The structure of the Eocene Chapedony metamorphic core complex in Central Iran: significance for formation of the Iranian plateau

Fariba Kargaran[1, 2], Franz Neubauer[1] Johann Genser[1] & A. Houshmandzadeh[1]

1 Department of Geography and Geology, University of Salzburg, Hellbrunner Str. 34, A-5020 Salzburg, Austria (fariba.kargaranbafghi@sbg.ac.at

2 Parskani Comp., 28 Sarparast Ave.West Taleqani St., Tehran, Iran

Recently, U-Pb zircon dating of migmatite and granite of the Chapedony dome revealed the existence of a high-grade metamorphic core complex in Central Iran (Ramezani and Tucker, 2003, Amer. J. Sci., 303, p. 622–665). Here, we report structural data from the Chapedony metamorphic core complex. The hangingwall unit is represented by the Posht-e-Badam complex, which mainly contains greenstones, schists, gneisses, amphibolites and marbles with a pre-Mesozoic metamorphic overprint, which are locally intruded by Triassic granites. The Posht-e-Badam complex is covered by Cretaceous red sandstone and carbonate successions. On top of it, terrestrial Eocene basins are exposed.

The Chapedony metamorphic core complex displays characteristics of both mantled gneiss dome and metamorphic core complex. The dome structure is elongate in NNE-SSW direction and comprises mainly high-grade metamorphic rocks, migmatites, rare paragneisses and abundant orthogneisses, which are cored by a number of syn- and post-kinematic granite, granodiorite and hornblende-diorite intrusions. These units yielded U-Pb zircon ages ranging from 44 to 47 Ma (Ramezani and Tucker, 2003). Our detailed geothermobarometry yield peak P-T conditions of ca. 3–4 kbar and ca. 650–700°C for migmatites and paragneisses. Along NW and SE dome margins, the ductile mylonitic Chatak-Neybaz shear zone is exposed, which mainly shows a NE-SW-trend of both foliation and lineation mostly parallel to elongation of the dome. We interpret the Chatak-Neybaz shear zone as a ductile low-angle normal fault in contrast to the previous thrust interpretation. The shear zone exposes a variety of mylonitic rocks ranging from proto-mylonitic augen gneiss through mylonitic orthogneiss to ultramylonite and phyllonite, mostly along upper boundary of the shear zone. These fabrics indicate that hydrothermal activity assisted to shearing by lowering of shear resistance and also resulted in variable retrogression and phyllonite formation. Ca. 20 to 100 m wide zones of massive, unfoliated cataclasites and hydrothermal chlorite-breccia with components from both hangingwall and footwall units separate the dome interior from overlying Post-e-Badam unit. Structural data indicate that NE-SW stretching and tectonic unroofing contributed to dome formation. No Eocene ductile metamorphic overprint has been found in the hangingwall unit. $^{40}Ar/^{39}Ar$ mineral (amphibole, white mica, biotite) dating is ongoing for both hangingwall and footwall units as well as for phyllonites from the Chatak-Neybaz shear zone.

Locally, nearly unmetamorphic Eocene clastic and and volcanic rocks are exposed directly overlying the, and in tectonic contact with, cataclasites. These are often veined by numerous quartz veins. Further terrestrial basins filled with coarse-grained clastic sediments (Kerman Conglomerate) occur in some distance to the Chatak-Neybaz shear zone. These basins are considered to have formed at north-eastern margin within a halfgraben-type rollover structure due to NE-SW extension. The basin is filled by bad-sorted sandstone and conglomerate with clasts, which are derived from the denudating Posht-e-Badam complex in the hangingwall of exhuming Chapedony dome. We suggest that formation of these basins is a result of extension related to exhumation of the Chapedony metamorphic core complex and these basins represent, therefore, collapse basins.
The existence of the Eocene Chapedony metamorphic core complex with a migmatite core in its centre reveals the presence of melts and a high geothermal gradient in mid-crustal levels. The data, therefore, show that the Iranian plateau was affected by magmatic underplating and crustal extension similar to southern sectors of the Tibetan plateau. Consequently, similar plate tectonic processes might have formed structures in both regions.