreading ridge at the Chile Triple Junction based on geomagnetic survey data by R/V MIRAI

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The Chile Triple Junction (CTJ), an Ridge-Trench-Trench type triple junction located at 46° 13′ S, 75° 48′ W off Taitao Peninsula, the western coast of Chile, is characterised by the subducting Chile Ridge, which is the constructive plate boundary that generates both the Nazca Plate and the Antarctic Plate. The key issues of this area are (1) why an active spreading ridge characterised by active volcanism can subduct under the trench quite easily, and (2) what the driving force of the ridge subduction is. Keys to understanding these problems may be evolution of the spreading rate and lithospheric thickness. The evolution of the spreading rate around the CTJ was investigated primarily using marine geomagnetic data collected during the MR16-09 cruise Leg 1 and 2 implemented in 2016-17 by R/V MIRAI. The results from the previous RD1803 cruise in 1975 by R/V Robert D. Conrad were also taken into account for reference. After the previous presentation at the Eighth Symposium on Polar Science in 2017, three profiles of magnetic total force anomaly were added for analysis. Finally the ridge subduction mechanism and the regional tectonics around the CTJ were discussed through the analysis by use of all the currently availavle data.

The result shows that the spreading rate on the Segment SCR3 is 40-35mm/year, almost constant up to the ridge crest 150km away from the trench. However, the spreading rate on the Segment SCR1 located in the neighbour of the trench decreases from 22mm/year to 12mm/year towards the east. This suggests that volcanic activity diminishes towards the subducting ridge axis. The lithosphere under the Chile Ridge might have amalgamated with the surrounding oceanic lithosphere due to heat loss after the cessation of volcanic activity at the trench. The oceanic lithosphere towards the trench also thickens rapidly due to heat loss, according to the residual gravity anomaly (gravity anomaly calculated by replacing the density of sea water and the whole crustal materials into that of the uppermost mantle), as is taking place in the western Pacific subducting lithosphere. Consequently, shallow-angle subduction of the even youngest and most immature oceanic plate occurs smoothly via slab-pull force without any resistance along the boundary with the South American continental plate.

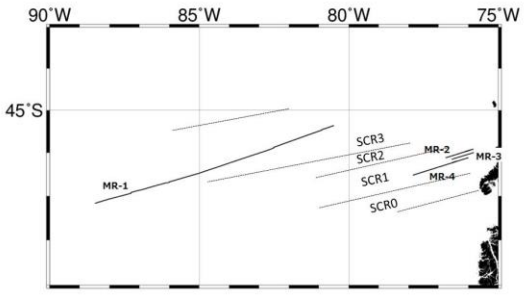

Figure 1. MR16-09 tracks off Taitao Peninsula

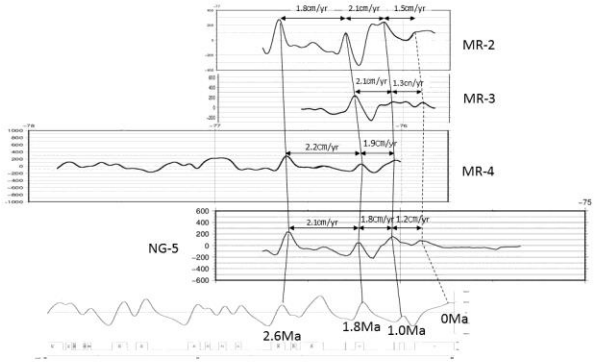

Figure 2. Magnetic total force anomaly with estimated crustal age and spreading rate along the Segment SCR1

References

Matsumoto, T., A. Mori, S. Kise, and N. Abe, Tectonics and mechanism of a spreading ridge subduction at the Chile Triple Junction based on new marine geophysical data, Geochemical Journal, 47, 137-147 , 2013.

Matsumoto, T., T. Ishihara, and Y. Nogi, Mechanism of a spreading ridge subduction at the Chile Triple Junction based on geomagnetic survey data: a possible model, The Eighth Symposium on Polar Science, National Institute of Polar Research, 2017.

Matsumoto, T., T. Ishihara, and Y. Nogi, Mechanism of a spreading ridge subduction at the Chile Triple Junction based on geomagnetic survey data: a possible model, JpGU2018, 2018.