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Petrology of Eocene volcanic rocks of Moalleman Damghan area

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Abstract

The Moalleman area is situated to the south of Damghan City, in the central of Torud sheet (scale 1:250000). The area is part of central Iran structural zone.

The oldest and the youngest rocks units of the area include schists and limestone ascribed to Silurian and Devonian periods, and the fluvial terraces of Quaternary periods.

Most of the volcanic rocks of the area are respectively related to Lutetion stage till upper Eocene, and are exposed between the Torud Angilu faults. Following to the eruption of these rocks, during upper Eocene to Oligocene, subvolcanic cryptodomes, hypoabyssal plutons and several dikes have intruded into this volcanic sequence.

Igneous rocks of the study area may be classified into three main groups: Lavas, Pyroclastics and subvolcanic.

Lavas include basalts, andesite, dacitic andesites and quartztrachyandesite, Trachyandesites form the major volume of these volcanic rocks with in the study. Pyroclastic rocks mainly consist of cryptallic tuff (with an andesitic to trachyandesitic composition) and crystal tuff. (With an andesitic to dacitic composition).

The Major volume of volcanic rocks of study area have suffered alterations which gave rise to the formation of secondary minerals such as calcite, chlorite, sericite, epidote, serpentine, and iddingsite. It appears that the faults and fractures with in these rocks have facilitated the transition of hydrothermal solutions and the subsequent alteration.

Microscopic evidences of magmatic contamination in lavas include phenomena such as resorption, formations of sieve texture, and osciliatory zoning in plagioclases, corrosion of pyroxenes and plagioclases, and two types of altered and unaltered plagioclases concurrence.

According to the geochemical diagrams, the rocks of the study area of the alkaline and calc-alkaline types and have a tendency to potassium enrichment (probably related to contamination of their magma).

Geochemical evidences such as great scatter in the diagrams and showing no particular trend in some differentiation coefficient plots, spectially of the elements Hf, Th, and Zr, and also the similarity between spider diagrams of samples to the diagrams of amphibolites- gneiss facies (upper crust) are the cues to contamination of basaltic melts with upper crust.

It appears that during Eocene, due to a variety of factors, basaltic magma, while ascending to the surface, has been subjected to some variation and processes of partial crystallization and partal contamination (assimilation fractional crystallization process) resulted in the formation of the intermediate rocks.