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Principal stresses flipping during the East- West-Gondwana collision

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During the Precambrian-Cambrian transition, the Arabian-Nubian Shield underwent final assembly and accretion to the Saharan Metacraton concurrent with the assembly of eastern and western Gondwana. The Arabian-Nubian Shield consisted of volcanic island-arc terranes, equivalent intrusions and the connecting oceanic crust. During the eastern and western Gondwana collision, the oceanic crust was thrust over the arc terranes and several shear zones were activated. Najd Fault System – the largest pre-Mesozoic shear zone on Earth – is one of these shear zones. Exhumation of mid-crustal level rocks (high-grade gneisses) as metamorphic complexes is closely connected to the activity of the Najd Fault System. In Eastern Desert of Egypt, high-grade rocks were exhumed in extension setting as classical metamorphic core complexes. In contrast, in Sinai, they were exhumed in an oblique transpression regime.

In order to investigate reasons for this difference, a current project deals with the exhumation mechanism of the mid-crustal rocks in other parts of the Najd Fault System, namely in the Arabian part of the shield (Saudi Arabia). First results of fieldwork show that the geographic position of molasse basins, typically spatially associated with the gneiss domes, is different in the Eastern Desert than in Saudi Arabia. In Eastern Desert, these basins are located to the northwest and the southeast of the metamorphic complexes. In Saudi Arabia the basins are to the east and the west of the complexes. The geographic position of the molasse basins with respect to the metamorphic complexes and the overall geometry of the Najd Fault System may indicate that the principal stresses (σ_2 and σ_3) of the system were flipped from the east to the west of the Arabian-Nubian Shield. Petrological and age dating work are currently in progress to check the field observations.