Andaman Mud Volcanoes—Low temperature geochemistry of eruptive fluids and potential hydrocarbon source

SAUGATA DATTA[1] AND DHANAPATI HALDAR[2]

[1] Department of Geology, University of Calcutta, India; sggeo@caluniv.ac.in

[2] Department of Geology, Presidency College, India; haldar2115@yahoo.co.uk

Mud volcanoes are a common feature, reported by several workers, in the Baratang Island of Middle Andamans, India. The association of methane gas and adsorbed hydrocarbons in the mud has been cited well by scientists working in Andamans and also by others working on other eruption areas around the world. Our intended work centres around delineating the nature of such mud volcanoes in the above terrain, their chemical composition with special reference to the clay minerals formed under this sedimentary volcanism environment and exploiting such volcanic deposits towards potential hydrocarbon reserves (if any). The analysis suggests that, at any instant of time, gas vents at variable rates in different gas channels at the same site, and that the compositional differences in these vent gases are nearly as large as can be produced by hydrate crystallization. Almost two orders of magnitude differences in venting rate between individual gas channel ways are suggested. Our hypothesis is compatible with geologic generalizations that venting evolves from fast (mud volcano), to intermediate (hydrate crystallization), to slow (carbonate precipitation) if venting organized into more discrete vents with time. The most realistic agent that explains the observed effects is a rapid local emission of mud and/or water. Stable isotopes of the separated clay minerals (smectite- and illite-rich extruded mud) from the mud volcanoes will be utilized towards the knowledge of nature of volcanism in the Andaman areas. The most likely mechanism believed is re-hydration of shales by both hydrocarbons and a geochemically mature fluid from greater depth within the wedge. Deep fluid source studies supported by our results from gas analyses, includes He-3, thermogenic C-13 in methane as well as 'ultraheavy' C-13 in CO2. Trace element and REE studies of the muds are being conducted to attest to the above hypothesis. The overall results attest active local flow of geochemically different fluids along deep-seated faults penetrating the wedge, with the waters as well as the gases coming from below.