

## Petrology of the Post-Collisional Dolerites, Basalts from the Javakheti Highland, South Georgia

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**Abstract :** The Neogene-Quaternary volcanic rocks of the Javakheti Highland are products of post-collisional continental magmatism and are related to divergent and convergent margins of Eurasian-Afroarabian lithospheric plates. The studied area constitutes an integral part of the volcanic province of Central South Georgia. Three cycles of volcanic activity are identified here: 1. Late Miocene-Early Pliocene, 2. Late Pliocene-Early /Middle/ Pleistocene and 3. Late Pleistocene. An intense basic dolerite magmatic activity occurred within the time span of the Late Pliocene and lasted until at least Late /Middle/ Pleistocene. The age of the volcanogenic and volcanogenic-sedimentary formation was dated by geomorphological, paleomagnetic, paleontological and geochronological methods /1.7-1.9 Ma/. The volcanic area of the Javakheti Highland contains multiple dolerite Plateaus: Akhalkalaki, Gomarethi, Dmanisi, and Tsalka. Petrographic observations of these doleritic rocks reveal fairly constant mineralogical composition: olivine /  $F_{0.7-1.9}$  /, plagioclase /  $Ab_{22.8} An_{75.9} Or_{1.3}$ ;  $Ab_{45.0-32.3} An_{52.9-62.3} Or_{2.1-5.4}$  /. The pyroxene is an augite and may exhibit a visible zoning: /  $Wo_{39.7-43.1} En_{43.5-45.2} Fs_{16.8-11.7}$  /. Opaque minerals /magnetite, titanomagnetite/ is abundant as inclusions within olivine and pyroxene crystals. The texture of dolerites exhibits intergranular, holocrystalline to ophitic to sub ophitic granular. Dolerites are most common vesicular rocks. Vesicles range in shape from spherical to elongated and in size from 0.5 mm to than 1.5-2 cm and makeup about 20-50 % of the volume. The dolerites have been subjected to considerable alteration. The secondary minerals in the geothermal field are: zeolite, calcite, chlorite, aragonite, clay-like mineral /dominated by smectites/ and iddingsite -like mineral; rare quartz and pumpellyite are present. These vesicles are filled by secondary minerals. In the chemistry, dolerites are the calc-alkalic transition to sub-alkaline with a predominance of  $Na_2O$  over  $K_2O$ . Chemical analyses indicate that dolerites of all plateaus of the Javakheti Highland have similar geochemical compositions, signifying that they were formed from the same magmatic source by crystallization of olivine basaltic magma which less differentiated /  $^{87}Sr / ^{86}Sr$  0.703920-0704195/. There is one argument, which is less convincing, according to which the dolerites/basalts of the Javakheti Highland are considered to be an activity of a mantle plume. Unfortunately, there does not exist reliable evidence to prove this. The petrochemical peculiarities and eruption nature of the dolerites of the Javakheti Plateau point against their plume origin. Nevertheless, it is not excluded that they influence the formation of dolerite producing primary basaltic magma.

**Keywords :** calc-alkalic, dolerite, Georgia, Javakheti Highland

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