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Deciphering the tectonometamorphis history of the Anarak Metamorphic Complex, Central Iran

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The Cimmerian orogeny shaped the southern margin of Eurasia during the Late Permian and the Triassic. Several microplates, detached from Gondwana in the Early Permian, migrated northward to be accreted to the Eurasia margin. In the reconstruction of such orogenic event Iran is a key area. The occurrence of several "ophiolites" belt of various age, from Paleozoic to Cretaceous, poses several questions on the possibility that a single rather than multiple Paleotethys sutures occur between Eurasia and Iran.

In this scenario the Anarak region in Central Iran still represents a conundrum. Contrasting geochronological, paleontological, paleomagnetic data and reported field evidence suggest different origins for the Anarak Metamorphic Complex (AMC). The AMC is either interpreted to be part of microplate of Gondwanan affinity, a relic of an accretionary wedge developed at the Eurasia margin during the Paleothetys subduction or part of the Cimmerian suture zone, occurring in NE Iran, displaced to central Iran by counterclockwise rotation of the central Iranian blocks from the Triassic.

Our field structural data, petrographic and geochemical data, carried out in the frame of the DARIUS PROGRAMME, indicate that the AMC is not a single coherent block, but it consists of several units (Morghab, Chah Gorbeh, Patyar, Palhavand Gneiss, Lakh Marble, Doshak and dismembered "ophiolites") which display different tectonometamorphic evolutions.

The Morghab and Chah Gorbeh units share a common history and they preserve, as a peculiar feature within metabasites, a prograde metamorphism with sin- to post-deformation growth of blueschists facies assemblages on pre-existing greenschist facies mineralogical associations. LT-HP metamorphism responsible for the growth of sodic amphibole has been recognized also within marble lenses at the southern limit of the Chah Gorbeh unit. Finally, evidence of LT-HP metamorphism also occur in the metabasites and possibly also in the serpentinites that form most of the "ophiolites" within the AMC. Structural analyses show that the Chah Gorbeh, Morghab units and the "ophiolites" have been tectonically coupled during at least two deformational phases that occurred at greenschist facies conditions and predate the LT-HP metamorphic overprint. Available geochronological data loosely constraints the subduction event in the Late Permian – Early Triassic times. Subsequent deformation events that occurred during the whole Mesozoic and the Cenozoic up to the Miocene and possibly later, resulted in folding, thrusting and faulting that dismembered the original tectonic contacts. Therefore, the correlations among deformation structures and metamorphic events in the different units are not straightforward.

The other units of the AMC lack evidence of HP metamorphism, especially the Lakh Marble a large thrust sheet that occupies the uppermost structural position in the AMC. The contact with the underlying units is invariably tectonic, thus no original relationships have been preserved.

So, if structural and petrographic data point out an accretionary wedge setting for the evolution of the Chah Gorbeh, Morghab and the "ophiolites", geodynamic significance and paleogeographic attribution of other units still remain controversial.

In progress U-Pb dating of undeformed intrusive bodies and metamorphic minerals in the LT-HP rocks will soon help to better constrain the evolution of the ACM.