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Late Cenozoic magmati and geodynamical evolution of the high Caucases, southern Russia: implications from the new geochemical and geophysical datasets

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In the north-central part of Caucasian orogenic belt in southern Russia, the key expressions of Miocene-Pliocene silicic to intermediate magmatism are represented by Chegem Caldera, Eldjurta granitoids and associated Tyrnyauz molybdenite camp, and Caucasian Mineral Waters (CMW) granitoid laccoliths. In this work, new geochemical and geophysical data for a representative set of plutonic and volcanic rocks of this magmatic suite test geodynamic hypothesis for the late Cenozoic evolution of this region.
Chegem caldera, a Pliocene (2.8 Ma[?]) resurgent ash-flow caldera complex, contains a compositionally diverse suite of igneous rocks exposed over ∼2 km in deeply dissected river drainages (Lipman et al. 1993). Due to extremely rugged field conditions, modern analytical characterisation has mostly lagged the most intense field descriptions, largely concentrated >25 years ago (Lipman et al. 1993, Gazis et al. 1995, 1996).
We compile existing geochemistry and add trace element profiles to Chegem units that are otherwise lacking that data, including the resurgent granodiorite pluton and the highest and hardest-to-access andesitic tuffs and lavas. These intermediate units overlie glacial deposits, which, in turn, cover stratigraphically lower dacite and rhyolite tuffs. Previously published ages for rhyo-dacitic sequence, post-glacial andesite, and resurgent granodiorite are indistinguishable within analytical precision at ∼2.8 Ma, but our preliminary magnetic polarity data is inconsistent with a short eruptive history for the whole caldera complex.
In Tyrnyaz, two young magmatic phases (potentially linked to molybdenite mineralization) include Eldjurta Granite dated at 1.90 Ma near the roof and at 1.56 Ma in the deepest parts of the core, and later rhyolite dykes. These two magmatic phases are petrographically very similar to some granitoid laccoliths in CMW region located ∼80 km northwards of Tyrnyauz magmatic field.
By comparing major and trace geochemical characteristics of the representative rock types from CMW area (syenites, granosyenites, amphibole granites and their derivative leucogranites) with those of Tyrnyauz and Chegem rocks, we assess the character of parental magma in these three systems, as well as the processes of magma ascent and emplacement.
In the Caucasian sector of the Alpine-Himalayan orogenic belt, the geodynamic evolution progresses from the late-subduction to slab and/or lithospheric delamination and early post-collisional tectonic regimes. Therefore, when considered in concert our new datasets can address large-scale issues on the magmatic response to an evolving geodynamic setting.