

The thesis focuses on tectonics and petrology of the Shotur Kuh complex and it is subdivided into four chapters. The first chapter involves a brief summary of information on regional geology, metamorphism and geochronology from different basement units in Iran. Chapters 2 and 3 include results of my research work that are in print or submitted for publication to international journals, respectively. In general, these two chapters provide an interdisciplinary approach to the metamorphism and tectono-metamorphic evolution of the Shotur Kuh complex and emphasizing the related links between geochronology, metamorphic petrology, micro-structural and macro-structural analyses, and tectonics. The last chapter (4) is a summary of achieved results with their possible interpretation and some future directions of research in the basement units of Iran.

Consolidation of the Iranian basement units by metamorphism with partial granitization and partly intense folding occurred during Late Precambrian. This process continued during several major orogenic phases that were accompanied by syntectonic metamorphism and magmatic events. The most important orogenic events were during Paleozoic, Middle Triassic, Middle Jurassic, Late Jurassic and late Cretaceous periods. Some authors assume only epeirogenic movements during Paleozoic time. However available geologic and age data suggest occurrence of Variscan (300 ? 333 Ma) or/and Caledonian (375 - 400 Ma) deformation with questionable regional metamorphism. Several orogenic events accompanied with metamorphism have now been established during the Mesozoic period. The earliest Alpine events were apparently vigorous in some parts of the Iran, and they were accompanied by metamorphism.

Metamorphic basement rocks of the Shotur Kuh complex are exposed beneath the very-low-grade to unmetamorphosed Upper Jurassic-Eocene formations north of the Torud fault zone within the Great Kavir Block. The area is represented by a series of NE-SW (N60-70W) fault zones and the Shotur Kuh Complex is situated north of the Torud fault zone which was followed by Eocene volcanism. The rocks are represented by amphibolite facies orthogneisses (tonalite, granodiorite, and granite) with amphibolites and small amounts of metasediments-micaschists. Similar to other crystalline windows in Central Iran, the basement rocks have been assumed as pre-Cambrian metamorphic complex. Major- and trace-element geochemistry of metaigneous rocks in combination with U-Pb age dating in zircon showed a Neoproterozoic (547 ? 7 Ma) arc magmatism. Rocks of similar geochemical signatures and age are known in several localities from Saghand area? and Sanandaj? Sirjan region and they are assumed to be the result of the Neoproterozoic arc magmatic activities that? occurred due to closure of the Chapedony Ocean north from the Peri-Gondwanan terranes.

At least three metamorphic and four deformation events have been recognized in the Shotur Kuh complex. The first two metamorphic events occurred in epidote-amphibolite and amphibolite facies conditions. The metamorphic events are distinguished by the presence of two different compositional zonings in core (I) and rim (II) of garnet in metasediment (micaschist). Both core and rim garnet show prograde zoning with slight compositional change along their interfaces. PT conditions, calculated using isopleths of garnet I and II in pseudosection, indicate 520-570 °C at 4.5-5.5 kbar (first event) and 580 °C at 6.5 kbar (second event). The amphibolite facies mineral assemblages of the second event are plagioclase + biotite (+muscovite) + garnet + quartz in orthogneisses and in micaschists and amphibole + plagioclase + garnet in amphibolite. Kyanite was found only in some Al-rich amphibolite with gedrite. The orthogneisses and amphibolite show relatively higher temperature and pressure of 8 kbar and 650 °C that were obtained using various thermobarometric and pseudosection methods. Based on Ar-Ar age dating of muscovite from orthogneisses, the amphibolite facies metamorphism occurred during the Middle Jurassic period and related to the closure of the Neotethyan basin. The third metamorphic event, which affected also the

Permian and Mesozoic sequences, reached transition between upper greenschist facies and very low-grade metamorphic conditions.

The amphibolite facies metamorphic event was contemporaneous with the first deformation (D1) that led to development of amphibolite facies metamorphic foliation S1 defined by shape preferred orientation of biotite, muscovite and recrystallized quartz aggregates in micaschists and orthogneisses and of amphibole in amphibolite. The S1 fabric has been isoclinally folded, reactivated and/or completely transposed into a new penetrative mylonitic foliation S2. The S2 foliation, defined by shape preferred orientation of micas and quartz aggregates, develops in greenschist facies conditions. The S2 fabric shows various orientations reflecting the domal structure of metamorphic complex, and it bears subhorizontal NW-SE trending stretching lineation L2 defined by linear arrangement of micas and elongation of quartz aggregates. The L2 is subparallel to axes of isoclinal F2 folds. Subsequent deformation D3 is responsible for folding of S1 and S2 fabrics and results in the development of small to large-scale folds with subvertical NW-SE trending axial planes and subhorizontal axes. The latest ductile deformation D4 affects all previous fabrics and results in the development of crenulation cleavage and open folds with sub-vertical NE-SW trending axial planes and sub horizontal axes.

The new data obtained by this research for the Shotur Kuh complex well fit in geodynamic evolution of the Great Kavir block in the Central Iran. Available geochronological data show two maxima with high number of Cretaceous (60-130 Ma) and fewer frequent Upper to Middle Jurassic (155-165 Ma) ages of metamorphism for the Sanandaj Sirjan zone. In contrast, the Central Iran basement suffered mainly by Jurassic metamorphism that was due to closure of the Neotethyan ocean and related back-arc basins.