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GEOLOGY AND STRUCTURAL CONTROLS ON SOME OF REE AND POLYMETALIC Nb-Zr-Ta DEPOSITS-BEARING ALKALINE-PERALKALINE ROCKS IN THE ARABIAN SHIELD, KINGDOM OF SAUDI ARABIA

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During 725-518 Ma, large and widespread felsic plutons were emplaced in Northwestern Arabian Shield but lacking in number towards the south. However, the interval 607-518 Ma evidenced emplacement of particular varieties of alkaline-peralkaline plutons that have economic significance with polymetallic mineralization, including REEs, Nb, Zr, Y, Ta and, sometimes, Th. Six of these plutons are chosen for the study and arranged, from the northwest to south, by Jabal Tawlah, Jabal Umm Al Birak, Jabal Al Hamra, Jabal Abu Ad Dud, Jabal Umm Al Suquian and Jabal Libd-Miryash. The form of these plutons are elongated, rectangular, circular with flat-topped bell-jar structure and, elsewhere, tapering along the shear faults and limbs of some folds. They embrace albite granite, albitized granite, alkali-feldspar granite, quartz syenite, quartz alkali-feldspar syenite and silexite. They have intrusive contacts, strong shearing and alignment of silicification, pegmatites, quartz pods and veins against the enveloping highly deformed arc metavolcanic-volcanosedimentary rocks and in places weakly to unmetamorphosed volcanics and molaase sediments.

Structurally, N-S to NNE-SSW dextral Nabitah and NW-SE sinistral Najd crustal shear zones dominate the Shield with less common NE-SW Hijaz structural trends and transcurrent fault (or suture ?) zones. The shear zones are multi-kilometer-wide corridors and lined, with the transcurrent faults, by parallel trends of serpentinized ultramafic slices. Faults within Nabitah shear zone delimit the contacts between dismembered ophiolites, arc volcanic assemblages and gneisses and their movement led to the NE-trending accretion (or amalgamation). During and post-accretionary phases, kinematic indicators indicated continuity of the movement by dextral simple shearing that shaped mode of the emplacement of subsequent magmatic intrusions within Nabitah faults. In the central part of the Shield, these faults are obscured and dislocated

as they appear running to the north by the NW-SE Najd shear zone, which transposed, in a sense of sinistral shear, the pre-existing accreted rocks northwest- and west northwestwards. Sinistral main shear within the Najd faults resulted in the formation of a few meters and kilometers wide principle displacement zones and many of pull-apart basins, broadly lasted from 620 Ma to 530 Ma and inside which spectacular intrusions of alkaline to peralkaline were emplaced. Individual structures within the displacement zones and basins are brittle to brittle-ductile shears (NW-SE to WNW-ESE Riedel and NE-SW conjugated Riedels) and behaved, in many instances, as conduits for alkaline to peralkaline magma ascent and to the fluids with volatile phases to driven off along the fault planes, resulting in a melt enriched in rare earths and other polymetallic deposits.

The present study serves in accord with the above structural regime at clarify, in more detail, the field mapping, mineralogy, structural analysis and importance of structural controls on the polymetallic mineralization as a target for mineral exploration and assessment within the selected six plutons.

Key words: Arabian Shield, alkaline-peralkaline rocks, structural controls, polymetallic mineralization

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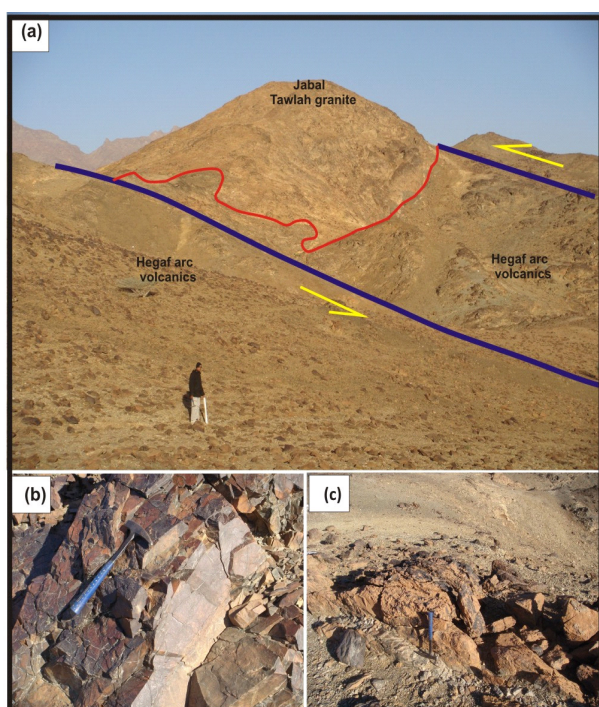


Fig. (3) a-Tawlah granite upheaval within WNW-ESE sinistral shear zone and, relatively, against a moderate relief of the enveloping Hegaf arc volcanics; photo looking NW. b- Metatuff as a part of volcanoclastic metasediments of the Hegaf Formation on the southern flank of Wadi Tawlah; photo looking SE. c- Ankerite band (iron carbonates) striking WNW-ESE and represents remnant of highly deformed ultramafic rocks incorporated inside the Hegaf Formation in the southeastern part of Jabal Tawlah; photo looking S.

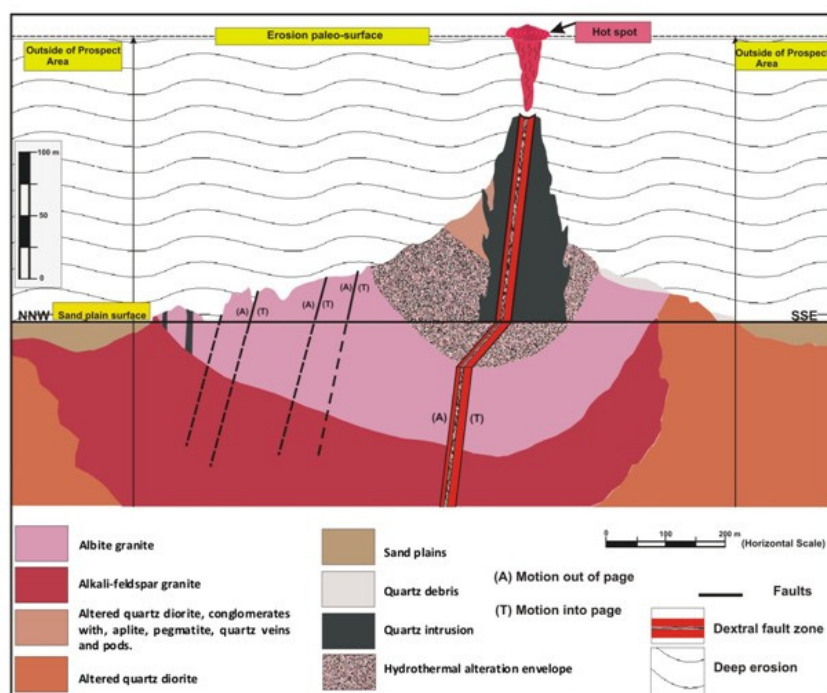


Fig. (15) A proposed schematic diagram taken on NNW-SSE traverse interpreting the structural control on mineralization by bell-jar structure in Umm Al Suqian prospect.

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