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The Cimmerian evolution of the Nakhlak-Anarak area (Central Iran) and its bearing for the reconstruction of the history of the Eurasian margin

A. Zanchi (1), M. Balini (2), F. Berra (2), E. Garzanti (1), M. Mattei (3), G. Muttoni (2), S. Zanchetta (1), A. Nicora (2), I. Bollati (1), F. Mossavari (4)

(1) Dipartimento di Scienze Geologiche e Geotecnologie, Università di Milano-Bicocca, P.Scienza 4, MI Italy, andrea.zanchi@unimib.it, (2) Dipartimento di Scienze della Terra Università di Milano, Italy, (3) Dipartimento di Scienze della Terra, Università di Roma Tre, Italy, (4) Geological Survey of Iran, Teheran, Iran

The volcanic arc-related Triassic succession of Nakhlak, exposed in the middle of Central Iran, shows several features in contrast with the dominant carbonate platform facies developed in all of the surrounding regions, from the Alborz Mountains to the northern margin of the Jaz Murian depression. The sedimentary succession consists of relatively deep marine sediments including rossoammonitico facies, reworked volcanics and turbidites deposited in a volcanic arc setting between the Olenekian and the Carnian. A few kilometres to the south of Nakhlak the E-W trending Anarak Metamorphic Complex (AMC) is exposed.. The metamorphic complex consists of low-grade metamorphic rocks including metapelites, metabasites and marbles associated with slivers of ultrabasic rocks possibly representing fragments of an oceanic lithosphere. Blue-schist relics also occur as small boudins in greenschist-facies metabasites belonging to the AMC. Early and Late Palaeozoic fossil remnants, some of which possibly Permian in age (Davoudzadeh et al., 1987), have been found within the metacarbonates occurring in the wedge. Moreover, Berberian & King (1981) report a 240 Ma radiometric age obtained in metamorphic rocks of the AMC around Anarak, and a 210 Ma age in the Saghand area for similar rocks. The AMC is crossed in its western portion by the late Mesozoic “coloured melange”, forming a much younger ophiolitic ring developed around the internal part of Central Iran. The AMC can be followed to the east for at least 100 km in the Chur region, where it is unconformably covered by the Shemshak Formation, and possibly in the Saghand area to the southeast. Ophiolitic

slivers and Upper Triassic to Jurassic intrusives occur in the Jandaq area and also in the in the region south of Kashmar, suggesting a continuity of the complex across the region south of the Great Kavir Fault.

This peculiar rock association suggests that the AMC may be interpreted as an accretionary wedge developed in front of the Triassic Nakhlak volcanic arc. The exposure and unroofing of the prism is testified by the 900 m-thick conglomeratic succession of the Baqoroq Formation intercalated between the Olenekian to Middle Anisian Alam and the Upper Ladinian Ashin Fm. of the Nakhlak succession. The conglomeratic unit is rich in clasts of marble and metapelitic rocks very similar to the ones exposed in metasedimentary units of the AMC.

On the basis of these observations, we suggest that the Nakhlak-Anarak units represent an arc-trench system developed during the Cimmerian orogeny in the interior of Central Iran. This interpretation suggests that the Iranian plate was formed by at least two different microblocks that collided in a complex way during their accretion to the Eurasian margin between Middle–Late Triassic and Early Jurassic. The ocean separating the two blocks was probably very narrow, as the region to the north and to the south show a very similar stratigraphic evolution during the Late Palaeozoic (Leven & Gorgji, 2006).

This model is in open contrast with previous interpretations, suggesting a unique suture located along the south Caspian coast (Palaeotethys suture) between Eurasia and the Iranian Plate. The anomalous position of the Nakhlak-Anarak region was explained by previous authors (Soffel et al., 1996; Davouzadeh & Weber-Diefenbach, 1987; Alavi et al., 1997) by using poorly defined paleomagnetic data that presumptuously showed a post-Triassic 135˚ anti-clockwise rotation of Central Iran resposible for displacing a large fragment of the Palaeotethys suture from the present-day Afghan-Iranian border region to its present position. To this respect, new paleomagnetic data obtained in the Alam Fm. at Nakhlak seem to suggest in fact that no relevant vertical axis rotations with respect to Laurasia occurred in this area since the Middle Triassic.

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