

Crustal evolution of the Precambrian Arabian Shield

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The Arabian Shield is a stable craton occupying about one third of the Arabian Peninsula with an exposed area inside Saudi Arabia of about 620,000 square kilometers. It is composed mainly of metamorphosed, stratified and plutonic rocks of Neoproterozoic to Early Cambrian age (approximately 900 Ma to 570 Ma). It is bounded on the west by Cenozoic rocks of the Red Sea Rift, and on the north, east and southeast by the gently dipping Phanerozoic sedimentary strata (i.e. the Cover Rocks). The region as a whole has been isostatically elevated along the Red Sea margin and tilted northeastward as a consequence of uplift and continental rifting beginning approximately 30 Ma ago causing opening of the Red Sea and separation of Arabia from Nubia. The Arabian Shield evolutionary models currently favor collisional accretion of multiple plates or plate fragments, however, some authors have advanced an alternative hypothesis of cyclic rifting followed by compression. This paper discusses the crustal evolution of the Precambrian Shield, reviews the above models and redefines the terrane boundaries based on the integration of the available geological, geochronological and geophysical data. The geophysical and geochronology datasets when used together provide a better classification of the basement terranes within the Shield. In this study the Khida old microcrust is very well delineated by gravity data and its internal structure by the aeromagnetic data. The structure is dominated by ESE trending short wavelength anomalies related to a dyke system likely to be associated with the Najd shearing movement.