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Petrology and Finite Strain of the Al Amar Region, Northern Ar-Rayn Terrane, Eastern Arabian Shield, Saudi Arabia

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Abstract : The Neoproterozoic basement rocks of the Ar Rayn terrane have been identified as parts of the Eastern Arabian Shield. It focuses on the petrological and finite strain properties to display the tectonic setting of the Al Amar suture for high deformed volcanic and granitoids rocks. The volcanic rocks are classified into two major series: the eastern side cycle, which includes dacite, rhyodacite, rhyolite, and ignimbrites, and the western side cycle, which includes andesite and pyroclastics. Granitoids rocks also contain monzodiorite, tonalite, granodiorite, and alkali-feldspar granite. To evaluate the proportions of shear contributions in penetratively deformed rocks. Asymmetrical porphyroclast and sigmoidal structural markers along the suture's strike, namely the Al Amar, are expected to reveal strain factors. The Rf/phi and Fry techniques are used to characterize quartz and feldspar porphyroclast, biotite, and hornblende grains in Abt schist, high deformed volcanic rock, and granitoids. The findings exposed that these rocks had experienced shape flattening, finite strain accumulation, and overall volume loss. The magnitude of the strain appears to increase across the nappe contacts with neighboring lithologies. Subhorizontal foliation likely developed in tandem with thrusting and nappe stacking, almost parallel to tectonic contacts. The ductile strain accumulation that occurred during thrusting along the Al Amar suture mostly includes a considerable pure shear component. Progressive thrusting by overlaid transpression and oblique convergence is shown by stacked nappes and diagonal stretching lineations along the thrust axes. The subhorizontal lineation might be the result of the suture's most recent activity. The current study's findings contradict the widely accepted model that links orogen-scale structures in the Arabian Shield to oblique convergence with dominant simple shear deformation. A significant pure shear component/crustal thickening increment should have played a significant role in the evolution of the suture and thus in the Shield's overall deformation history. This foliation was primarily generated by thrusting nappes together, showing that nappe stacking was linked to substantial vertical shortening induced by the active Al Amar suture on a massive scale.

Keywords : petrology, finite strain analysis, al amar region, ar-rayn terrane, Arabian shield
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