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Stable isotope compositions of ocean crust remnants in the Carpathian Basin: metamorphic events and subduction-related mantle metasomatism

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Remnants of the ophiolitic rocks of the Meliata-Vardar and the Penninic ocean basins have been studied by means of stable isotope analyses in order to investigate the effects of metamorphic processes and the influence of subduction of ophiolites on mantle composition. Rocks of the Meliata-Vardar ophiolitic suite were sampled at several localities in Hungary and Slovakia. The rocks range from Triassic and Jurassic pillow lavas and gabbros that had suffered no metamorphism or only very low-grade metamorphism to blueschists formed during a high-pressure metamorphic event. The subduction-related high-pressure metamorphic event is best recorded in blueschists of the localities of Sugov, Hacava and Borka (SE-Slovakia). The stable isotope compositions of these ophiolite fragments (d18O: 5.2 to 18.5 ‰, mean = 10.3 ‰, dD: -88 to -49 ‰, mean = -68 ‰, n = 41) are very similar to those found in the Penninic ophiolite system of the Kõszeg-Rechnitz series (E. Austria and W. Hungary) (Demény et al., 2006) (d18O: 5.9 to 16.4 ‰, mean = 12.1 ‰, dD: -106 to -46 ‰, mean = -68 ‰, n = 26). Primary magmatic compositions have been preserved not only in the clinopyroxene phenocrysts of unmetamorphosed pillow lavas, but also in amphiboles of gabbros that had suffered both oceanic hydrothermal and very low-grade regional metamorphism. The lack of low d18O values in both complexes, which are usually found in ophiolite sequences due to high-temperature seawater-rock interaction, is in agreement (Gao et al., 2006) with the slow spreading nature of these ocean basins inferred by earlier studies (Lagabrielle and Lemoine, 1997). Subduction of these ophiolite complexes introduces substantial amounts of water into the mantle, thus, the iso-

topic compositions of fluids released from the subducted slab should be modeled and compared to the compositions found in magmatic rocks of the region. The blueschists of the Meliata ophiolites would release D-enriched water (ranging from -20 to +3 ‰) due to the large mineral-water D/H fractionation for alkali amphiboles. The other rock types of the two complexes (metagabbros, metabasalts, serpentinites, ophicarbonates) would release water with dD=-41 +/- 11 ‰ (n=86). This H isotope composition fits the primary dD value of amphibole megacrysts of the Carpathian Basin (-40 +/- 10 ‰; Demény et al., 2005). Thus, subduction of these ocean crust complexes can explain the higher-than-mantle compositions observed in mantle-derived rocks. The metasedimentary rocks associated with the ophiolites would release water with lower dD values (about -60 ‰), similar to compositions found in subduction-related calc-alkaline rocks of the region.

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References /Demény, A.; Vennemann, T.W.; Koller, F. (2006): Stable isotope compositions of the Penninic ophiolites of the Kõszeg-Rechnitz series Geophysical Research Abstracts, 8, 07202. /Gao, Y., Hoefs, J., Przybilla, R., Snow, J.E. (2006): A complete oxygen isotope profile through the lower oceanic crust, ODP Hole 735B. Chemical Geology, 233, 217-234. /Lagabrielle, Y., Lemoine M. (1997): Alpine, Corsican and Apennine ophiolites: the slow-spreading ridge model. Comptes Rendus de l'Academie des Sciences Series IIA, Earth and Planetary Science, 325, 909-920.