
Differential Exhumation and the Structural Evolution of the Northern Oman Mountains

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The Late Cretaceous orogeny that created the northern Oman Mountains is an ideal site to investigate this process as there is near-continuous outcrop through different structural levels. In the NE the Saih Hatat culmination preserves eclogite and the blue schists. In contrast the southern flank of the Jebal Akhdar culmination was buried to only a few km. These culminations are the surface manifestation of thickened Arabian continental crust yet all show extensional tectonics at outcrop. Extension and contraction were broadly coeval and both were influenced by pre-existing NNE-SSW trending basement structures.

In Saih Hatat syn-exhumation shears were directed top NNE, accompanied by lineation-parallel folding on all scales. Rather than simply interpret these as sheath folds we propose that the folds represent a component of constrictional strain, the product of transtension. In contrast the northern flank of the Jebal Akhdar culmination contains few such folds so we suggest the extension there was largely plane-strain. The intervening eastern edge of the Jebal Akhdar culmination (Jebel Nakhal) forms a km-scale NNE-trending anticline. We infer that the constriction was the result of laterally-varying crustal extension (differential exhumation) whereby top NNE extension was locally combined with left-lateral shearing. The imbalance between net extension and possible contraction within the Arabian continent suggest that the crustal extension continued after the end of convergent tectonics in the region.

In summary, although all parts of the culminations of Arabian continental crust show NNE-directed extension, different areas manifest this strain in different ways, with varying degree of apparent Constriction. The degree of Constriction, and presumably therefore the role of non-plain strain in the extension of the northern margin of the Oman orogen, varies with crustal level and proximity of the pre-existing basement faults.
