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Dedicated to Acad. Theodor Neagu: 90 years since his birth

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### Chairmen:

Prof. Dr. habil. Eng. Mihai Emilian Popa;

Prof. Dr. Eng. Cristian Mărunțeanu;

Dr. Eng. Marin Palcu.

### PROGRAMME

Authors	Title	Schedule
Cristian Mărunțeanu	Opening remarks	10.00-10.05
Mihai Emilian Popa	Acad. Theodor Neagu: 90 years since his birth	10.05-10.15
Ovidiu Eugen Avram	Geoelectric research in the Stejaru Valley area, Fărcașa village, Neamț County	10.15-10.30
Amansia Chirulescu, Dumitru Ioane	Seismic tomography and its applicability in crustal and lithospheric studies	10.30-10.45
Cristian Cudalbu, Eliza Anton, Constantin Lazăr	Analysis of the most popular libraries and platforms that can be used to create a model for the intelligent recognition of microfossils	10.45-11.00
Gabriela Mariana Dragomir	Using the empirical method to determine permeability and characteristic values on marls and clay from Pașcani and Valea Doftana area - case of study	11.00-11.15
Andreea Aurelia Iojă	Modeling contaminant transfer in the vadose zone - Siret - Trotuș - Fântânele interfluve	11.15-11.30
Break		11.30-11.45
Oliver Livanov	2021-2022 magnetometry field campaign results in Noviodunum area	11.45-12.00

Andreea Mârza-Ene, Liviu Mațenco, Ioan Munteanu, Bernhard Fügenschuh	Preliminary observations of structural deformations in the Boclugăa - Megina series, North Dobrogea Orogen	12.00-12.15
Cornel Păunescu, Valentin Mihalcea, Vlad Păunescu	Are the new technologies really new?	12.15-12.30
Valentin Nistor, Liviu Matenco, Ioan Munteanu	Towards defining the kinematic mechanism of break-thrust folds in the external East Carpathians	12.30-12.45
Ioana-Lavinia Niță, Cornel Păunescu, Bogdan Mihai Niculescu	Electrical surveys for investigating the gradual saltwater intrusion in freshwater aquifers in the southern Romanian Black Sea coastline	12.45-13.00
Adrian Popa, Mihai Emilian Popa	Mapping of physical habitats offshore Mangalia (Romania) using automatic discrimination methods	13.15-13.30
Adrian Tălmăciu, Bogdan Mihai Niculescu	Processing and interpretation of 2D geoelectrical data and their integration with other geophysical data	13.30-13.45
Bogdan-Alexandru Torcărescu	Neogene cetaceans from the collections of the National Geological Museum	13.45-14.00
Daniel Ungureanu	Two new sponge ( <i>Porifera</i> ) species in Middle Oxfordian of Cekirgea Valley, Central Dobrogea	14.00-14.15
Cristian Mărunțeanu, Mihai Emilian Popa, Marin Palcu	Concluding remarks	14.15-14.30

## ABSTRACTS

### GEOELECTRIC RESEARCH IN THE STEJARU VALLEY AREA, FĂRCAȘA VILLAGE, NEAMȚ COUNTY

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Keywords: landslides, geophysical measurements, slopeflow, resistivity.

The geophysical investigations in the affected area have been carried out due to the occurrence of instability phenomena caused by torrential rains that destabilized the terrain on the slopes of the Stejaru Valley, with destructive effects on the houses of that area. These landslides and slopeflow, combined with the upstream alluvium overflow by the Farcasa river, completed the picture of a naturally calamity area.

Resistivity measurements have been made on 4 transversal profiles (ST1, ST4, ST5 and ST6) and 2 longitudinal profiles (STL1 and SL2), in Valea Stejaru, representing the most affected areas by instability phenomena and showed that the Schlumberger array produces the most suggestive images of the resistivity distribution in vertical section.

A total of 6 geophysical profiles (alignments) have been executed, with lengths between 64 and 128 m, a total of 576 m of geophysical profiles in a longitudinal section perpendicular to the valley direction - NW-SE and in a cross section in the direction of the flow of the valley towardsdownstream, NE-SW, with different methods (Schlumberger, dipole-dipole, wenner). The position of each measurement point (SEV) was recorded by GPS and transposed on the map. The final results are presented by inverted resistivity sections.

These measurements represent the basis for the landslide hazard map, which is synonymous with the map of instability landslide or the potential for landslides. The landslide hazard map represents a situation plan, at a conveniently chosen scale, corresponding to a land surface, divided into polygons

characterized by the same degree of landslide instability. The landslide hazard map has a qualitative value and is realized based on the interaction of several factors that through their combined action can influence the equilibrium state of the slopes.

In conclusion, the need for a research to identify and assess the risk of erosion processes is of great importance, because only by quantifying the risk measures and ways to prevent and combat erosion processes can be developed. Also, the purpose of the research is the monitoring of degraded lands, with priority of those affected by landslides, due to natural factors, in order to establish strategies for the elimination of economic, social and ecological consequences.

## **SEISMIC TOMOGRAPHY AND ITS APPLICABILITY IN CRUSTAL AND LITHOSPHERIC STUDIES**

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Seismic tomography is a novel geophysical technique designed to investigate deep continental crustal and lithospheric geological structures, as well as important inhomogeneities of the inner Earth.

When applied at regional or continental scales the main input into the specialized software is represented by recorded remote earthquakes during tens of years in seismological observatories. In regions with low seismicity recorded explosions in seismic refraction or military experiments are also employed. For smaller areas, such as the Vrancea seismic zone, portable seismographs are deployed for a limited time interval.

To compute the velocity anomalies, either positive or negative, the processed dataset is related to a model describing the seismic velocity variations with increasing depth, the velocity model being representative for the studied region.

The color code for the seismic tomography velocity anomalies are as follows: Blue for higher values of seismic velocity anomaly; Red for the lower values of seismic velocity anomaly.

The best deep geological structures nicely illustrated in seismic tomography sections are the subduction zones, the subducted oceanic lithosphere being shown as an inclined blue structure toward depths of hundreds of km. Other regional scale blue colored structures, meaning high density and high velocity rocks, are old cratons and deep zones where subducted lithosphere was and still is accumulated, at depths between 400 and 700 km. Red colored deep geological structures, meaning lower density and seismic velocity, may be represented by not “frozen” magma chambers and deep sedimentary basins.

## **ANALYSIS OF THE MOST POPULAR LIBRARIES AND PLATFORMS THAT CAN BE USED TO CREATE A MODEL FOR THE INTELLIGENT RECOGNITION OF MICROFOSSILS**

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Key words: machine learning, image recognition, microfossils.

This paper presents an analysis of the most common software tools (libraries and platforms) used in the field on AI image processing by building deep learning models. The most useful characteristics for each tool are analyzed for providing a suitable candidate for a deep learning model in the field of intelligent image recognition for microfossils. Microfossils are a heterogeneous group of fossils, studied in micropaleontology. These, unlike other types of fossils, are not grouped according to phylogenetic relationships but based on their generally small size (micron to centimeter).

The identification and classification of microfossils is the main direction of study in the field of micropaleontology. Conventionally, paleontologists qualitatively identify and classify microfossils based on morphological features, by studying micron-sized organisms, i.e., calcareous nannofossils, diatoms and radiolarians, or microfossils, such as foraminifers and ostracods, under an optical or electron microscope. These traditional methods are time consuming and require considerable expertise due to the large number and high diversity of microfossils.

In recent years, machine learning and especially deep learning have led to excellent results in the classification of microfossils. A deep learning method can implement the “end-to-end” classification procedure, which is more objective and not limited to one type of fossil. Machine learning models and algorithms can help us quickly and easily implement specific image processing functionalities. However, building a personalized machine learning model or a basic neural network requires a lot of resources and a high level of technological expertise. With the help of open-source tools, libraries and frameworks that exist and are presented herein, one can choose to implement in their own software model the best solution for the intelligent automatic recognition of microfossil images.

## **USING THE EMPIRICAL METHOD TO DETERMINE PERMEABILITY AND CHARACTERISTIC VALUES ON MARLS AND CLAY FROM PASCANI AND VALEA DOFTANA AREA- CASE OF STUDY**

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Keywords: marl, Pascani, Doftana, clay, empirical.

The two investigated areas are Pascani and Valea Doftanei. From a tectonic and geological point of view, the two areas have experienced a separate evolution, but for this paper we are interested in the identified sedimentary formations, respectively clays, marly clays and marls. For sector 4 from Pascani, 38 geotechnical boreholes were executed, with depths varying from 6 m to 30 m. Comparatively, for Valea Doftanei, 17 boreholes were executed, both mechanized and manual, with a maximum depth of 30 m. In both areas, the formations of interest were identified between 10 and 30 m, the percentages of calcium carbonate being between 5.1 and 32.3 %. There were performed laboratory tests to identify and classify the geotechnical properties of soils in the area. Based on the geotechnical parameters obtained from laboratory and field tests (SPT), and geo-engineering knowledge, for the whole route, but especially for the works of art, the permeabilities and characteristic calculation values were determined empirically, according to NP122. The tests performed in the laboratory according to the current standards, correlated with the visual description of the samples and the field tests, highlighted differences between the two investigated areas, differences related to the geo-mechanical behavior of the samples. It was found that samples with a similar percentage of fractions, but with a varied percentage of calcium carbonate, behave differently in the case of Atterberg tests or have permeability values with large differences. Empirical methods are not used on a large scale in geotechnics, considering that permeability can be determined classically in the laboratory. But if we think about the financial part of a large project like a highway, it is more profitable to use the empirical method.

## **MODELING CONTAMINANT TRANSFER IN THE VADOSE ZONE - SIRET-TROTUȘ-FÂNTÂNELE INTERFLUVE**

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Keywords: phreatic zone, pollution, hydrogeology

Tapping groundwater supplies compared to surface water supplies require expensive additional geological and hydrogeological investigation and research. The additional research investment is compensated by the good quality of the groundwater which allows the elimination of water treatment costs. Maintaining good groundwater quality is ensured by demand protection measures for the application of low costs and convenient capacity.

Modeling the migration of contaminants in the vadose zone is the current, highly effective approach for protecting the quality of groundwater from phreatic aquifers, used as the source of tapping groundwater supplies for a large part of urban and rural agglomerations in Romania.

Using SESOIL, one-dimensional vertical transport screening-level model for the unsaturated (vadose) zone that simulates migration of contaminants based on diffusion, adsorption, volatilization, biodegradation, cation exchange and hydrolysis, in the context of 3D conceptual model of the phreatic aquifer from the Siret-Trotus interfluvium, we evaluated the elements necessary to assess the vulnerability to pollution of the aquifer.

The design of the simulation of contaminants migration through the vadose zone, under the conditions of climate change conditions, was made on the basis of the parametric model of the hydrostructure resulting from the drilling investigation and the history of local meteorological conditions. The obtained results are the basis for the design of the protection zones of the Tapping groundwater supplies in the Siret-Trotus interfluvium.

## **2021-2022 MAGNETOMETRY FIELD CAMPAIGN RESULTS IN NOVIODUNUM AREA**

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The Noviodunum area, due to its geographical position, was an important strategic point even long before the existence of the fortress itself. Besides its military importance, Noviodunum was also an economic, cultural and spiritual centre. Raised to the rank of "municipium", the fortress reached its peak in the Roman-Byzantine era, as evidenced by the numerous archaeological artefacts that can be found in the Noviodunum area.

After two campaigns of geomagnetic measurements (2021-2022), an area of approx. 20 000 m<sup>2</sup> was surveyed at approximately 500 m South-West of the fortress. This area was chosen due to its archaeological importance and also because it is mainly unaltered by anthropogenic activities. The map of the vertical magnetic gradient which resulted from the processing of the data collected from the field revealed some magnetic anomalies that could be of archaeological origin. Considering their magnetical signature (shape, intensity), these anomalies were interpreted as roads, kilns or graves.

The results of the geomagnetical survey determined the proposal of future geophysical studies, in areas of archaeological relevance from the Noviodunum site.

## **PRELIMINARY OBSERVATIONS OF STRUCTURAL DEFORMATIONS IN THE BOCLUGEA - MEGINA SERIES, NORTH DOBROGEA OROGEN**

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Keywords: structural analysis, metamorphism, Megina, North Dobrogea

The North Dobrogea Orogen is a Hercynian/ Cimmerian orogen affected by multiple deformation events. One of the occurrences of higher grade metamorphic rocks in this orogen can be found within the Priopcea - Mircea Voda hills, making these outcrops an ideal location to study the structural deformations of what was previously inferred to be an exhumed orogenic wedge reaching amphibolite grade metamorphism. Current interpretations ascribe the observed geometry to orogenic shortening with thrust-faults at the contacts between the Paleozoic low grade to non-metamorphosed sediments, the greenschist grade metamorphic Boclugea Series and the Megina Group, described as Hercynian thrust-sheets, locally reactivated during the Cimmerian orogeny that formed the presumably larger offset Megina and Luncavita - Consul thrusts. In the Paleozoic sediments, the Cerna formation consists mainly of Silurian shales and a thin black limestone at its base, whereas the Boclugea metamorphics consists of quartzites and mica-rich schists. Two series have been described in the Megina Group: an amphibolitic one with gneissic, occasionally schistose texture associated with a quartz-plagioclase gneiss, and a second series described in the literature as the Megina ortogneiss consisting mainly of quartz-plagioclase gneiss with small, local amphibolite outcrops. In our research we will present preliminary field and microstructural observations on oriented thin sections alongside the mineral paragenesis of various sequences within the Boclugea and Megina Series. These observations will form the basis of a new interpretation on the variability of metamorphic grades across the North Dobrogea Orogen.

### **ARE THE NEW TECHNOLOGIES REALY NEW?**

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Keywords: new technologies, topographic plans, mathematical formulas, position of a point.

There has been intense talk lately about new technologies that have revolutionized the way to draw up topographic plans, to make measurements for cadastre engineering works etc. Of course, these technologies are new, but the theory on which they are based has always been the same. Mathematics uses the same formulas in plane geometry and trigonometry and ultimately provides us with the position of a point on the surface of the earth, regardless of the instrument we use.

The methodology for determining the position uses the same rules today, except that their application is made directly in the instrument, without the operator thinking about which formulas he uses or if the measurement conditions are met. Without minimizing the new technology that currently helps us to overcome some thresholds that we would not have crossed otherwise, the conclusion is that the formulas on which it is based are the same as we have always known. Unfortunately, computerization makes the surveyor not understand where the point positions came from and how. The fact that you press a button and the coordinates come on their own is an extraordinary thing, but the understanding of the phenomenon is moving away.

As we specified when using the total station, the vast majority of the users do not reduce the distance to the projection plane, but to the horizon of the device and, from here, endless discussions. When the mistake is found, the surveyor's answer is: "That's how the total station gave me". Absolutely mind-blowing! The same is for GNSS receivers. Press the button and the coordinates flow as from the faucet. But where they come from is an enigma. The sky in its magnitude gave satellites that whisper coordinates to us. It may be known that there are GPS satellites, but the vast majority do not say GNSS, but still GPS. They haven't heard much about the constellation GLONASS or Beidou. Maybe about Galileo, being European, should know something. There are quite a few specialists in photogrammetry and, in order to use the programs, you have to understand them. Otherwise, the final product will not be in accordance with the reality and the requirements of the beneficiary. At LiDAR it is similar to photogrammetry, but still different. The programs are very well done, but the operator's eye should complete the interpretations and here it depends on experience, on understanding of the phenomenon, of correctness and the desire to raise the quality. No matter how advanced the technology, the position determination method uses the same formulas. Specialists should have a good grasp of the technology, but also how it works. If it is based only on the phrase "That's how the total station gave me", GNSS or computer, without understanding the phenomenon in its entirety, the result will not have a very good quality.

## **TOWARDS DEFINING THE KINEMATIC MECHANISM OF BREAK-THRUST FOLDS IN THE EXTERNAL EAST CARPATHIANS**

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Keywords: overturned structures, hinge zone, folds, faults, retrodeformation

We present the first results of the kinematic mapping of break-thrust folds that make up most of the observed deformational geometry of the external Tarcău and Marginal Folds Nappes, in the Moldavides of the East Carpathians. These units are mainly composed Hauterivian - Lower Miocene deep-water pelagic, syn-contractual turbiditic and other mass-wasting sedimentation that compose an alternating association of variable mechanical rheologies. The Marginal Folds Nappe crops out in a number of half-windows, such as the Bistrița half-window and its neighboring tectonic contacts where our field kinematic study was focused. We observed, mapped and subsequently interpret different macroscopic and mesoscopic folds and faults generations formed in response to a gradual increase in the accommodation space in the hinge and flank zones of the break-thrust folds. A series of parasitic folds associated with various kinematic omission and duplication structures have been separated / differentiated in respect with the fold hinges, which can be in normal or overturned position, based on

cleavage or turbidites characteristics. The wavelength of these structures is related to the strata rheology. For instance, large amplitude folds were observed in the Kliwa Formation, clastic and thicker sediments, and narrower ones in the Bisericani Formation. Significant flexural slip is associated and increases with the gradual formation of the recumbent break-thrust folds. In rheologically less competent layers, the kinematics of faulting is often associated with brittle shear bands that accommodate layer-parallel elongation or shortening across the flanks and hinges. Faulting occurred during the gradual formation of recumbent break-thrust folds, which requires retro-deformation of structures to their original position at the times of their formation. Faults and shear-bands may duplicate or omit a layer in relationship with the normal or the overturned position of the fold flanks.

## **ELECTRICAL SURVEYS FOR INVESTIGATING THE GRADUAL SALTWATER INTRUSION IN FRESHWATER AQUIFERS IN THE SOUTHERN ROMANIAN BLACK SEA COASTLINE**

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Keywords: Black Sea coastline, freshwater aquifers, saltwater intrusion, Vertical Electrical Sounding, system of faults and fractures

One of the world's environmental risks is represented by saltwater intrusion into the coastal freshwater aquifers, which can lead to the degradation of the groundwater quality and render it unusable. It is frequently caused by human impact, such as uncontrolled or excessive exploitation by pumping freshwater for consumption or for agricultural usage. The lowering level of freshwater allows the saline water pressure to push the limits and interfere with those sources. Year by year this intrusion advances more and more in the coastal areas leaving people unable to continue using the production wells.

Such intrusions have been observed in Romania, in the southern Black Sea coastline aquifers, in resorts such as Costinești and Vama Veche. The Vertical Electrical Sounding (VES) surveys performed in Costinești area, between 1991 and 2010, showed the intrusion of seawater due to overexploitation of potable water.

The electrical investigations conducted in Vama Veche have been done in three stages: in 2008, 2019 and 2022 showing a gradual intrusion of seawater in freshwater coastal aquifers. In 2008, 23 VES measurements have shown seawater intrusion at around 45 m depth at least 150 m inland. In 2019, 8 profiles imaged via 2D ERT (Electrical Resistivity Tomography) indicated a more extended saltwater contamination, reaching almost 500 m distance from the coastline. Also, a potential intrusion pathway has been identified in a system of fractures and faults. From 2022 surveys, 9 VES measurements have been collected that revealed an anomaly of minimum resistivity associated with saltwater intrusion at about 600 m from the coastline and at 50 m depth and even deeper.

## **MAPPING OF PHYSICAL HABITATS OFFSHORE MANGALIA (ROMANIA) USING AUTOMATIC DISCRIMINATION METHODS**

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Keywords: Black Sea, Romanian coastal area, Habitat mapping

South shelf area is the most diverse in terms of marine habitats within the Romanian waters with both fauna and flora having a multitude of species. The Romanian aquatory in general, but here particularly is affected by stress factors, both natural (erosion) and anthropogenic (pollution, fishing, tourism, marine development works). The planning of new beach nourishment for south littoral may affect in a negative way the benthic habitats, both animals and plants facing the reduction of individuals. An ecosystem may evolve in a natural way in a long period of time but taken into account the stress factors, it can evolve or disappear in a very short period. For evaluating a marine ecosystem we need a better understanding of underwater processes and a better knowledge of all biotic and abiotic components. In 2021-2022, GeoEcoMar continued the habitat mapping surveys which started in 2016, having both new tools and a better understanding of the area. The survey areas were partly included in Sites of Community Importance from Natura 2000 Network: ROSCI-0293 Costinești-23 August, ROSCI-0281 Cape Aurora and ROSCI-0094 Sulphide Springs from Mangalia.

The main tool we used for the mapping of physical habitats was a multibeam echosounder (MBES) model Norbit iWBMSH which has the capability to record bathymetry data, backscatter data and water column data. After bathymetry and backscatter data acquisition we performed a pre-processing of data on the survey vessel resulting in bathymetry map and backscatter mosaic that were used for projecting the sampling points. For each type of physical habitat that could be discriminated from the backscatter mosaic, between 4 and 8 sampling point were decided. Samples collection was done with a Van Veen Grab for grain size and for biology. Grain size analyses were carried out in laboratory using a Malvern Mastersizer 2000E analyzer after separating shells and shell fragments from the rest of the sediments. Sediments were classified using Folk diagram. Biology samples were washed, sorted and preserved on spot and afterwards analysed in laboratory.

The main software for processing data were: Xylem Hypack Suite (MBMAX64, Geocoder), QPS Fledermaus, Blue Marble Geographics Global Mapper and ESRI ArcGIS. After processing all data and coupling it with grain size analysis results, the habitat maps were realised using tools from ESRI ArcGIS software: Raster Calculator, Raster to Polygon, Aggregate Polygons. Very small polygons which resulted from recording or processing errors or artifacts were eliminated. Physical habitats were classified based on morphological features observed on bathymetry map and sediments granulometry and was based on EUNIS 2019 scheme.

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## **PROCESSING AND INTERPRETATION OF 2D GEOELECTRICAL DATA AND THEIR INTEGRATION WITH OTHER GEOPHYSICAL DATA**

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Keywords: electrometry, magnetometry, orthophotoplane, geophysical, interpretation

In September 2020, geophysical investigations were conducted in Resca, former Roman city – Romula. More precisely, in the central area of the city, known as The Central Fortification, an area of major interest from archeological point of view, measuring 2.5 ha with sides ranging from 80 to 230 meters. Surveys of electrometry, magnetometry and gravimetry were performed, together with a drone flight in order to build an orthophotoplane of the area. The goal of the study was to evaluate the applicability of magnetic and electrical surveys in an area with powerful magnetic noise and high resistivity due to a superficial layer, near surface, of bricks and rocks, in order to supply meaningful data.

This work aims to centralize the information collected in September 2020, in the form of a GIS. The importance of the work consists, on one hand, in facilitating the interpretation of the obtained geophysical data, by superimposing them on an orthophotoplan in real coordinates, as well as helping with a better location of future geophysical surveys.

## **NEOGENE CETACEANS FROM THE COLLECTIONS OF THE NATIONAL GEOLOGICAL MUSEUM**

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Keywords: Neogene, cetaceans, Romania, Mysticeti.

Institutional collections, when managed properly, have the potential to provide a treasure trove of information regarding the fossil specimens housed in them. On the flip side, poor management of the collections could also mean the loss of valuable information regarding the location from where the specimens were collected, as well as other relevant geological information. Such is the case of the cetacean fossils mentioned herein. They are housed inside the collections of the National Geological Museum (NGM), however for several specimens no relevant information can be obtained. Cetacean fossils are certainly not a novelty, remains being mentioned in published literature for an important length of time, from various sites inside the Carpathian Foreland. Most material is represented by postcranial elements such as vertebrae, other elements of the postcranial or even cranial skeleton being rarer. The specimens mentioned here also adhere to this pattern, most of the fossils being vertebrae from various parts of the vertebral column, while one fossil is represented by a complete humerus. Unfortunately, most cetacean species from the Romanian territory were ascribed based on vertebrae remains, that provide no relevant information for detailed taxonomical identification. The goal of this work is to study new cetacean fossil remains newly found in the NGM collections, to provide new localities for them and to ascribe them to a taxonomic rank based on comparisons with similar specimens from published literature. As such, a number of 15 cetacean fossil remains were studied, several were collected from south-western Romania, and all were ascribed to the family Cetotheriidae.

## **TWO NEW SPONGE (*PORIFERA*) SPECIES IN MIDDLE OXFORDIAN OF CEKIRGEA VALLEY, CENTRAL DOBROGEA**

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Two new sponge taxa are described, *Sphaeropontia osculophora* n.sp., assigned to Class Demospongiae Sollas 1875 and *Eudea dobrogiaca* n.sp., assigned to Class Calcispongiae de Blainville 1830, respectively. Morphological features are described and the taxonomical assignment is assessed. Differences from related species are discussed. The new taxon is part of the sponge assemblage in the Middle Oxfordian (Upper Jurassic) of Cekirgea Valley (western Central Dobrogea), which adds to the contemporaneous faunas in the area, belonging to other phyla.