Origin of breccia in mud volcanoes of Andaman accretionary prism: Implications for slab contribution to mantle wedge

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Mud volcanoes at convergent margins are important pathways through which depressurized pore water, hydrocarbon gases and argillaceous material, collectively known as mud breccia, derived from deep within the forearcs, are ejected at the surface - opening an important window to the processes within subduction zones. In spite of the fact that mud breccia is the only detachable part of a subducting slab at shallow depths, its origin and impact on the composition of the arc magmas remain largely unknown. In an attempt to understand its importance in the mantle recycling of crustal materials, we have carried out a detailed geochemical study of mud breccia ejected from the mud volcanoes of the Andaman accretionary prism. Our study reveals that the smectite-chlorite-kaolinite-illite rich matrix of mud breccia is derived from the subducting slab that carries > 27 kyr old trench sediments. Geochemistry and Sr-Nd-Pb isotopic ratios of mud breccia indicate that it contains materials derived from both the altered oceanic crust and overlying sediments, with the former contributing the most (>75 %). Our results show that the mud matrix, unlike the accompanying fluids, is an efficient carrier of large ion lithophile elements, and possibly acts as the main agent of metasomatism in the mantle wedge. Mixing models using Nd-Pb isotopic ratios of mud matrix suggest that the arc lavas at the Andaman subduction zone are contaminated up to 4% by the slab derived material, an estimate that is higher than generally expected.