

KINGDOM OF SAUDI ARABIA

Saudi Geological Survey

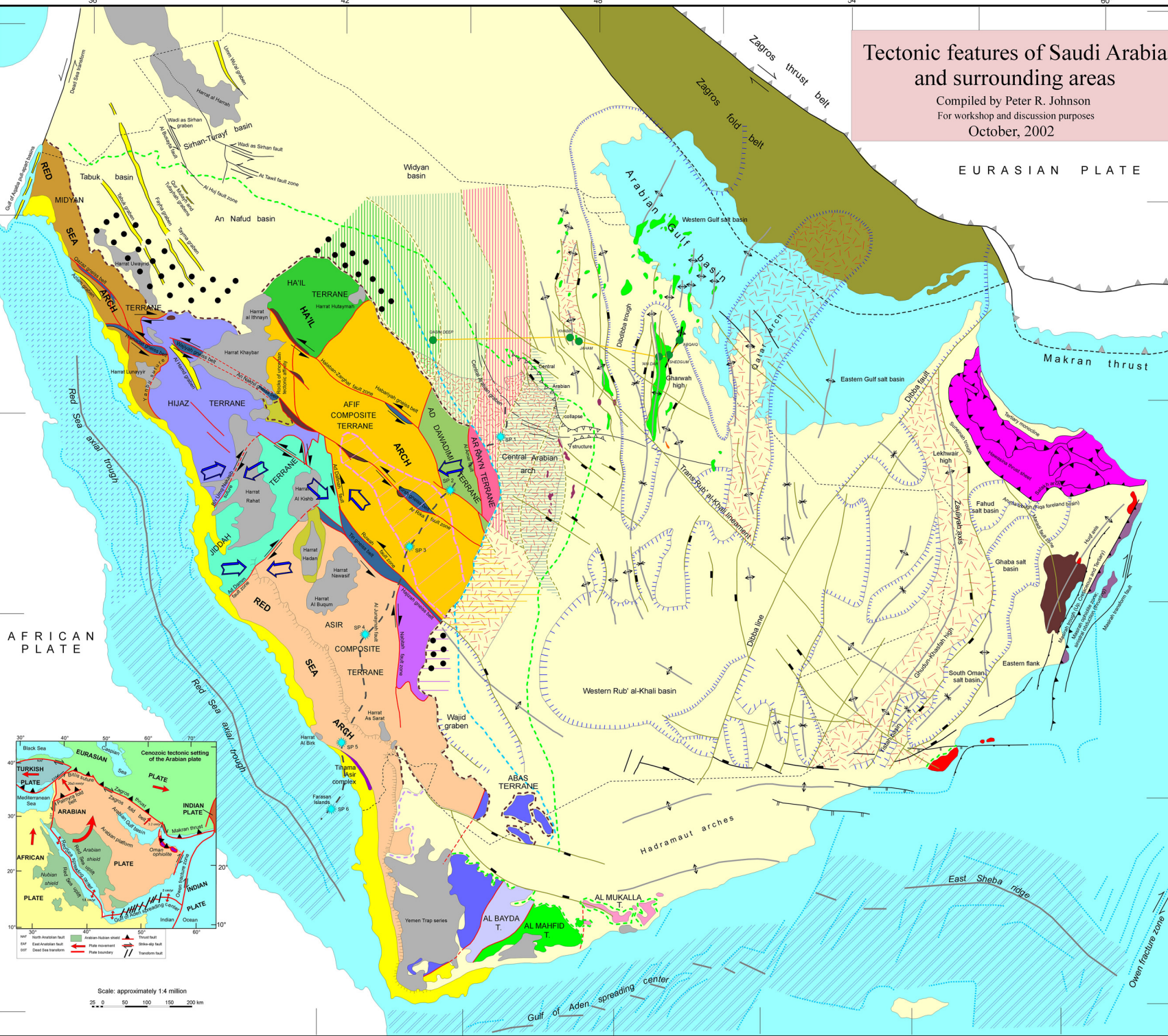


سورة الجيولوجية السعودية
SAUDI GEOLOGICAL SURVEY

Tectonic features of Saudi Arabia and surrounding areas

Compiled by Peter R. Johnson
For workshop and discussion purposes
October, 2002

EURASIAN PLATE



Phanerozoic features

- Red Sea and Gulf of Aden axial trough (spreading center)
- Steep bathymetric gradient (possible fault)
- Possible mixed oceanic and continental crust of northern Red Sea
- Oceanic crust of southern Red Sea and Gulf of Aden, partly covered by Cenozoic sediments; boundaries approximate
- Proto-oceanic crust exposed on the Saudi Arabian coastal plain (Thama Asir complex)
- Exposed Cretaceous, Paleogene, and Neogene sedimentary deposits of the Red Sea basin; local paleogeographic and tectonic blocks of Precambrian rocks not shown
- Paleogene and Neogene pull-apart basins and grabens associated with Red Sea extension
- Cenozoic floor-basalt associated with Red Sea extension
- Paleogene-Neogene sedimentary rocks exposed in the central Arabian shield and partly concealed by Cenozoic floor-basalt
- High, continuous Red Sea escarpment (Oligocene to present) south of Ad Damr fault; equivalent Gulf of Aden escarpment not shown
- Structural high (ridge) structural low (basin) in the surface and subsurface east of the Arabian shield
- Anticline; syncline east of the shield - mostly in the subsurface
- Fault in Phanerozoic rocks and concealed Precambrian basement - mostly in the subsurface; bricks indicate downthrown side; arrows indicate sense of horizontal displacement. Dashed where inferred
- Transform fault; arrows show sense of movement
- Central Arabian collapse structure caused by dissolution of near-surface evaporites
- Faults of the Central Arabian graben system (Late Tertiary to Holocene)
- Gulf of Aden collapse structures associated with Gulf of Aden extension
- Normal faults associated with Cretaceous and Tertiary basins flanking the Gulf of Aden
- Post-collisional Zagros fold belt (Miocene-Pliocene)
- Zagros thrust belt (Eocene-Miocene); collisional suture between the Eurasian and Arabian plates; dashed where submerged
- Hawasina and Semail thrust sheets in Oman; Cretaceous extension of oceanic crust and associated rocks
- East Oman (Masrah) ophiolite complex
- Phanerozoic sedimentary rocks of the Arabian platform, unconformable on Precambrian basement
- Oil fields in Mesozoic reservoirs
- Oil fields in Paleozoic reservoirs
- Outcrop trace of pre-Upper Cretaceous unconformity
- Outcrop trace of pre-Jurassic unconformity
- Outcrop trace of pre-Upper Permian pre-Khuff unconformity
- Outcrop trace of pre-Cambrian-Ordovician unconformity
- Region showing effects of Lower Paleozoic glaciation
- End-Precambrian-Cambrian volcano-sedimentary rocks in ophiolite on the Arabian shield (Liban group) and in Oman (Hud group)
- Line of section and bore holes in central Saudi Arabia, revealing Devonian Hercynian structures shown in inset below
- SP 3 Location of shot points and seismic-refraction survey in western Saudi Arabia yielding data modeled in inset below

Precambrian features

- Schist and gneiss in brittle-ductile transition shear zones and terrane sutures
- Region of Group III evolved lead-zinc in Arif terrane; possibly reflecting continental microplate
- Neoproterozoic faults - including suspect terrane boundaries (sutures), sutures modified by later faulting, and strike-slip faults; arrows show sense of horizontal movement
- Relative sense of terrane movement (oblique collision or transposition)

Precambrian suspect terranes

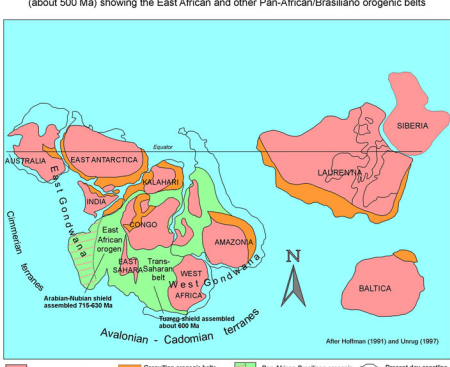
- Surface extent
- Possible extension beneath Phanerozoic cover
- Midian terrane
- Hijaz terrane
- Ha'il terrane
- Arif composite terrane
- Ad Dawadimi terrane
- Ar Rayn terrane
- Unnamed suspect terranes in central Arabia
- Suspect terrane east of the Najd fault zone
- Jiddah terrane
- Air composite terrane
- Abas terrane
- Al Bayda terrane
- Al Mahfid terrane
- Al Mukalla terrane
- Metamorphic and igneous rocks of possible Neoproterozoic provenance in Oman

Reconstruction of early Neoproterozoic Rodinia supercontinent and the possible site of origin of oceanic assemblages of the eventual Arabian-Nubian shield (part of the East African orogen)

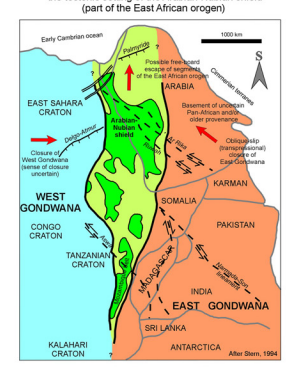


For sources of information see USGS-TK-98-3

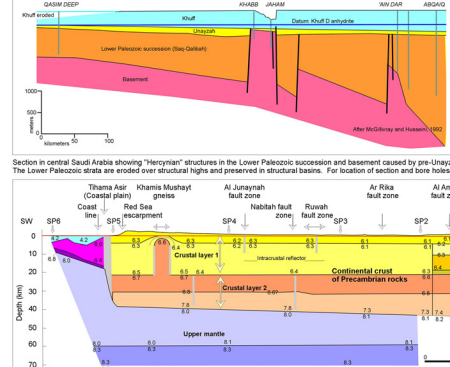
Reconstruction of the end-Neoproterozoic supercontinent of Gondwana (about 500 Ma) showing the East African and other Pan-African/Brasiliano orogenic belts



Detail of the region between East and West Gondwana showing the tectonic setting of the Arabian-Nubian shield (part of the East African orogen)



Section in central Saudi Arabia showing 'Hercynian' structures in the Lower Paleozoic succession and basement caused by pre-Ordovician Devonian extension. The Lower Paleozoic strata are eroded over structural highs and preserved in structural basins. For location of section and bore holes see main map.



Seismic-refraction crustal model of Moorey and others (1985) for the southwestern part of the Arabian plate showing a principal block of the crust and rapid thinning of the crust beneath the coastal plain. Alternative models for the entire section of part of the section given by Prodehl (1985), Mather and Fuh (1986), and Burt (1991). Seismic-refraction data reported by Healy and others (1982); compressional-wave velocities in km/sec. For location of profile and shot points, see main map.

Copyright © 1998 Saudi Geological Survey. All rights reserved.