

Mineral Occurrences of the Eastern Greater Caucasus, Georgia

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The eastern part of the Caucasus orogen, termed the Georgian segment, is mainly underlain by highly deformed Lower-Middle Jurassic shales, sandstones, and volcanoclastic rocks, and is cut by numerous intrusive bodies of various compositions and sizes. All units contain a variety of mineral deposit types and their surrounding zones of hydrothermal alteration. Detailed geological and metallogenic research, after 30 years' stagnation, has led to important new information regarding the evolution of this region. Three main stages of magmatic activity are now clearly distinguished: the oldest magmatism comprises Early Jurassic events, related to extensional tectonism, with volcanism and subvolcanic plutonism that ranged from rhyolitic through dacitic and andesitic to basaltic. Additional extensional processes (in Bajocian time: 170–168 Ma) were characterized by the intrusion of a gabbro and diorite dike system into slightly older Jurassic formations. The final magmatic event was associated with Middle Jurassic (168–166 Ma) folding and uplift, during which multiphase diorite plutons were emplaced, as evidenced by fragments of silicified diabase dikes contained in younger magmatic rocks. Only a limited number of these plutonic bodies are cropping out, as they have yet to be widely exposed by erosion. These plutonic rocks are mainly composed of plagioclase, hornblende, quartz, epidote, chlorite, sulfide minerals (pyrite, chalcopyrite, pyrrhotite, sphalerite) and trace sphene, and zircon. The REE distribution patterns of these intrusives show that the main magmatic bodies underwent relatively little fractionation. However, in the exposed apical parts of these plutons, multiphase stocks which have average felsic compositions are found. Intense hydrothermal activity related to this latest felsic magmatism was responsible for important polymetallic mineralization, including more than 100 historically recognized outcropping occurrences of pyrite-pyrrhotite- and copper-polymetallic-dominant mineralized areas of various sizes; these include disseminations, veins, and massive sulfide bodies. A detailed study of 11 of the more significant of these occurrences has indicated anomalous concentrations of base metals as well as gold, thorium, yttrium, cobalt, cadmium, and bismuth. In addition, several new and potentially significant mineral occurrences were discovered, including two designated here as Gelia and Lechuri. New geological work, carried out by us, in the eastern Greater Caucasus segment, included a more detailed geological reconstruction of the region, defining magmatic and postmagmatic hydrothermal events and examining the mineral occurrences of the region. Analysis of the relevant data allowed us to make essential corrections to the preexisting geological understanding of the region, and, in particular, important new points on the regional metallogeny were demonstrated.

During geological field work, more than 200 samples for petrographic study and about 700 samples for geochemical analyses were collected. In addition, 12 samples of magmatic rocks were selected for isotopic (U-Pb method) dating.