Contamination of slab components into the incipient arc magmatism in the Oman Ophiolite

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The Oman ophiolite is one of the best places to investigate magmatic and volcanic processes of an infant arc. Volcanic rocks of the subduction stage extend for >80 km along the paleo arc and consisted of 1100 m thick of arc tholeiite (LV2) and boninite (UV2) upward. Pahoehoe and sheet flows are dominate in the LV2, while 50 m thick pyroclastic rocks are partly distributed upward. The UV2 magma intrudes into lower plutonic and extrusive sequences and erupted as pyroclastic fall and lava flows through fissure vents. Formation of these arc magmas are explained by the involvement of the amphibolite-facies slab-derived fluid in the mantle source [1]. Hf and Nd isotopic compositions provide evidence for contribution of sediments to the arc magma; the UV2 magma con be accounted for by 0.5-7% sedimentary melt mixing with the pre-arc (V1) magma. When 1.5% of the slab-derived fluid is added to the mantle source which is assumed from the V1, the LV2 magma generation is modeled by 9% partial melting. When 1.0% of the slab-derived fluid and 0.5% of the bulk sediment are added to the LV2 residue, the UV2 magma can be formed by 16% partial melting. Such successful, sequenctioal modelling implies that magma source region have not changed and the arc magma have been developed by the repetition of flux melting. A local compositional variation of the UV2 would be generated from heterogeneous wedge mantle following the LV2 magmatism which occurred sporadically [2]. The hot subduction zone (~1400°C mantle potential temperature [3]) may invite ephemeral initial arc magmatism (<2 m.y. [4]) because the most of the water in the slab was released at shallow depth and not available to partial melting. Finally the immature wedge mantle had been cooled.

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