Pliocene-Pleistocene volcanism in northwestern Arabian plate (Jordan): I. Geology and geochemistry of the Asfar Volcanic Group

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With 11 figures and 5 tables

Abstract: The Asfar Volcanic Group (AVG) of northeastern Jordan comprises several phases (4.52 – 1.00 Ma) erupted from volcanic centers and associated with pyroclastic rocks. Three distinctive lithotypes are recognized in the AVG based on their volcanologic, lithologic and petrologic affinities. These are Ushayhib lithotype, Ufayhim-Hashimyya litho-type and Salaman-Madhala litho-type. The three litho-types exhibit noticed compositional differences giving rise to two geochemical units based on major and trace elements content. Geochemical unit 1 (Ufayhim-Hashimyya litho-type) belongs to basanite, comprises silica-undersaturated primitive samples (SiO₂ < 45 wt %) with high MgO (7.76 – 12.21 wt %) and FeO (11.12 – 13.79 wt %). Unit 2 (Ushayhib litho-type, Salaman-Madhala litho-type) is alkali basalt with higher silica (SiO₂ > 45 wt %) but lower MgO (5.7 – 10.03 wt %) and FeO (9.79 – 11.14 wt %). The geochemical variations in the AVG cannot be accounted for by fractional crystallization alone and require variable degrees of partial melting at variable depths, a heterogeneous source, and/or crustal contamination.