Petrology of gneiss from the Zarghan metamorphic complex (northwest of Sabzevar ophiolite zone, Iran)

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The Zarghan metamorphic complex is located southwest of the Sabzevar city in the Khorasan Razavi province, in northeast Iran. This metamorphic complex is related to the ophiolitic complex of Sabzevarand has an approximate northwest-southeast trend (Omrani *et al.*, 2014). It outcrops south of the village of Zarghan and north of the Nodeh village with a geographical location of 57º 4' to 57º 23' E longitude, and 36º 21' to 36º30' N latitude ("metamorphic domain" shown in green colour in Fig. 1, where the box shows the study area). This complex contains garnet amphibolites, metasandstones, gneisses, metapelites, impure marble and calc-silicate rocks. Although the gneisses are found in the metapelitic series, they are orthogneisses since some evidence of their magmatic origin has been observed during the field study. According to whole-rock geochemical analyses, plotted in the K_2O vs SiO_2 diagram (Koepke *et al.*, 2007) and in the triangularK_2O-SiO_2-TiO_2 diagram (France *et al.*, 2010), they show a plagiogranitic/tonalitic composition. Trace elements also show that these rocks have compositions close to those of plagioclase-quartz-bearing acidic and intermediate rocks from an arc/back-arc system. Petrographic characteristics, in particular the presence of relict pyroxene and garnet, indicate that they were first metamorphosed in high-grade conditions. During exhumation, the rocks were affected by medium-to low-grade metamorphism (amphibolite and greenschist facies), which resulted in the formation of amphibole, plagioclase, chlorite, muscovite, epidote and calcite. Mineral assemblages and trace-element data, combined with phase equilibria, suggest a decoupling of fluid release and trace-element release in the subducting slab. We suggest that the flux of trace elements from the slab is not simply linked to mineral breakdown, but resulted from complex fluid-rock interactions and fluid-assisted partial melting in the slab. The subduction zone in the northern margins of the Paleo-Tethys Ocean would have been at a sharp angle, with a deep melting zone. The exhumation of this part of the deep crust has exposed this terrane as a discontinuous band along the north Alborz margin.

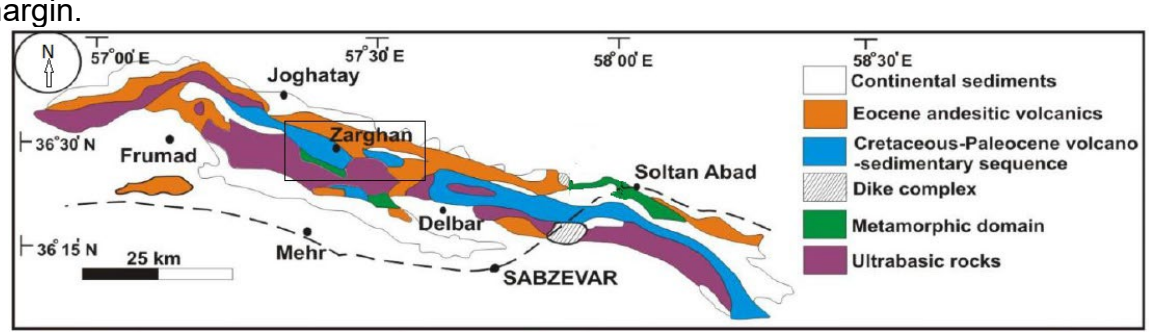

Figure 1- Geological map of Sabzevar ophiolite zone. Zargan metamorphic complex is in the box.

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