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Dynamic ridge-transform intersection (RTI) fossilized in the Troodos ophiolite: inferences from gabbro magnetism

R. Granot (1), **M. Abelson** (2), H. Ron (3), A. Agnon(3)

(1) Scripps Institution of Oceanography, UCSD, San Diego, CA, USA (rgranot@ucsd.edu/+1-858-822 4879), (2) Geological Survey of Israel, Jerusalem, Israel (meira@gsi.gov.il/+972-2-5314228/1), (3) Institute of Earth Sciences, Hebrew University, Givat Ram, Jerusalem, Israel

The fossil RTI of Troodos is defined by the fossil Arakapas oceanic transform and the extinct spreading axis of the Solea graben. The intersection between these two structures is obscured by the gabbro suite representing the lower oceanic crust. In order to obtain insights into the complete structure and dynamics of the RTI we measured paleomagnetic vectors and anisotropy of magnetic susceptibility (AMS) sampled from 59 sampling sites in the gabbro suite. The sampling sites were deployed parallel and perpendicular to the Arakapas transform. The parallel profile records temporal variations in magmatic regimes and deformation with various distances from the spreading axis. The perpendicular profiles span between the Solea axis and the Arakapas transform at the outside and inside corners of the RTI.

The paleomagnetic measurements demarcate three domains: 1) the outside-corner shows block rotations about horizontal axis (domain 1), as found in the overlying sheeted dike layer, 2) the inside corner shows block rotations about vertical axis (domain 3) smaller than shown by the adjacent dikes of the overlying crustal layer, and 3) between these two domains, the domain 2 was found with no rotations, whilst the adjacent dikes indicate rotation about vertical axis. The absence of rotations in domain 2 identifies the fossil neo-volcanic zone (NVZ) in the lower crust, and suggests torsional detachment between the upper crustal sheeted-dike layer and the lower gabbro layer, implying shallow brittle-ductile transition at the NVZ. The resemblance of block rotation at the inside- and outside-corners implies deepening of the brittle-ductile tran-

sition, i.e., thickening of the lithosphere away from the NVZ.

The AMS measurements in the gabbro assist to define the orientation of the spreading axis through the gabbro suite. Accordingly, two configurations of the fossil RTI were found, orthogonal and curved with the approach to the transform. The AMS reveal also episodes of magma flow regimes at the segment edge. A vertical magmatic flow was found at the fossil NVZ where the RTI was orthogonal. Lateral magma flow from the segment midpoint towards its edge was found at the curved RTI. This suggests that the more magmatic-starved episode, i.e., the lateral flow towards the segment edge, occurred during spreading at the curved RTI. The crosscut relationships in structural features between these two types of RTI indicate abrupt transition from orthogonal RTI to curved RTI accompanied by a transition from vertical to lateral feeding and a decrease in axial magmatism.