



Strike-slip linked core complexes: A new kinematic model of basement rock exhumation in a crustal-scale fault system

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Metamorphic core complexes usually develop as extensional features during continental crustal thinning, such as the Basin and Range and the Aegean Terrane. The Najd fault system in Saudi Arabia is a 2000 km-long and 400 km-wide complex network of crustal-scale strike-slip shear zones in a Neoproterozoic collision zone. Locally, the anastomosing shear zones lead to exhumation of lower crustal segments and represent a new kinematic model for the development of core complexes. We report on two such structures: the Qazaz complex in Saudi Arabia and the Hafafit complex in Egypt.

The 15 km-wide Qazaz complex is a triangular dome of gently dipping mylonitic foliations within the 140 km-long sinistral strike-slip Qazaz mylonite zone. The gneissic dome consists of high-grade rocks, surrounded by low-grade metasediments and metavolcanics. The main SE-trending strike-slip Qazaz shear zone splits southwards into two branches around the gneiss dome: the western branch is continuous with the shallow dipping mylonites of the dome core, without overprinting, and changes by more than 90 degrees from a NS-trending strike-slip zone to an EW-trending 40 degree south-dipping detachment that bounds the gneiss dome to the south. The eastern SE-trending sinistral strike-slip shear zone branch is slightly younger and transects the central dome fabrics. The gneiss dome appears to have formed along a jog in the strike-slip shear zone during 40 km of horizontal strike-slip motion, which caused local exhumation of lower crustal rocks by 25 km along the detachment. The eastern shear zone branch formed later during exhumation, transacted the gneiss dome and offset the two parts by another 70 km.

The Hafafit core complex in Egypt is of similar shape and size to the Qazaz structure, but forms the northern termination of a sinistral strike-slip zone that is at least 100 km in length. This zone may continue into Saudi Arabia as the Ajjaj shear zone for another 100 km. The NW trending strike slip mylonite zone grades into a gently N-dipping detachment to the west which accommodated strike slip by exhumation of high-grade lower crustal rocks. The Qazaz and the Hafafit Domes are similar, mirror-image structures with small differences in the accommodating shear zones. It is likely that these types of strike-slip related oblique core complexes are common in the Arabian Nubian shield, and possibly elsewhere.