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Palaeomagnetic evidence for an oceanic core complex in the Mirdita ophiolite of Albania

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Oceanic core complexes (OCCs) are the uplifted footwalls of oceanic detachment faults that unroof upper mantle and lower crustal lithologies and expose them at the seafloor. Their common occurrence in slow and ultra-slow spreading rate oceanic crust suggests they accommodate a significant component of plate divergence, representing a newly recognised class of seafloor spreading. Numerical modelling and palaeomagnetic results from the Integrated Ocean Drilling Program (IODP) have shown that the footwalls beneath oceanic detachment faults rotate during their evolution, initiating at steep angles at depth and then "rolling-over" to their present day low angle orientations as a result of flexural isostasy during unroofing. This footwall rotation provides a means of testing whether extensional structures separating upper mantle/lower crustal rocks from upper crustal rocks in ophiolites potentially represent fossil OCCs. Here we present the results of an extensive paleomagnetic study of an inferred OCC in the Mirditata ophiolite of the Albanian Dinarides, first proposed by Tremblay et al. (2009). The western part of Mirdita ophiolite is composed of mantle sequence overlain by a thin gabbro/troctolitic sequence and MORB-like pillow lavas. The sheeted dyke complex and gabbroic sequence are missing locally, and the upper crustal volcanic sequence then rests directly on the mantle sequence in tectonic contact. This anomalous situation is directly comparable to lithostratigraphic relationships in oceanic detachment fault settings. In order to understand this tectonic contact and describe its kinematics we sampled 73 sites from ultramafic rocks, gabbros, lava flows, pillow lavas and dykes, around the Puka and Krabbi massifs between the villages of Puka and Rreshen in northern Albania. Results demonstrate that gabbroic bodies in the mantle sequence preserve a highly stable remanence that differs in direction and polarity to the serpentinized peridotite host rock. A significant difference in remanence direction between the footwall gabbros and the hanging wall upper crustal rocks is consistent with relative rotation across the intervening extensional structure. These data provide the first quantitative example of OCC-related footwall rotation in an ancient ophiolite.