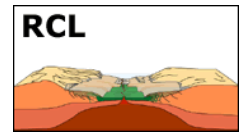


# Integrated Thermochronological & Structural Investigation of the Saudi Arabian Red Sea Rift Margin: Implications for the rupturing of Continental lithosphere

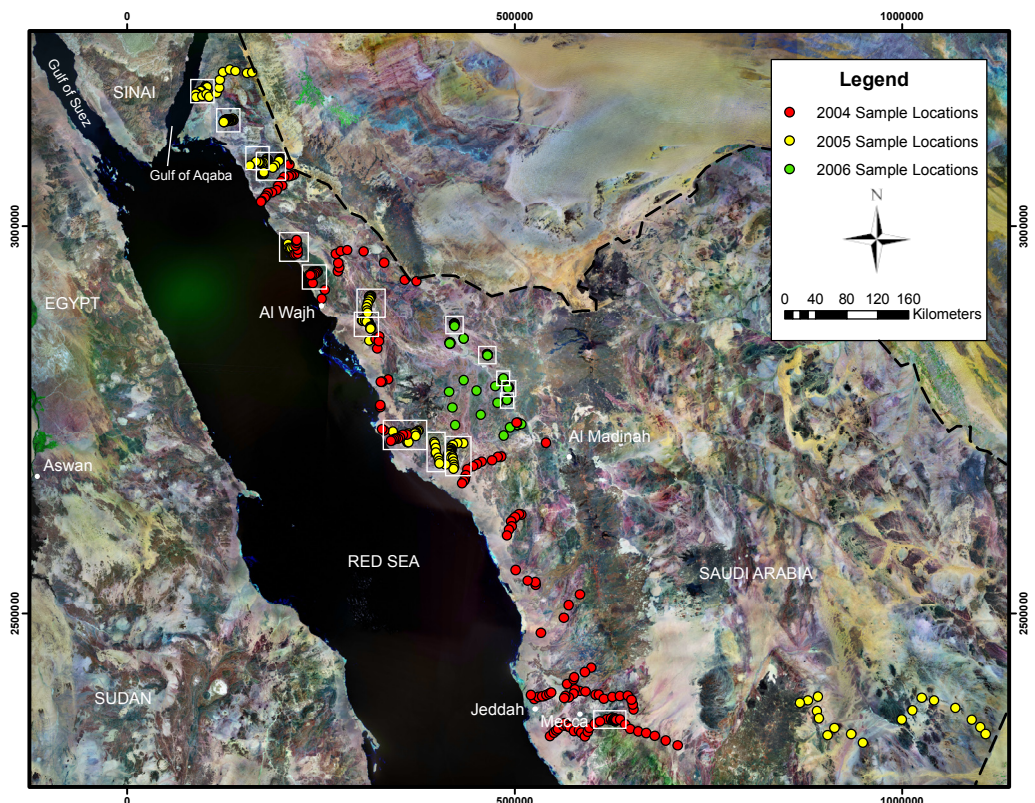


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The Tertiary Red Sea-Gulf of Suez rift system is one of the best-exposed examples of a continental rift and a prime example of active continental break-up. Although the Egyptian, Yemeni, Ethiopian portions of the margin have been studied in some detail, little is known about the timing and structure of rifting of the Saudi margin. In this unprecedented collaborative project with the Saudi Geological Survey, we have undertaken a comprehensive low-temperature thermochronometric investigation integrated with structural and geomorphic studies to determine the timing, origin, and geometry of extensional faulting and rift flank exhumation along the central and northern Red Sea margin in Saudi Arabia. Our efforts have focused on a comprehensive thermochronometric study of exhumed crystalline basement along the central and northern Saudi Arabia Red Sea rift margin, stretching from the coastal escarpment south of Makkah/Jeddah to the northern Gulf of Aqaba (see figure). Apatite and zircon (U-Th)/He and fission track analysis date the timing of extension and quantify the pre- and post-rift denudation. Rifting along the border fault system along the central Saudi Arabian margin and normal faults within the rift flank (Medina to Tabuk area) initiated between 23-21 Ma. Structurally controlled geomorphic surfaces are well developed between the modern coastal plain and the main rift flank escarpment, separated by normal faults decorated by uplifted ~15 Ma carbonate reefs. Younger faulting and volcanism is associated with the middle Miocene tectonic reorganization in the Red Sea coeval with the development of the Gulf of Aqaba transform, with cooling and exhumation increasing in magnitude from south to north.



*Shaded digital relief map of the central and northern Red Sea showing locations of low-temperature thermochronometric samples collected from the Saudi Arabian Red Sea margin.*

*More than 400 thermochronometric samples were collected to resolve the timing of extensional faulting and to differentiate between different episodes of cooling and exhumation affecting the Saudi Arabian Red Sea margin. Detailed vertical transects (white boxes) were collected across the exhumed crustal blocks and topographic escarpments to constrain the timing and spatial distribution of extensional faulting and evolution of rift segmentation and localization, and rift flank exhumation. Horizontal traverses were collected across the entire rift margin from the modern coastal plain to the edge of the exposed Neoproterozoic Arabian Shield.*

Stockli, D.F., Szymanski, E., Johnson, P., Kattan, F.H., Kadi, K., Al Shamari, A., Omar, G., and Brichau, S., 2006, Thermochronometric constraints on tectonic and geomorphic evolution of the northern and central Saudi Arabian Red Sea Rift Margin. *Margins Newsletter*, vol. 17, p. 10-12.

