

The geochemical stratigraphy of lavas from the Troodos Ophiolite

DOMINIC WÖLKI¹, MARCEL REGELOUS¹, KARSTEN HAASE¹ AND CHRISTOPH BEIER¹

¹GeoZentrum Nordbayern, Universität Erlangen-Nürnberg, Erlangen, Germany (dominic.woelki@fau.de)

The Troodos ophiolite on Cyprus formed in a ‘supra-subduction zone’ environment, but the precise tectonic setting is still debated. The presence of a sheeted dyke complex, overlain by pillow lavas and underlain by gabbros and mantle rocks, indicates formation at a former spreading centre. On the other hand, the enrichment in fluid-soluble elements relative to REE and HFSE in Troodos lavas compared to MORB indicates formation above a former subduction zone. The presence of boninites may indicate formation in a fore-arc location, during subduction initiation.

We will present the results of an ongoing study to construct a 3D geochemical stratigraphy of the Troodos lava pile, based on major and trace element and isotope analyses of fresh volcanic glasses, from representative sections throughout the ophiolite. Fresh glasses allow us to avoid the geochemical effects of alteration, and carefully located sampling to determine the geographical chemical variation can reveal the geodynamic setting of formation and the geochemical evolution of magmatism.

Troodos glasses range from boninitic, to tholeiitic picrite-basalt-andesite-dacite, with true boninitic glasses apparently most abundant in the upper parts of the stratigraphy on the southern margin, where they are interbedded with tholeiites.

Boninite glasses have depleted MREE-HREE ratios, coupled with enrichments in Pb, U, LILE and to a lesser extent Nb and the LREE. These trace element systematics indicate extreme source depletion, with later re-enrichment by both melts and fluids. Tholeiites from the northern and southern sections were derived from a less depleted source, with moderate enrichment in fluid-soluble elements, and have trace element compositions intermediate between those of the boninites and basalts from active back-arc basins. The higher Pb/Ce and more radiogenic Pb isotope compositions of the boninites indicates a larger contribution from subducted sediments.

The presence of ‘fore-arc’ boninites and primitive, depleted tholeiites on the southern margin of the lava pile, and arc – back-arc type andesites and dacites in the north indicates the former subduction zone lay closer to the present-day southern margin of Troodos.