Porphyry Cu and epithermal Au systems in Serbia and Macedonia. Sofia University SEG Student Chapter Field Trip – 2014

Су-порфирни и Au-епитермални системи в Сърбия и Македония. Екскурзия на студентската секция на Софийски Университет към Асоциацията по икономическа геология – 2014

Ivan Krumov, Zahari Nanov, Jana Kuncheva, Daniela Todorova, Stela Stoyanova, Simona Simeonova

Иван Крумов, Захари Нанов, Яна Кънчева, Даниела Тодорова, Стела Стоянова, Симона Симеонова

Sofia University “St. Kl. Ohridski”, Faculty of Geology and Geography, Department of Mineralogy, Petrology and Economic Geology, 15 Tsar Osvoboditel Blvd., 1504 Sofia, Bulgaria; E-mail: segsofia@gmail.com

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Sofia University SEG student chapter has organized a 5-day field trip to Serbia and Macedonia in November 2014. The main purpose of the trip was to introduce the students to various epithermal Au and Cu porphyry deposits and provide insights of their exploration geological features aiming at the mining history of the area. The field trip leader was assoc. prof. K. Bogdanov, Sofia University SEG Chapter Academic Adviser.

During the first two field trip days we visited 3 ore deposits located in the Bor district and hosted within the Timok magmatic complex (TMC). The complex has a lens-shaped form, that is about 85 km long and up to 25 km wide. It consists mainly of Turonian to Campanian andesites and trachyandesites (lavas, shallow intrusions and epiclastics), basaltic andesites, volcanoclastic and sedimentary rocks. The TMC volcanic series are transitional to calc-alkaline in composition. Kolb et al. (2013) demonstrate that they often have a geochemical signature similar to adakites, which are commonly associated with porphyry and epithermal Cu-Au ore deposits elsewhere in the world. Both western and eastern borders of the TMC are structurally controlled while its central and SE parts, Miocene clastic sediments unconformably overlie the Upper Cretaceous units.

The first day we visited Veliki Krivelj (RTB Bor) Cu-Au porphyry-epithermal system (Fig. 1) where Upper Cretaceous andesitic rocks host deeper parts porphyry Cu mineralization, which passes into a stockwork through to HS enargite and covellite rich massive sulphides, developed close to the palaeo-surface with 3 to 18% Cu. The estimated ore reserves are 650 Mt at 0.61% Cu, 0.25 g/t Au, 2 g/t Ag, 36 ppm Mo and 1.7% magnetite in the 0.3% Cu cut-off grade (Herrington et al., 1998).

Our next destination was Chukaru Peki project (Freeport-McMoran and Reservoir Minerals), located in Eastern Serbia approximately 5 km south of the town of Bor. The mineralization identified at the Cukaru Peki deposit belongs to the epithermal and porphyry Cu-Au types and is hosted in TMC. The project is part of Brestovac–Metovnica exploration permit. Chukaru Peki is concealed Cu-Au deposit covered by Miocene sedimentary rocks that unconformable overlie Upper Cretaceous andesite, volcanoclastic and sedimentary rocks. The best grades in the HS body are 291.2 Mt at 5.13% Cu and 3.4 g/t Au (Kozelj et al., 2014).

During the second day we visited Borsko Jezero property (Mundoro Capital). The license area is located 2 km west of the Bor Cu-Au porphyry-epithermal deposit. Geology of Borsko Jezero consists mainly of

Fig. 1. View of Veliki Krivelj open pit mine
pyroclastic rocks of the TVC. We had the opportunity to visit the core storage and to get acquainted with the deposit geology. The local geological staff introduced us the geophysical program, geological mapping, sampling and core-logging procedures that have been carried out during the exploration (Power-Fardy, Magaranov, 2013).

The third field trip day was devoted to the unique Jadar lithium-borate project (Rio Sava Exploration d.o.o./Rio Tinto Minerals). The deposit discovered in 2004 near the town of Loznica, around 100 km SW from Belgrade and is situated in the Jadar lacustrine sedimentary Neogene pull-apart basin. Estimated resources are 125.3 Mt at 1.8% Li₂O and 16.2 Mt B₂O₃. The new lithium-boron mineral (Fig. 2) jadarite LiNaB₃SiO₇(OH), that built up the main part of the deposit resources (Plessis et al., 2013) has been discovered in 2007. We had the chance to examine the core and see the unique association of borate minerals, such as colemanite, ulexite, jadarite, searlesite and ezcurrite.

During the fourth field trip day in Macedonia we visited the Plavica Project (Genesis Resources) that is related to the Kratovo–Zletovo volcanic complex. A series of NW- and NE-trending faults crosscut the structure, some of which host epithermal Au and Pb-Zn mineralization. Pervasive advanced argillic alteration in association with massive silica replacement bodies is a feature typical for the silica cap of Plavica. The HS vein-type and disseminated mineralization is dominated by pyrite, together with chalcopyrite, enargite, tennantite, galena and sphalerite. The mineralized zone at Plavica contains ~0.2% Cu, 0.3 g/t Au and 5 to 10 g/t Ag and extends over an area of 4 km² and is known to depths of >1000 m. The main mineralized body covers an area of close to 1 km² with vertical extent of ~200 m (Alderton, Serafimovski, 2007).

During the last field trip day we visited Ilovitza project (Euromax Resources). The porphyry system is about 1.5 km in diameter wide adjacent to a poorly exposed dacite-granodiorite plug, emplaced along the NE border of the NW elongate Strumitsa graben. Cu-Au-Mo porphyry mineralization occurs in advanced argillic altered Tertiary volcanic and Paleozoic basement rocks. The main sulphide mineral at Ilovitza is chalcopyrite, followed by pyrite and secondary copper sulphides, such as chalcocite, covellite and bornite. Measured and indicated resources are 237 Mt at 0.33g/t Au and 0.22% Cu containing 2.54 Moz Au and 1.1 Bn lb Cu (Davies et al., 2014).

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References