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Prof. Dr. habil. Eng. Mihai Emilian Popa

Prof. Dr. Eng. Cristian Mărunțeanu

Prof. Dr. Eng. Daniel Scrădeanu

Programme

Authors	Title	Schedule
Mihai Emilian Popa, Cristian Mărunțeanu, Daniel Scrădeanu	Opening remarks	12.00 – 12.10
Maria-Mădălina Bucur, Florin Nache	Applicability of digital photogrammetry in geological studies	12.10 – 12.30
Gabriela Mariana Dragomir	Geotechnical characteristics of marls from Râmnicu Vâlcea and Ditrău areas, Romania. Comparative study	12.30 – 12.50
Andrei Gabriel Dragoș	Photogrammetry and ground penetrating radar studies at two archaeological sites located in southern Dobrudja	12.50 – 13.10
Luchiana Faur, Ionuț- Cornel Mirea, Răzvan Arghir, Alexandru Petculescu, Silviu Constantin, Barbara Soare	Clays and associated minerals from Muierilor cave, Southern Carpathians: implications for karst evolution	13.10 – 13.30
Maria Doina Ghiran, Mihai Emilian Popa	Identification of macerals and maturity from Lower Miocene source rocks of the south - central part of the Getic Depression, Romania	13.30 – 13.50
Cătălina Ghiță, Daniel Scrădeanu, Elena Dumitrescu, Andreea Vladimirescu	Simulation – risk of mobile components migration from a crude oil accidental spill through vadose zone	13.50 – 14.10
Oliver Livanov	Magnetometry research in the south-western part of the Noviodunum archaeological site, Isaccea, Tulcea county	14.10 – 14.30

Cornel Păunescu, Valentin Mihalcea	Determination of errors and accuracy for measuring distances with total stations in an external geodesic base	14.30 – 14.50
Roxana Pirnea, Alexandru Gabriel Călin, Mihai Emilian Popa	The “whole-plant” concept applied to Late Oligocene gymnosperms of the Petroșani Basin, Romania	14.50 – 15.10
Adrian Popa, Mihai Emilian Popa	High resolution habitat mapping of Reyna study area	13.10 – 13.30
Torcărescu Bogdan-Alexandru, Haiduc Bogdan Stelian, Vasile Ștefan	Marine and terrestrial mammals from the Upper Neogene deposits in the vicinity of Botoșani city – preliminary report	13.30 – 13.50
Eugen Tudor, Ioan Munteanu, Victor Avram	Uncovering the pre-Miocene “heritage” the Carpathians obliterated in their rise	14.30 – 14.40
Mihai Emilian Popa, Cristian Mărunțeanu, Daniel Scrădeanu	Concluding remarks	14.40 – 15.00

GEODOCT 2021: ABSTRACTS

APPLICABILITY OF DIGITAL PHOTOGRAMMETRY IN GEOLOGICAL STUDIES

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Keywords: UAV (Unmanned Aerial Vehicle), Ceahlau nappe, Point cloud, digital terrain model

The purpose of this study is to perform a spatial analysis of 2 geological perimeters, which are difficult to access, using alternative methods. These 2 perimeters are located on the eastern side of the Bucegi Mountains. From a geological point of view those are formed by flysch deposits, which are part of the Ceahlau nappe (Sinaia formation). A multirotor drone was used for this study which has an airborne GNSS (Global Navigation Satellite System) receiver, the GNSS solution being improved based on real-time kinematic corrections (RTK) provided by another GNSS receiver, installed on the ground. The captured images were processed using the Agisoft Metashape program, obtaining a final set of photogrammetric data (point cloud, digital terrain model, TIN - Triangulated Irregular Network 3D model with texture, digital orthophotomap). The photogrammetric method can be used as a preliminary step for geological studies because it can take various information (thickness, orientation, monitoring changes over time, identification of risk areas, etc.) without coming into direct contact with the study area.

GEOTECHNICAL CHARACTERISTICS OF MARLS FROM RÂMNICU VÂLCEA AND DITRĂU AREAS, ROMANIA. COMPARATIVE STUDY

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Keywords: Marls, carbonate content, plasticity, clays, geotechnical behavior

Marly soil and marlstone can cause problems when they are used as foundation terrains for roads and embankments. Marlstone consists of clay and calcium carbonate and, depending on the percentage of the components, marls can be classified. The main objective of the paper is to identify the marls that can be used or will be used as the foundation for roads, to determine their behavior while they are both in their natural state, and after they were exposed to weather conditions (swelling caused by weather change, shrinks), and the effect of clay-carbonate content. The paper evaluates the geotechnical properties of marls in Râmnicu Vâlcea and Ditrău area, using laboratory tests. 54 samples from the study area were obtained and were tested using particle size distribution, Atterberg limits, carbonate content, index parameters. The tests were used to determine the samples' composition of clay or calcium carbonate particles, and how this composition influences their characteristics. Based on the test conducted on the samples from the two areas, we determined that not only cohesive soil can be rich in calcium carbonate, but also sandy or silty soils. The mean value of CaCO₃ was 11.32% for Râmnicu Vâlcea area, while for Ditrău was 12.32%. Regarding the plasticity of the samples, we had a mean value of 54.35 % for w_L, and 37.73% for I_p, meaning that the rocks plasticity in the two areas varies from low to medium. From the geotechnical point of view, it is important to conclude to what extent the marls behavior depends on the percentage of clay and calcium carbonate, and how the plasticity of the samples changes with the increase of CaCO₃.

PHOTOGRAMMETRY AND GROUND PENETRATING RADAR STUDIES AT TWO ARCHAEOLOGICAL SITES LOCATED IN SOUTHERN DOBRUDJA

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Keywords: GPR, orthophoto, non-destructive, radargrams, aerial photographs

Geophysical methods used in archaeology are largely adapted from those used in mineral exploration, engineering, and geology. Most of them are non-destructive, cost-effective, and more efficient when surveying large areas and the main objective of these methods is to identify and establish subsurface anomalies that could represent buried bodies of archaeological interest. In addition, photogrammetry is the means of measuring and interpreting photographic images (acquired via UAVs) and representing them through detailed 2D and 3D models. In this presentation, the effectiveness and complementary character of GPR and magnetic photogrammetric surveys are demonstrated at two archaeological ancient roman sites (two fortresses located in Dobrudja, Constanța, and Tulcea Counties). The two surveyed fortresses (Altenum and Dinogetia) are characterized by differences in soil conditions and hypothesized archaeological features. With the GPR method, a high-resolution

data acquisition was adopted with the aim of reconstructing the location, depth, and shape of the archaeological structures in the selected areas. Signal processing and the time-slice representation techniques were used for the analysis of the collected data. Aerial photography was also done with the aim of reconstructing the georeferenced 2D and 3D models of one of these ancient fortresses. The GPR studies were conducted with 2 antennas (250 MHz and 500 MHz), aiming in identifying archaeological anomalies in order to assist archaeologists in an excavation program and one of the more relevant GPR perimeters was also photographed via a DJI UAV system. The GPR results indicated geophysical anomalies characterized by hyperbolic reflections. These anomalies were confirmed by archaeologists and excavation programs will follow, according to their future financial possibilities, through the digging of test units, allowing the identification of anthropogenic features such as ancient walls, foundations, remnants of civil structures, and several objects and artifacts (numerous portions of walls, amphorae and, other household objects). The purpose of this presentation is to demonstrate the accuracy with which GPR and photogrammetric data can be matched to excavation data and the improvement it offers in target definition. Besides these, several examples of cases in which GPR prospecting was not successful are shown along with the causes and parameters that triggered excess noise on the resulted sections and radargrams and incoherent, or unclear, data.

CLAYS AND ASSOCIATED MINERALS FROM MUIERILOR CAVE, SOUTHERN CARPATHIANS: IMPLICATIONS FOR KARST EVOLUTION

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Keywords: Muierilor Cave, clay minerals, K-Ar, sediments, speleogenesis.

Cave sediments are one of the most studied components of karst settings in relation with speleogenesis, outlining development stages of cave passages that can be related to paleoclimate pulses. Moreover, the sedimentary outcrops within cave passages hold a wide range of components, both autochthonous and allogenic ones. Clays that are found in caves are mostly related to surface stream transported sediments and soils, thereby their study can yield valuable data about the provenance area of detrital deposits, the paleohydrology of karstic systems and even on the paleoenvironmental conditions that took place at the surface. In this research, we analyzed the clay mineralogical association of sediments from Muierilor Cave (Southern Carpathians) in order to determine the provenance of clastic deposits. Specimens were collected from three different passages located in the lower level of the cave, and investigated by X-ray diffractometry, and dated using the K-Ar method. Clays occurring in substantial amounts in all samples are illite, smectite, and mixed-layered minerals. Other clay minerals present are vermiculite, chlorite, and kaolinite with associated phases represented by quartz and feldspars. The K-Ar ages of illite-smectite structures indicate that all studied clays were formed between 95.6 Ma and 128.1 Ma, during the Cretaceous. The

mineralogical variations and the age differences obtained suggests that at a certain time in the evolution of the cave, sediments from the Bears Passage were provided from a different source area compared to those from Hades and Electricians passages.

IDENTIFICATION OF MACERALS AND MATURITY FROM LOWER MIOCENE SOURCE ROCKS OF THE SOUTH - CENTRAL PART OF THE GETIC DEPRESSION, ROMANIA

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Keywords: maturity, Late Burdigalian, random reflectance, rank, alginite.

Identification of macerals, identification of rank, of thermal maturity and of types of kerogen from Lower Miocene source rocks of the Getic Depression were subjects less investigated until now. Reflected light microscopy, in conjunction with fluorescent light microscopy are used to identify the Thermal Alteration Indices (TAI), and vitrinite reflectance ($R_0\%$) as thermal maturity indicators for the Early and Late Burdigalian deposits of the central-southern area of the Getic Depression. Two distinct, marine sedimentation cycles were separated. Along a complex structure, marked by Socu, Grădiște, Colțești, Hurezani, Măru, Vladimir, Logrești, Colibași, Pârâieni, Budieni, Târgu Jiu, Prigoria, Rădinești localities, Burdigalian sediments were zoned biostratigraphically together with the Biostratigraphy Laboratory - OMV-ICPT Campina. The Lower Burdigalian includes sandstones (locally conglomeratic), shales and marls, in 2-10 m thick beds, with rare thin anhydrite interlayers and with a single salt layer. The content of organic matter varies highly, TOC% values ranging between 0,04-0,12-0,26-0,36-0,45-0,79 wt%, suggesting poor to fair hydrocarbon generation potential. The organic matter is thermally mature and next to the top of the oil generation zone, with the mean random reflectance of vitrinite ranging ($R_0\%$) between 0,76% - 0,80% and 0,93% - 1,13%, with values of temperatures T_{max} between 430°C - 503°C. The samples contain abundant concentrated vitrinite fragments, associated with inertinite, nests or dispersed siderite, framboidal pyrite and fields with iron oxide. The Upper Burdigalian was early marked by a marine phase, and to the upper part, the effects of a strongly water freshening phase are recorded. The water freshening was related to a strong water supply from the continent, decreasing the salinity and setting the conditions for a brackish fauna. The Upper Burdigalian organic matter is immature, with mean values of vitrinite reflectance ($R_0\%$) between 0,36% - 0,48% with $T_{max} < 435^{\circ}C$, next to very early mature samples with the mean $R_0\%$ between 0,50% - 0,55% with T_{max} between 433°C - 436°C. The organic matter includes abundant liptinite with yellow fluorescence, often brighter, fluorescent phytoplanktonic algae and local resinite, cutinite, and sporinite. The TOC content varies between 0,26 wt% - 0,32wt% - 0,41wt% - 0,52wt% - 0,69% - 0,71wt% - 0,87wt% - 1,08wt% - 2,79 wt% suggesting fair to good hydrocarbon generation potential.

SIMULATION – RISK OF MOBILE COMPONENTS MIGRATION FROM A CRUDE OIL ACCIDENTAL SPILL THROUGH VADOSE ZONE

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Keywords: TPH -total petroleum hydrocarbons, BTEX – Benzene, Toluene, Ethylbenzene, Xylene, VOC's – Volatile Organic Compounds

Starting from a typical accidental spill of crude oil on the soil surface, the simulation of mobile components (BTEX&Cl) migration through vadose zone was integrated in hydrogeological risk assessment. What is the risk of migration of hydrocarbon mixtures components existent in a crude oil, through unsaturated zone? The mobile hydrocarbons components (VOC's type BTEX) from a typical oil composition, migrate more rapidly through unsaturated zone than TPH (petroleum residue). The study considers the uncertainties posed by risk assessment of ground water contamination in case of an oil spill, in accord with maximum thresholds imposed by environmental legislation for ground water. To simulate the migration of pollutants through unsaturated zone, in case of accidental oil spill on top soil, UnSat Suite Plus – SESOIL Module was used, a one-dimensional vertical level transport model. In case of an accidental spill of crude oil on soil and an existent unsaturated area between the surface contaminated soil zone and groundwater level, the SESOIL model can be applied to determine whether current soil contamination levels can impact groundwater in the future. For simulation of groundwater contamination risk, the most mobile and toxic components VOC's or BTEX associated with TPH in the composition of crude oil, and also Chloride the main component of reservoir water, were considered. Simulations were carried out over various time periods (20-45 years), migration through the vadose zone being influenced by different physico-chemical characteristics. Similar data for medium characteristics of unsaturated area (sandy loam clay, thickness 10 m) were used. A light crude oil (Romanian type) as the worst case (Benzene 0,6 % gr; Toluene 1,7% gr; Ethylbenzene 0,2%; Xylenes 3,4%), different flows of contaminant were calculated per unit area, based on presumptive concentrations of soil TPH (0,2% to 0,1%). In hypothetical case of soil pollution with crude oil, the risk of groundwater contamination by infiltrations of mobile toxic BTEX components, from the soil surface through vadose zone is extremely low.

Conclusions. If the contaminant is present in high concentrations but has low mobility (e.g. TPH) then it will not reach the top of the saturated area (underground water) even under long simulations (decades). If the contaminant is present in low concentrations having high level toxicity (e.g. BTEX), then even if the contaminant reaches the groundwater, the concentration in the leachate at the bottom of the unsaturated area is not sufficient to create an impact on groundwater at levels exceeding the limits imposed by quality standards. Under these aspects, the existing soil contamination is not a danger to groundwater pollution.

MAGNETOMETRY RESEARCH IN THE SOUTH-WESTERN PART OF THE NOVIODUNUM ARCHAEOLOGICAL SITE, ISACCEA, TULCEA COUNTY

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Keywords: Magnetometry, Archaeology, Noviodunum

Located on the border between Roman civilization and "barbarian tribes", the fortress of Noviodunum gained important strategic significance during time. Due to its strategic location, the fortress will be designated as "*municipium*" in the Roman Era and will be one of the most important military, economic and cultural center in Scythia Minor. In addition to the fortress itself, the adjacent areas played an increased role in the development of the region. Here, daily life was different from the military standard of living, specific to the fortress garrison. Outside the protective walls, spiritual, social, economic, or cultural-related activities flourished, examples in this regard being the numerous necropolises, civil settlements, and manufacturing areas that can be found today in the extra-mural region. Through magnetometry measurements carried out in the summer of 2021, an attempt was made to highlight the archaeological importance of the adjacent areas of the fortress by outlining ancient structures such as tombs, kilns, or walls. The map of the vertical magnetic gradient resulting from the processing of data collected from the field highlighted a few archaeological anomalies. A slightly negative 70m x 5-6m rectangular anomaly was outlined in the Western part of the surveyed perimeter, which is interpreted as an ancient road, most likely made of local limestone, which explains the negative magnetic anomaly. Next to the road, a circular bipolar anomaly was outlined, and considering its shape and size, it appears to be the magnetic signature of a major kiln. Two bipolar anomalies are present in the vicinity of this kiln, smaller in size, possibly minor kilns. Judging by this interpretation, it can be concluded that an ancient manufacturing area has been revealed. This new insight has determined the proposal of future extensive geophysical studies to determine the spread of this recently discovered area of archaeological importance.

DETERMINATION OF ERRORS AND ACCURACY FOR MEASURING DISTANCES WITH TOTAL STATIONS IN AN EXTERNAL GEODESIC BASE

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Keywords: total station, error, measurement, distance, accuracy

The purpose of this paper was to continue a case study conducted in 2014 on measuring distances with multi-function geodetic devices-Total stations. In that study, the standard deviations in terms of measuring distances with Total Stations, technology over a distance of more than 2 km were analyzed, making a direct comparison between them and measuring distances in the laboratory environment within a certified geodetic bases, but on a much smaller field, namely 50 m. The main objective was

to determine by measurements the maximum errors and measurement accuracies of each type of device in determining the lengths of a geodetic base created in the field. In this case study it was not intended in any way to promote one type of device to the detriment of the other. The basic idea was to find a simple and efficient method of determining the lengths of an external geodetic base and to highlight what measurement errors may occur in the case of each device. Distance measurements were performed on the range of 0 - 2150 m in two directions, back and forth using three geodetic devices with multiple functions (total stations). The points where the measurements were made were plotted using appropriate instruments. Basically, we wanted to show the influence of atmospheric parameters on the quality of measurement results and obtaining relevant results. A number of 20 points were marked on an alignment on the edge of DJ184B within the Ghermănești locality, Snagov commune. This is the connecting road between the locality mentioned above and the A3 Bucharest-Ploiești highway. The way to measure the distances between the alignment points was the direct way to measure in both directions, back and forth. A comparison of the measurement error between the two modes was performed. Also, this case study involves the analysis of the distance measurement errors making a direct comparison between the errors measured by the 3 total stations in regarding the measurement of the distances along the entire length of this geodetic base with total stations. It was desired to find methods to compensate for measurement errors determined during the measurement process.

THE “WHOLE-PLANT” CONCEPT APPLIED TO LATE OLIGOCENE GYMNOSPERMS OF THE PETROȘANI BASIN, ROMANIA

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Keywords: Whole-Plant Concept, Petroșani Basin, Oligocene, gymnosperm.

The main goal of Paleobotany is to understand the evolution of plants in time and space, however their reconstruction is strongly complicated due to the fragmentary nature of fossil plants. The ‘Whole-Plant’ Concept aims to study the relationships among the detached fossil plant organs, which have been extremely rarely found in anatomic connection. The concept does not necessarily imply that graphic reconstructions of ancient plants but aims at the possible association of plant organs as components of a single ‘whole plant’ to help making better taxonomic inferences. We applied the ‘Whole-Plant’ Concept to the late Oligocene macroflora of the Petroșani Basin, with focus on silicified wood fragments. So far, the most frequent type of fossil wood throughout the basin is gymnospermous wood, characterized by its tracheids, axial parenchyma and typical cross-sections. The typical traits revealed in thin section point to the Family Cupressaceae, which is also the group with the most abundant foliage representatives. The revision of the fossil material and the linking of fossil woods fragments with fossil leaves and reproductive structure is a step forward to the reconstruction of the fossil terrestrial flora.

HIGH RESOLUTION HABITAT MAPPING OF REYNA STUDY AREA

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Keywords: Black Sea, Romanian Coastal Area, Habitat Mapping

The Romanian coastal area and the Romanian Black Sea shelf contain the most diverse habitats for both organisms and sediments of the Romanian aquatory, particularly affected by numerous stress factors, such as natural (erosion) or anthropogenic (pollution, fishing, tourism) factors. In 2016, NIRD GeoEcoMar started the first project regarding the habitat mapping of these areas. Funded by Ministry of Research, Innovation and Digitization, the project is included in the National Core Program Framework. Supplementary areas were studied each year, especially in Sites of Community Importance of the Natura 2000 Network. In 2020 an area of 1.1 square km close to Constanța City was surveyed, and a complex biological and sedimentological study was performed by a complex team including geophysicists, geologists and biologists. This area was chosen as it contains a more diverse habitat for both fauna and sediments. Performed with a small boat, the study included bathymetry and backscatter measurements performed with a Norbit iWBMSH Multibeam Echosounder, Cee-Line Single Beam Echosounder and Klein L3900 Sidescan Sonar. The total length of measurements surpassed 65 km along 56 survey lines. The data processing was undertaken with Hypack Suite Software, as both a bathymetry map and a backscatter mosaic were obtained, for deciding the locations for direct sampling. The direct sampling was undertaken with a Van Veen Grab and in situ by scuba divers for both sedimentological and biological data. The biological samples were washed, sorted and preserved in the field and further analyzed in the lab. Grains size analysis of sediments samples was undertaken using diffractometry-sieving combined method, while sediments were classified using the Folk diagram. After integrating bathymetry, backscatter, sedimentological and biological samples, a habitats map was produced using Global Mapper and ArcGIS software. Habitats were classified using the EUNIS 2019 scheme, while the identified species were checked with the World Register of Marine Species (<http://www.marinespecies.org>).

MARINE AND TERRESTRIAL MAMMALS FROM THE UPPER NEOGENE DEPOSITS IN THE VICINITY OF BOTOȘANI CITY – PRELIMINARY REPORT

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Keywords: mammals, Upper Neogene, Moldavian Platform, Romania.

Moldavia is one of the regions of Romania where fossil remains of vertebrates, marine and continental, were found, with numerous authors describing an important number of fossiliferous sites of varying geological ages. The Upper Neogene sedimentary deposits cropping out near the city of Botoșani that represent the object of study in this work have yielded numerous postcranial and dental fossil remains. The peculiarity of this site is represented by the fact that both marine and continental mammal fossils have been found in the reddish conglomerate deposits present in the studied area. The marine vertebrate fossil material, belonging to cetaceans and pinnipeds, is only represented by postcranial elements, such as vertebrae and a distal tibial fragment. On the other hand, the continental vertebrate fossils remains belonging to artiodactyls and perissodactyls are represented by both dental and postcranial elements. The marine mammal remains are significantly more dense and mineralized, whereas the continental vertebrate remains are lighter, porous, and less mineralized. Furthermore, the taxonomical affinities identified indicate the presence of Miocene marine mammals alongside Pliocene-to-Pleistocene continental vertebrate remains. Since both types of mammal remains, marine and continental, were found in the same deposits, we can conclude that the marine mammal remains were reworked from older marine deposits into the younger continental ones. Additional analyses to assess the age of the deposits at this new site are planned.

UNCOVERING THE PRE-MIOCENE “HERITAGE” THE CARPATHIANS OBLITERATED IN THEIR RISE

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Keywords: subcrop, PreNeogene unconformity, Moesia, Bârlad Depression, Nord Dobrogea Orogen

Foreland basins are dependent on two key parts, a „moving part” (the fold and thrust belt) and a relatively „stationary part” (the pre-existing basins). Throughout the study area multiple wells drilled the pre-Miocene stratigraphy from multiple basins (East European Platform, Bârlad Depression, Nord Dobrogea Promontory, East Moesian Platform) and each basin had a different response for the Eward advancing Carpathians. The older and colder the plates, the rigid they responded to the advancement of the nappes and a new pre-foreland setup was established through creation of multiple depocenters across the basin. The pre-existing topography played an important role for foreland geometry and fill. Main findings show that the Northern foreland didn’t advance too far away as the East European Platform broke apart on long N-S fault zones rather than flexing and creating too much accommodation space for the Miocene fill. Further to the South we observe that the nappes had more space to advance, and this seems to be related to the Bârlad Depression response, as weaker plate flexing easily under the load and generating a rapid subsiding foreland basin. This area shows the highest subsidence rate for the Sarmatian section (Bacau area). Further to the South as the Carpathians hit the toughest block, the Nord Dobrogea Promontory (made up of Palaeozoic sediments and metamorphic basement rocks), the advancement of the thrust belt found advancing to the East as difficult as it can possibly be, thus the weakest link in the area (East Moesia), started flexing and creating large accommodation space starting with Sarmatian and through time until Romanian-Quaternary times.