Emplacement Processes of the Taitao Ophiolite

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The Miocene-Pliocene Taitao ophiolite, exposed near the Chile Triple Junction, was reported to consist of several units that have different ages and geochemical characteristics; the Pliocene upper volcanic sequence with geochemical characteristics of E-MORB to N-MORB compositions with arc-imprint, and Miocene lower plutonic rocks including gabbros of typically N-MORB and sheeted dike complex with bimodal compositions. However, origin of such variation is complicated because the rocks of the subducting Chile Mid-Oceanic Ridge have already various compositions, and compositions of numerous small seamounts around the Chile Ridge are not known yet.

We conducted field and laboratory studies to understand the process of emplacement of the Taitao ophiolite, and how activities of such diverse rock suits are connected with deformation during the emplacement. Our field results revealed presence of a major shear zone in hartburgite of the lowest part, which accompanies pressure ridges and separates the ophiolite from 4 Ma arc-derived granitoid in the south. The harzburgite and overriding gabbros in the north are folded into complex pattern together and the boundaries between them are mainly tectonic. Analyses of topographical map further suggest the presence of shear zones of NW-SE and EW directions that cut the ophiolite into at least four blocks. Sheeted-dike complexes have two main directions of intrusion; NNE-SSW intrusions of pl-phyric basalts in the northern block, and NW-SE intrusions in the southern blocks with bimodal compositions of basalt and dacite. Westward younging piles of pillow basalts/sediments were inferred to be connected with sheeted-dike intrusions of the northern block. Our paleomagnetic data suggest that this upper volcanosedimentery sequences deposited almost at site. Paleoslope on depositional age was inferred to facing to the Pacific from sedimentary structures and AMS fabrics.

Our paleomagnetic data also suggests counterclockwise rotation of each block separated by faults with increasing rotational angle toward lower ophiolite sequence in the south. This result implies that the constituents of ophiolite with diverse compositions, ages and contrasting ductility and intrusion directions may have continuously formed during the collision and block rotation during the obduction of a segment of the Chile Mid-Oceanic Ridge. This block rotation further suggests the possibility of synchronous arc-granites surrounding the ophiolite, intruded into such tectonic gaps and worked as lubricant during the rotation of the ophiolite block.