

Is there a genetic relationship between the Dead Sea Transform and the western Arabia LIP?

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The western Arabia Neogene-Quaternary volcanic fields are part of the Afro-Arabian LIP. The volcanism here is mainly related to the opening of the Red Sea rift, which is evident by its occurrence along the eastern flanks of the Red Sea, its age (ca. 30 Ma to present), which is concurrent with the Red Sea rifting, and the dominant directions (NW, sub-parallel to the Red Sea). However, the volcanism also shows spatial relations with the nearby Dead Sea transform (DST) fault. The latter is manifested in fields or lineaments of volcanic structures aligned N-S, sub-parallel to the DST, and the high occurrence of volcanism along the northern part of the DST, 500 to >1,000 km away from the Red Sea.

In this study, it is shown that the DST often functioned as a magma plumbing system. This includes the concentration of large volumes of magmas in pull-apart basins (e.g. south of the Sea of Galilee), the channeling of magmas away of the center of activity along DST segments (north of the Sea of Galilee) and the emplacement of magmas with distinct compositions (e.g. basanites vs. alkali-basalts) on opposing sides of the DST. It is also suggested that due to the 105 km sinistral displacement along the DST, it may form a sharp boundary between lithospheric domains with different composition, as reflected in certain cases in the magmas derived from these domains.

The possible existence of genetic relationship between the DST and magma generation (namely: partial melting due to DST-related extension) is studied through basalt composition on- and off-transform. It is shown that the composition of magmas that erupted along the DST does not differ from that of off-transform magmas (e.g. northern Israel). Furthermore, in cases (e.g. northern Syria), magmas that erupted along the DST are more enriched than magmas that erupted tens to hundreds of km away from the transform, which is in opposite sense to the common on-axis/off-axis petrogenetic comprehension. This, together with the lack of volcanism along the southern part of the DST and the concentration of northern DST fields in association with off-DST fields, doubt the existence of genetic relations between the DST and magmatism.