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**III KONGRES GEOLOGA
BOSNE I HERCEGOVINE
SA MEĐUNARODNIM UČEŠĆEM**



**GEOLOGIJA - OBRAZOVNI SISTEM I ASOCIJACIJE
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CEEPUS NETWORK CIII-RS-0038: MORE THAN TWO DECADES OF SUPPORTING CURRENT EDUCATIONAL AND SCIENTIFIC TRENDS IN GEOSCIENCES

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Key words: student and teacher mobility, Alpine-Carpathian-Balkan-Dinaride geological realm, fundamental and applied geology

Abstract

The CEEPUS network CIII-RS-0038 “Earth-Science Studies in Central and South-Eastern Europe (acronym: EURO Geo-Sci)” is one of the oldest active networks within the CEEPUS program, which has been continuously awarded for 24 years. It is dedicated to the development of both fundamental and applied geosciences by creating a unique educational system among universities belonging to the Central and South-Eastern Alpine-Dinaride-Carpathian-Balkanide geological region. So far, the performance of student and teacher mobilities, as the most significant activity of the Network, has involved 19 participating units (faculties) from 11 countries; it resulted in more than 1500 awarded exchanges and about 20 successfully defended MSc and PhD theses in the frame of Joint Supervision programs. With respect to traditional topics and learning modes, EURO Geo-Sci continuously incorporates new knowledge, modern analytical methods and up-to-date learning approaches (e.g. online lectures and consultations) into the educational system.



It helps the participating units to readily respond to many societal challenges, such as the protection of critical infrastructure and water resources, solving environmental problems, or searching for new geo-sources.

1. Introduction

Nowadays geology and the whole geosciences evolve into one of the scientific disciplines that are deeply involved in multidisciplinary research and applications. This is greatly enhanced due to the growing needs of the modern society, which all have a 'geo' significance, such as the preservation of water resources, problems of climate crisis and environmental pollution (air, soil and water), the quest for new and sustainable sources of energy, the lack of new mineral raw materials as, e.g., needed for the energy transition, the exploitation problems of the existing resources. The importance of geology is also reflected in the civil fight against geological hazards and risks (e.g., earthquakes, tsunamis, landslides, volcanic eruptions and others; see Cvetković, ed., 2019; Šarić et al., 2022). In addition to all of the mentioned above, geology also has a special place in preservation of cultural heritage and geotourism research (see Vitezović et al., eds., 2020).

Such high demands of our society made it clear that there is a large necessity to further develop geological education in a group of countries that are geographically related and share common societal interests. The CEEPUS (Central European Exchange Program for Studies) network no. CIII-RS-0038 entitled "Earth-Science Studies in Central and South-Eastern Europe (acronym EURO Geo-Sci) has been established following this idea. Its main aim is to work on the development of higher education systems in the field of geosciences in Central and South-Eastern Europe, more precisely in the geologically unique and simultaneously extremely heterogeneous and complex Alpine-Dinaride-Carpathian-Balkanide geological realm. Instead of focusing on one restricted geological area, the Network chooses to focus on the geology of a much wider orogenic belt that underwent similar geological evolution and therefore shares many similar characteristics and common interests. In this way, by reinforcing basic geological disciplines through a systematic approach (from fieldwork that involves collecting samples and field data by a geological hammer and a geological compass to the acquisition and interpretation of modern analytical data using most sophisticated instruments) (Figure 1-c), EURO Geo-Sci contributes to the education in both fundamental and the applied geological disciplines for providing our society with training experts who are ready to respond to all professional challenges.

This paper first briefly explains what the CEEPUS program is, and then describes how the EURO Geo-Sci network operates through several segments. The reader can learn more about the Network history, the area that is covered by the cooperation, the aim and the mission as well as about the mobility of students and teachers, which is the most important activity within EURO Geo-Sci. Illustrations of EURO Geo-Sci activities can also be found at <https://ceepus.rgf.bg.ac.rs/>.



2. What is the CEEPUS program?

Central European Exchange Program for University Studies - CEEPUS is a program of student and teacher mobility within the Central European universities. Along with Austria, the program's founder country, there are other participating members: Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Moldavia, Montenegro, North Macedonia, Poland, Romania, Slovakia, Slovenia, Serbia and Universities of Priština, Prizren and Peć from Kosovo (<https://www.ceepus.info/content/about>). As it is reported by Šarić (2022), "the main aims of the program are the improvements of education standards in geosciences through academic mobility of students and teachers within the Central and partly within the Southern European region. The mobility involves short and semestral courses, issuing of common diplomas and recognition of ECTS acquired during the outgoing visits, all with the general aim at establishing a common European Higher Education Area".



Figure 1. Complex geological research and education start in the field with collecting samples, field observations and measurements and continue in modern instrumental laboratories; a – Prof. Bernhard Fügenschuh (University of Innsbruck, Austria) gives field lectures to students from Serbia; b – field work with a student group (Katarina Raičević from University of Belgrade, Serbia, with students and professors from Eötvös Lorand University Budapest, Hungary); c – BSc student Filip Rajković from University of Belgrade (Serbia) is preparing samples for further analyses for his mobility stay at University of Salzburg (Austria) in school year 2023/24.

2. CIII-RS-0038: EURO Geo-Sci network

2.1. Brief history of EURO Geo-Sci

EURO Geo-Sci network (CIII-RS-0038: „Earth-Science Studies in Central and South-Eastern Europe”) is one of the oldest CEEPUS networks, established back in 1999 by Prof. Volker Höck (Paris Lodron University of Salzburg, Austria), who was the first network coordinator. About ten years later, the Network coordination was taken over by Prof. Corina Ionescu (Babeş-Bolyai University Cluj-Napoca, Romania). Dedicated and enthusiastic efforts of these two pioneer coordinators have resulted in the creation of a stable and active Network ready to follow new trends in geology and to accommodate with many difficulties that can endanger its mission.



In 2019, Prof. Kristina Šarić (University of Belgrade, Serbia), as the third and the actual Network coordinator, took an advantage to continue with this rich tradition but at the same time she faced with unexpected challenges (her first coordination school year 2019/'20 was a pandemic year with lockdowns) and new directions of the Network development (active incorporation of the awarded mobilities into activities of current scientific programs, e.g. Recon Tethys project, stronger cooperation with geological and mining companies, free access to the Scientific Webinar sessions organised by University of Wroclaw - Institute of Geological Sciences to all EURO Geo-Sci participating units etc). This common enterprise has involved all the local coordinators of participating units and resulted in continuously awarded applications for all 24 years of the Network existence. At the moment, the Network has 19 participating units from eleven countries, which are gathered in a Network consortium represented by the local coordinators (one teacher from each participating unit), who accepted a voluntary engagement and continuous work during whole academic years.

2.2. The EURO Geo-Sci mission, area and participating units

As it can be seen from the description of EURO Geo-Sci: “the Network aims at improving the quality of teaching and training in fundamental and applied geosciences within the unique Alpine-Dinaride-Carpathian-Balkanide geological realm. The main expected outcomes are: a) diversification of teaching topics and methods, b) strengthening geo-interdisciplinarity, c) increasing the scientific contribution through improved learning and teaching standards, d) contributing to the overall development of geosciences in the region, and e) providing measurable contribution in many societally relevant aspects: e.g., environmental problems (air, water and soil pollution), water and ore resources, geo-hazards (landsliding, floods), preservation of cultural heritage. This makes the EURO Geo-Sci network a perfect mode of multidisciplinary cooperation in education and research in this region”.

The number of participating units is flexible and depends on the actual interest of new faculties to join the Network or on possible resigns of inactive participating units (Šarić & Ionescu, 2018; https://ceepus.rgf.bg.ac.rs/?page_id=39). With very small variations, the number of the participating units continuously has steadily increased from the foundation of the Network until today, proving that the Network received substantial recognition from geological educational entities of Central and South-Eastern Europe.

At the moment, the Network consists of 19 faculties from 11 countries: Albania (Polytechnic University of Tirana), Austria (Universities of Innsbruck, Salzburg, Vienna and Montanuniversitaet Leoben), Bosnia and Herzegovina (University of Tuzla), Croatia (two faculties from University of Zagreb), Czech Republic (University of Brno), Hungary (Eötvös Lorand University Budapest), Poland (Universities of Wroclaw, Silesia in Katowice and Jagiellonian University Cracow), Romania (Babeş-Bolyai University Cluj-Napoca and Alexandru Ioan Cuza University Iași), Slovakia (Comenius University Bratislava and



Technical University Košice), Slovenia (University of Ljubljana) and Serbia (University of Belgrade) (https://ceepus.rgf.bg.ac.rs/?page_id=39). This covers almost 85% of the surface of the whole CEEPUS area (Figure 2a, b). The Network is pleased to announce that for the application 2023/24 two new units joined the Network: University of Tuzla, Faculty of Mining, Geology and Civil Engineering (Bosnia and Herzegovina) and University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering (Croatia) (Figure 3a-c).

2.3 Main activities within EURO Geo-Sci

Main activities within the Network are dedicated to student and teacher mobilities through which continuous improvement of the learning process in geosciences is realized (Figure 3d-f). Students staying at host universities are attending theoretical and practical courses with special emphasis on subjects that are absent from the curriculum of their home faculties. The mobility of teachers includes the holding of courses, but also individual work with students of all study levels (BSc, MSc and PhD students). Teachers are also involved in the so-called Joint Supervision programs, which encompass the guidance of students through their preparation of BSc, MSc or PhD theses by two teachers (from their own and the visiting institution). The wide range of geological disciplines covered by the EURO Geo-Sci network program comprises activities that can be illustrated through the following description: from the geological hammer to excited electrons and from field descriptions to the prediction of geological events (volcanic eruptions, landslides, earthquakes). This actually means that we start with field measurements and sample collections, then continue with laboratory preparation of the collected samples up to the application of a large number of the most modern instrumental methods, such as digital polarisation microscopy and scanning electron microscopy with energy-dispersive and wave-length spectrometry, electron back scattered diffraction technique, cathodoluminescence analysis, freezing-heating stage in fluid-inclusion studies, thermochronological methods, porosity-permeability lab instruments, numerical modelling techniques, and many others, as well as professional softwares (example from University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering: <https://www.rgn.unizg.hr/hr/software>).

Apart from performing the awarded mobilities, other important Network activities are annual meetings of the local coordinators, consultations with all interested groups and potential stakeholders (Figure 3g-i) and dissemination and outreach tasks of EURO Geo-Sci (Figure 3j-l).

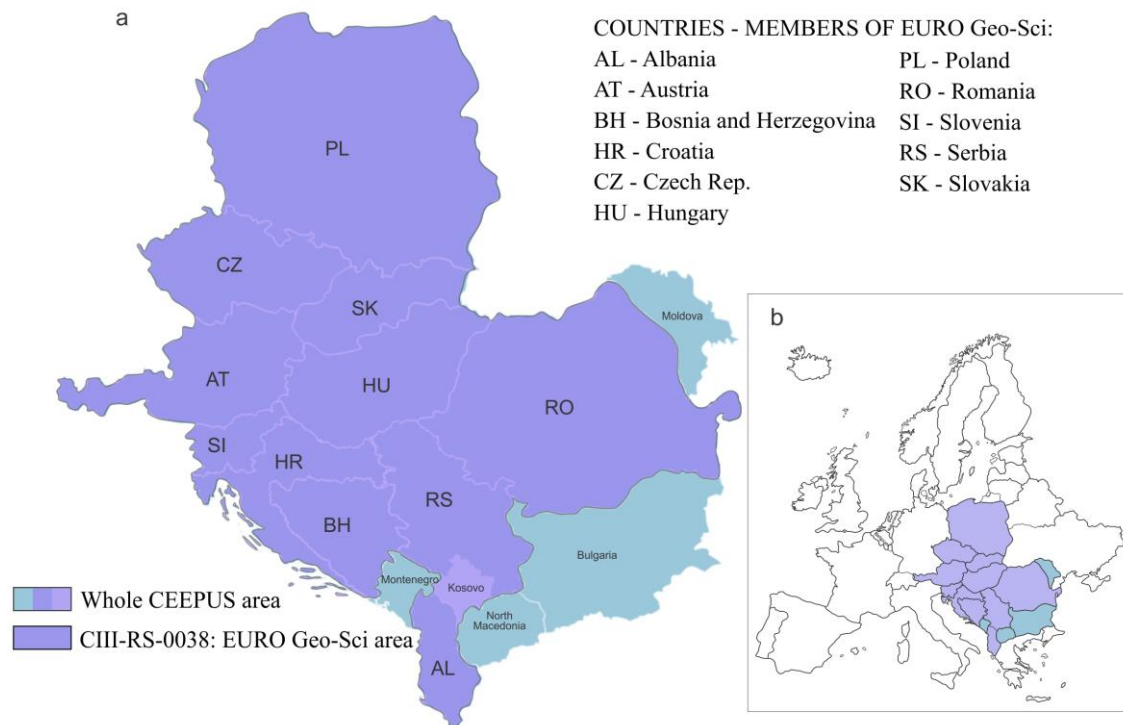


Figure 2. a - the map of the entire CEEPUS area with countries that participate to EURO Geo-Sci network (modified from <https://www.ceepus.info/content/about>), b - position of the CEEPUS area in Europe.

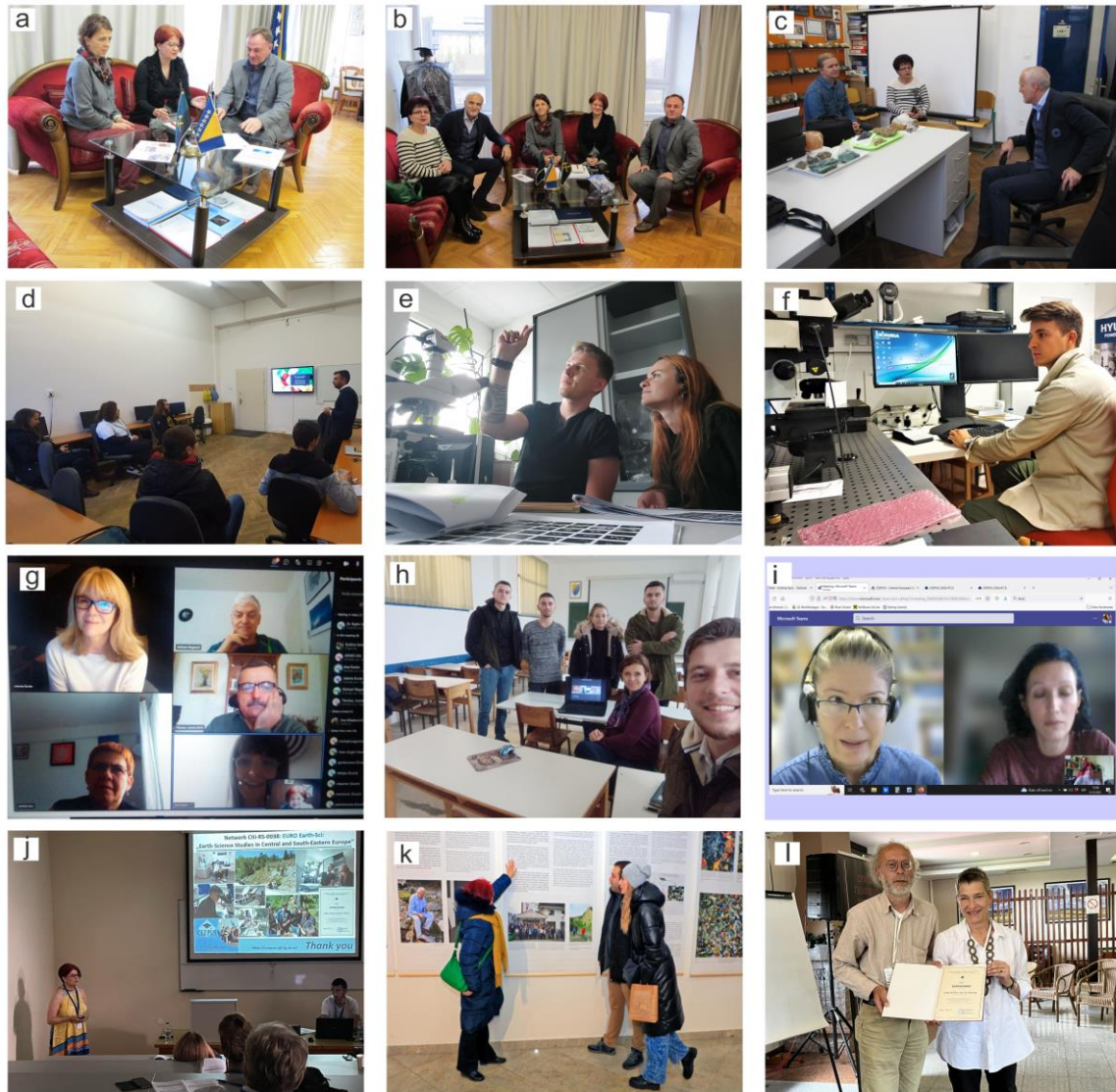


Figure 3. Some of the activities performed within the EURO Geo-Sci network: a-c - visit of Prof. Kristina Šarić, Network coordinator and academician Prof. Vladica Cvetković, former local coordinator from University of Belgrade - Faculty to Mining and Geology (UB-FMG) to Tuzla, consultations with colleagues from the University of Tuzla - Faculty of Mining, Geology and Civil Engineering (Prof. Kemal Gutić - dean, Prof. Elvir Babajić - local coordinator, Prof. Rejhana Dervišević, Prof. Zehra Salkić), preparations and signing the CEEPUS documents: Letter of Intent and Letter of Endorsement; d-f - mobilities as the main Network activity: d - lectures of Prof. Jatón Pekmezi from Polytechnic University of Tirana given at the Technical University in Košice (Slovakia), e - PhD student Adam Wierzbicki from the Jagiellonian University in Krakow (Poland) during his visit to University of Vienna (Austria); f - PhD student Stefan Petrović from UB-FMG (Serbia) during his visit to Montanuniversitaet of Leoben (Austria); g-i - communication and consultations: g - annual online meeting, h - consultations with students from University of Tuzla - Faculty of Mining, Geology and Civil Engineering, i - consultations with local coordinator Prof. Sibila Borojević Šoštarić from University of Zagreb - Faculty of Mining, Geology and Petroleum Engineering and Ms Tanja Veljak from National CEEPUS Office (Croatia); j-l - dissemination activities: j - presentation of the EURO Geo-Sci by the Network coordinator Prof. Kristina Šarić at XXII International Congress of the Carpathian-Balkan Geological Association (2022, Plovdiv, Bulgaria), k - promotion of EURO Geo-Sci in Serbia within the exhibition entitled: „Illuminating rocks – scientific & artistic journey through the rocks and 150 years of cooperation between Austria and Serbia in the field of geology“ (author: Network coordinator Kristina Šarić, co-operators are Adrein Fiex, cultural attaché of the embassy of Rep. of Austria in Serbia, Hans-Jürgen Gawlick, professor from Montanuniversitaet Leoben; supported by Austrian Cultural Forum Belgrade and UB-FMG. l - Prof. Hans-Jürgen Gawlick (Montanuniversitaet Leoben, Austria) awarded by the certificate of appreciation Prof. Biljana Abolmasov (dean, UB-FMG) for his contribution to the CEEPUS network from UB-FMG (Serbia) at XVIII Serbian Geological Congress (2022, Divčibare, Serbia).



It is also worth noting that student and faculty staff mobilities are often used for establishing and developing new research methods at corresponding institutions. Some recent examples include the visits of PhD student Stefan Petrović and Dr. Miloš Velojić to Leoben, who received training in studying fluid inclusions (heating/freezing stage) and brought newly acquired knowledge back to their home institution (University of Belgrade – Faculty of Mining and Geology) (Šarić, 2022).

2.4. Challenges and future

Such a long-lasting network is continuously faced with challenges imposed by various circumstances. As Borojević Šoštarić and Šarić (2023, in press) reported, the challenges can be divided into internal (e.g., outdated curricula of some programs, the lack of innovative content, the inactivity of some local coordinators, local university administrative loads) and external (e.g., the presence of other networks which offer higher financial support for the applicants, effects of demographic trends and regional brain drain processes, pandemics, unstable political situations, negative public perceptions of the geological-mining sector due to environmental and political activism).

Identifying challenges and recognizing new needs and circumstances that can affect both geological sciences and society are some of the most important guidelines for maintaining the Network performances in the future. The close involvement of active students and young enthusiastic researchers in their early post-doc phase in the Network guarantees a dynamic momentum to face such challenges and to constantly grow and adapt to the great societal challenges associated with geosciences. Care about the future of the Network is also marked by cooperation with other complementary networks within CEEPUS as well as by the recognition of the quality of EURO Geo-Sci by other institutions, such as for instance European Federation of Geologists (EFG). Namely, Network coordinator Prof. Kristina Šarić and Ms. Maria Tzima, coordinator of the EFG Panel of Experts and Education, are designing the way by which EURO Geo-Sci can contribute to the academic platform that is currently being established by EFG. Moreover, the planned cooperation between EURO Geo-Sci and EFG is fully approved and supported by Mr. Michael Schedl, secretary general, from Central CEEPUS office.

3. Conclusion

The CEEPUS network CIII-RS-0038 "Earth-Science Studies in Central and South-Eastern Europe (acronym: EURO Geo-Sci)" focussed on improving education and research in the field of fundamental and applied sciences, consists of 19 faculties (participating units) from 11 countries. In its duration of 24 years, the Network has continuously followed current trends in geology and applied new achievements in geological education and research. The Network value can be easily measured through multiple successfully defended MSc and PhD theses done within Joint Supervision programs, through cross-institutional assistance and technical expertise for establishing new methods and modernizing laboratories, as well as in holding numerous courses outside the existing curriculum at visiting participating units.



Particular importance is related to activities that contribute to better visibility of the Network for both the academic community and public sector in each participating country. This is especially true when dealing with the sustainable exploration of mineral resources, the study and protection of water resources, problems of environmental pollution, the prediction of geological hazards and risks, and with many other societal relevant aspects and challenges. The future of EURO Geo-Sci, regardless of the importance of education and research in the field of geology, will also depend on the enthusiasm and commitment of the local coordinators, the help of relevant ministries and other institutions, as well as on the ability to respond to unpredictable challenges.

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References

1. Borojević Šošćarić, S. & Šarić, K., (2023): CEEPUS Network CIII-RS-0038: recognition of challenges in geological education in South-Eastern Europe and prompt responds. 7th Croatian Geological Congress, Poreč, Croatia, in press.
2. Cvetković, V., (ed), (2019): Geohazard in Serbia in the 21st Century – Knowledge is the best bastion against the natural disasters. Serbian Academy of Sciences and Arts, Lecture series 5, 129 pp. ISBN 978-86-7025-844-0.
3. <https://ceepus.rgf.bg.ac.rs/>
4. https://ceepus.rgf.bg.ac.rs/?page_id=39
5. <https://www.ceepus.info/content/about>
6. <https://www.rgn.unizg.hr/hr/software>
7. Šarić, K., (2022): CEEPUS network CIII-RS-0038 at the Faculty of Mining and Geology, University of Belgrade: more than twenty years of contribution to student and teacher mobility. XVIII Serbian Geological Congress "Geology solves the problems", June 1-4, 2022, Divčibare, 228-229.
8. Šarić, K., Fociro, A., Wagreeich, M., Ortner, H., von Hagke; C., Gawlick, H-J., Gerlšová, E., Tibljaš, D., Kazmer, M., Bujtor, L., Burda, J., Machanec, E., Trojanowska Olichwer, A., Gál, Á, Tibuleac, P., Gale, L., Fridrichová, J., Duriška. I. (2022): CEEPUS network CIII-RS-0038: improving geological education to better serving the society. In: Eds: I. Peytcheva, A. Lazarova, G. Granchovski, R. Ivanova, I. Lakova, L. Metodiev, XXII International Congress of the Carpathian-Balkan Geological Association, 7–11 September 2022, Plovdiv, Bulgaria, *Geologica Balcanica*, 250 p.
9. Šarić, K. & Ionescu, C., (2018): The CEEPUS network “Earth-Science Studies in Central and South-Eastern Europe” – nineteen years of challenges and success. XXI International Congress of the Carpathian Balkan Geological Association (CBGA), Salzburg, September 10-13, 2018, (Eds): Franz Neubauer, Uwe Brendel & Gertrude Friedl, *Geologica Balcanica*, Abstract Volume, 388 p.
10. Vitezović, S., Šarić, K., Antonović, D., (eds), 2020: Current Interdisciplinary Studies in Technology in the Archaeology of the South-East Europe. First meeting of the Section for Archaeometry, Archaeotechnology, Geoarchaeology and Experimental Archaeology. Conference proceedings, Belgrade, February 28th 2020, Serbian Archaeological Society. ISBN 978-86-80094-10-6.