

Diversity of copper and gold deposits in the Eastern Europe Balkan, Carpathian and Rhodopean belts: tectonic, magmatic and geochronological investigations



SCOPES Project - Conference & Field Trip: Macedonia & Serbia

Organizers: A. von Quadt, T. Serafimovski, I. Peytcheva & V. Cvetkovic

May 29 - June 02, 2012 - Izgrev Hotel, Stip, Macedonia

Program, abstracts and field guide, edited by A. von Quadt & T. Serafimovski
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Content

- Participation list
- Program of the presentation – 31.05.2012
- Abstracts
- **Excursion** to the Cu-Au-PGE porphyry Elatsite (Bulgaria) – 29.05.2012
- Geographic map (Sofia – Elatsite)
- **Excursion** to the Tulare project (Dunav Resources LTD.) – 30.05.2012
- **Excursion** to Alshar mineralization (border region Macedonia – Greece) – 01.06.2012
- **Excursion** to Buchim porphyry deposit – 02.06.2012

Participant list of the workshop in Stip, May – June 2012

| | First name | Name | Institution |
|----|---------------|-----------------------|--|
| 1 | Todor | Serafimovski | University Goce Delcev, Stip |
| 2 | Goran | Tasev | University Goce Delcev, Stip |
| 3 | Dobriela | Rogozareva | University Goce Delcev, Stip |
| 4 | Aneta | Donkova-Petrushova | University Goce Delcev, Stip |
| 5 | Lazar | Georgiev | University Goce Delcev, Stip |
| 6 | Violeta | Stefanova | University Goce Delcev, Stip |
| 7 | Albrecht | von Quadt | ETH Zurich |
| 8 | Stephan | Lehmann | ETH Zurich |
| 9 | Joshua | Barcikowski | ETH Zurich |
| 10 | Daniela | Gallhofer | ETH Zurich |
| 11 | Milorad | Antic | Uni Basel |
| 12 | Stefan | Schmid | ETH Zurich |
| 13 | Nino | Seghedi | Romanian Academy-Institute of Geodynamics |
| 14 | Irena | Peytcheva | BAS - Geological Institute |
| 15 | Peter | Marchev | BAS - Geological Institute |
| 16 | Valentin | Grozdev | BAS - Geological Institute |
| 17 | Stoyan | Georgiev | BAS - Geological Institute |
| 18 | Elitsa | Stefanova | BAS - Geological Institute |
| 19 | Petyo | Filipov | BAS - Geological Institute |
| 20 | Rossitsa | Vassileva | BAS - Geological Institute |
| 21 | Zlatko | Peltekovski | University Goce Delcev, Stip |
| 22 | Atanas | Hikov | BAS - Geological Institute |
| 23 | Valdica | Cvetkovic | University Belgrade, Faculty of Mining and Geology |
| 24 | Aleksandar | Pacevski | University Belgrade, Faculty of Mining and Geology |
| 25 | Kristina | Saric | University Belgrade, Faculty of Mining and Geology |
| 26 | Suzanna | Eric | University Belgrade, Faculty of Mining and Geology |
| 27 | Miodrag | Banjesevic | |
| 28 | Masa | Radivojevic | University Belgrade, Faculty of Mining and Geology |
| 29 | Aleksandar | Miskovic | University of British Columbia, Vancouver |
| 30 | Craig | Hart | Department of Earth & Ocean Sciences |
| 31 | Bojan | Djordjevic | Avala Resources DOO |
| 32 | Sinisa | Glisic | Avala Resources DOO |
| 33 | Sibila | Borojevic Sostaric | University Zagreb |
| 34 | Dejan | Kozelj | South Danube Metals DOO Beograd |
| 35 | Stela | Anatasova | BAS |
| 36 | Bayram | Artun | Teck Cominco Limited |
| 37 | Daniela | Bombol | EurOmax Macedonia DOOEL Skopje |
| 38 | Mihaela-Elena | Cioaca | Geological Institute of Romania |
| 39 | Saygun | Keles | Teck Cominco Limited |

| | | | |
|----|--------------------|------------|--|
| 40 | Yassen | Khrishev | Empire Mining Corporation |
| 41 | Kemal | Kurcan | Teck Cominco Limited |
| 42 | Georgi | Magaranov | Mundoro Capital Inc |
| 43 | John | Menzies | Cmi Capital Limited |
| 44 | Marian | Munteanu | Geological Institute of Romania |
| 45 | Gligor | Saveski | Atlas Copco AB |
| 46 | Dechev | Teo | Mundoro Capital Inc |
| 47 | Vasil | Andreev | |
| 48 | Dorin | Dordea | PROSPECTIUNI SA |
| 49 | Veselin | Kovachev | University Sofia |
| 50 | Osman | Kurtulus | |
| 51 | Dimitar | Tsotsorkov | Asarel |
| 52 | Ahmet | Tukac | |
| 53 | Bahri | Yildiz | Stratex Madencilik San. Tic. Ltd. Şti |
| 54 | Trajca | Toncic | Mining and Metallurgical Company |
| 55 | Aleksandar | Pacevski | University Belgrade, Faculty of Mining and Geology |
| 56 | Nadka Bozhkova | Vasileva | Ellatzite Mine |
| 57 | Zheyazko Hristo | Yalamov | Ellatzite Mine |
| 58 | Aurelien | Rombaut | |
| 59 | | Driver | |

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May 29 - June 02, 2012

"Diversity of copper and gold deposits in the Eastern Europe Balkan, Carpathian and Rhodopean belts: tectonic, magmatic and geochronological investigations".

| Name | Title | Affiliation | |
|------------------------------|--|---|----------------------|
| 0 Albrecht von Quadt | Opening | ETH Zurich | 8.15 - 8.30 |
| Regional Geology | | | |
| 1 Stefan Schmid | Correlation of tectonic units from the Alps to Western Turkey | ETH Zurich | 8.30 - 9.00 |
| 2 Ioan Seghedi | Miocene-Quaternary basalts from East Carpathian volcanic chain, Romania: a mineral chemistry and melt inclusion study | Institute of Geodynamics of Romanian Academy, Bucharest | 9.00 - 9.30 |
| 3 Sibila Borojevic Sostaric | Oligocene shoshonitic rocks of the Rogozna Mts. (Central Balkan Peninsula): evidence of petrogenetic links to the formation of Pb-Zn-Ag ore deposits | Faculty of Mining Geology, Zagreb | 9.30 - 9.45 |
| 4 Kristina Saric | New LA-ICP-MS U/Pb zircon data on various granitoids from the European side of the Tethyan Mesozoic suture | Faculty of Mining and Geology, Belgrade | 9.45 - 10.00 |
| Regional Metallogeny | | | |
| 5 Todor Serafimovski | Major Alpine ore districts at the territory of the Republic of Macedonia | University "Goce Delcev"-Stip | 10.00 - 10.30 |
| 6 Daniela Gallhofer | Geodynamics, geochronology and Cu-Au hydrothermal ore provinces in the Banat region and Apuseni mountains | ETH Zurich, IGP | 10.30 - 11.00 |
| Coffee break | | | 11.00 - 11.30 |
| 7 Aleksandar Pacevski | Skarn mineralizations in the Bor ore district: new evidence from study of bornite-chalcocopyrite-hematite paragenesis | Faculty of Mining and Geology, Belgrade | 11.30 - 11.45 |
| Environmental Geology | | | |
| 8 Lazar Gjorgiev | Technogenous deposits and their environmental impact around the Buchim Mine | University "Goce Delcev"-Stip | 11.45 - 12.00 |
| 9 Aneta Donkova-Petrushova | Au-Ag tellurides and other mineral associations in the Ilovitza Cu-Au deposit | University "Goce Delcev"-Stip | 12.00 - 12.15 |
| 10 Dobriela Rogožareva | Some typical hydrothermal alterations in the Ilovitza Cu-deposit | University "Goce Delcev"-Stip | 12.15 - 12.30 |
| Lunch | | | 12.30 - 14.00 |
| Deposit Studies | | | |
| 11 Elitsa Stefanova | Ilovitza porphyry Cu-Au deposit: sequence of vein formation and sulfide deposition | BAS, Geological Institute, Sofia | 14.00 - 14.15 |
| 12 Zlatko Peltekovski | Principle metallogenic features of the Sasa Pb-Zn deposit, Republic of Macedonia | University "Goce Delcev"-Stip | 14.15 - 14.30 |
| 13 Goran Tasev | New data of fluid inclusions study of the Kadiica deposit, Republic of Macedonia | University "Goce Delcev"-Stip | 14.30 - 14.45 |
| 14 Violeta Stefanova | Placer gold prospecting around the Tertiary occurrences in the Republic of Macedonia | University "Goce Delcev"-Stip | 14.45 - 15.00 |
| 15 Rossitza Vassileva | Compositional characteristics of sulphide mineralization from the hydrothermal Madan Pb-Zn deposits: a LA-ICP-MS study | BAS, Geological Institute, Sofia | 15.00 - 15.15 |

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|------------------|---------------------|--|----------------------------------|----------------------|
| 16 | Atanas Hikov | Rare earth element mobility during advanced argillic alteration in Assarel porphyry copper deposit, Central Srednogie, Bulgaria | Elatsite Mine | 15.15 - 15.30 |
| Magmatism | | | | |
| 16 | Joshua Barcikowski | Magmatic evolution of the Buchim-Damjan-Borov Dol ore district - Petrology-geochemistry | ETH Zurich | 15.30 - 15.45 |
| 17 | Stephan Lehmann | Magmatic evolution of the Buchim-Damjan-Borov Dol ore district- Geochronology-source material | ETH Zurich | 15.45 -16.00 |
| | Coffee break | | | 16.00 - 16.30 |
| | Milorad Antic | More than 500 Ma of magmatic and tectonic evolution of the Serbo-Macedonian Massif (south Serbia, southwest Bulgaria and east Macedonia) | University of Basel | |
| 18 | Stela Atanasova | Magma Interaction Recorded in Amphiboles from Vitosha pluton, Western Srednogie, Bulgaria” | BAS, Geological Institute, Sofia | 16.30 - 16.45 |
| 19 | Petyo Filipov | Preliminary Data on the Age and Geochemistry of Mesta Volcanic Complex and Central Pirin Pluton | BAS, Geological Institute, Sofia | 16.45 - 17.00 |
| 20 | Stoyan Georgiev | Transect through the Cenozoic magmatism in WSW Bulgaria and Macedonia from Pirin Mountain to Kozhuf: temporal and isotope-geochemistry constraints | BAS, Geological Institute, Sofia | 17.00 - 17.15 |
| 21 | Valentin Grozdev | U-Pb zircon dating and zircon population analyses of the Paleogene magmatic rocks in Kyustendil and Kratovo area. | BAS, Geological Institute, Sofia | 17.15 - 17.30 |
| 22 | | | | 17.30 - 17.45 |

More than 500 Ma of magmatic and tectonic evolution of the Serbo-Macedonian Massif (south Serbia, southwest Bulgaria and east Macedonia)

M. Antić¹, I. Peytcheva², A. von Quadt³, A. Kounov¹, B. Trivić⁴, T. Serafimovski⁵, G. Tasev⁵, and I. Gerdjikov⁶

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The Serbo-Macedonian Massif (SMM) represents a complex crystalline terrane situated between the two diverging branches of the Eastern Mediterranean Alpine orogenic system, the northeast-vergent Carpatho-Balkanides and the southwest-vergent Dinarides and the Hellenides. It can be followed from the Pannonian basin in the north, to the Aegean Sea in the south, along the central and southeastern Serbia, southwestern Bulgaria, eastern Macedonia and southern Greece. It's affiliation to European and/or African plate basement is still questionable due to the lack of reliable geochronological data and a detailed structural investigation. The SMM is the key area for understanding the bipolarity of the Alpine orogenic system, as well as the interaction of the Pannonian and Aegean back-arc extension during the Cenozoic time.

The SMM is generally considered to comprise an Upper (low-grade) and a Lower (medium to high-grade) unit (Dimitrijević, 1959). The protoliths of both units are reported as volcano-sedimentary successions, which have been later intruded by igneous rocks during several magmatic pulses. On our mission to discern the main magmatic episodes and the geodynamic evolution of the SMM we have analysed zircon grains of metamorphic rocks from both units, as well as undeformed igneous rocks. LA-ICP-MS analyses were carried out on zircon grains in order to obtain the protolith ages and geochemical analyses were carried out on the total of nineteen samples from different magmatic rocks.

Our first results reveal the presence of a Permo-Triassic (253±13 Ma) magmatic pulse in the Serbian part of the SMM; additionally, the Ordovician – Silurian (496-416 Ma) and the Ediacaran - early Cambrian (Cadomian ; 595-504 Ma) event complete the Pre-Mesozoic magmatic evolution in the Serbian part of the SMM. The new geochronological constraints, together with the field relationships, allowed us to conclude: a) The Lower SMM consists of a Cadomian (Ediacaran-early Cambrian) volcano-sedimentary sequences and magmatics, which were intruded by Ordovician magmatic rocks; b) The Upper SMM (Vlasina and Morava unit) contains a volcano-sedimentary sequence, which is intruded by the Cadomian magmatic rocks; c) In contrast to the Lower complex, no Ordovician age magmatics were documented in the Upper unit, and d) The Upper SMM is covered by Silurian-Devonian sedimentary sequence.

The youngest magmatic event in the SMM occurred in the late Eocene, it is related to the intrusion of Surdulica granodiorite and subsequent latitic volcanism.

Zircon fission track analysis together with apatite data modelling revealed two distinct cooling events. Late middle-Cretaceous rapid cooling through zircon and apatite closure temperature (300°-60°C) is detected along the lower complex of the SMM. To the east along the Vlasina Complex the rocks have probably followed the same late Cretaceous cooling whereas later they have been heated to the temperatures higher than 120°C (apatite closure temperature) during the Eocene - early Oligocene magmatic activities. The second cooling event in the Cenozoic was related to the formation of the Crnook-Osogovo-Lisets dome and the later, post magmatic, extensional phases.

References:

Dimitrijević, M. D, 1959, Osnovne karakteristike stuba Srpsko-makedonske mase, (Basic characteristics of the column of the Serbo-Macedonian Mass), First symposium of the SGD, Abstracts.