ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

12th Annual NECLIME Meeting

27th -30th September 2011

Bucharest - 2011,

***

Program and Abstracts

Edited by the Geological Institute of Romania
Bucharest, 2011

ISSN 0250-2933

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Inside

PROGRAM OF NECLIME MEETING BUCHAREST, 2011

Tuesday, September 27		
All day	**Arrival**	
➔ ➔20:00	Registration and **welcome Party (20:00 ➔)**	
Wednesday, September 28		
09:00 – 09:30	Grigorescu S., GIR Manager Dragastan O., Prof. Univ. Iamandei S.	Welcome speaking
09:30 – 10:30	Utescher T., Bruch A.A. Kern A., Erdei B.	Introduction, NECLIME news, reports of the working groups
Coffee break: 10:30 – 11:00		
Miocene climate and vegetation – Romania. Convenor		
11:00 – 11:30	Țicleanu M. & Nimigean D.	The Neogene's palaeoclimate from the perspective of real dynamic (cosmic) cycles of the Earth.
11:30 – 12:00	Paraschiv V.	Vegetation and Palaeoclimate in western Carpathian fordeep during mid Miocene.
12:00 – 12:30	Țabără D. & Chirilă G.	Palaeoclimatic estimation from Miocene of Romania, based on palynological data.
Lunch: 12:30 – 14:00		
Miocene climate and vegetation – Turkey. Convenors: Akkiraz M. S., Akgün F.		
14:00 – 14:30	Akkiraz M. S., Akgün F., Wilde V., Utescher T., Bruch A.A. & Mosbrugger V.	Miocene vegetation and climate of lignite-bearing sediments from western Turkey on the basis of palynoflora and macroflora.
14:30 – 15:00	Üçbaş S. D., Akkiraz M. S. & Akgün F.	Miocene Palaeoclimate and Palaeovegetation of the Yenice Kalkım Basin From Northwestern Turkey.
15:00 – 15:30	Kayseri-Özer M.S. & Akgün F.	Vegetation and climate of the Middle Miocene in Western Turkey.
Coffee break: 15:30 – 16:00		
Miocene climate and vegetation – Central Europe. Convenors: Kern A. K., Erdei B.		
16:00 – 16:30	Erdei B., Hably L., Mosbrugger V., Tamás J. & Utescher T.	Climate and vegetation change in the Pannonian of the Pannonian Basin – a detailed study.
16:30 – 17:00	Kern A. K., Harzhauser M., Soliman Ali, Mandic O. & Piller W. E.	Tortonian small-scale vegetation dynamics within a solar-cycle influenced lake-environment.
17:00 – 17:30	Campani M., Mulch A, Kempf O. & Schlunegger F.	Oligo-Miocene stable isotope paleoclimate records from palaeosols in the North Alpine Foreland Basin.

Thursday, September 29		
Using fossil woods in palaeoclimate reconstructions. Convenor: Sakala J., Bondarenko O. V.		
09:00 – 09:30	Iamandei S. & Iamandei E.	Palaeoclimate and palaeoenviroment reconstruction using the fossil wood in Carpathians - case study.
09:30 – 10:00	Sakala J.	Wiemann et al.'s numerical model for reconstructing palaeoclimate based on angiosperm wood: case study of Neogene Rauscheröd and Palaeogene Helmstedt (Germany).
10:00 – 10:30	Bondarenko O. V. & Blokhina N. I.	Implication of fossil woods for climate reconstruction of southern Primory'e (Far East of Russia) in the Pliocene.
Coffee break: 10:30 – 11:00		
Modeling monsoonal patterns, CO_2, palaeo-elevation and teleconnections. Convenor: Momohara A.		
11:00 – 11:30	Momohara A.	Altitudinal effects on palaeotemperature reconstruction by use of the coexistence approach based on plant macrofossil assemblages in central Japan.
11:30 – 12:00	Jacques F.M.B., Gongle Shi, & Wei-Ming Wang	Neogene palaeovegetations of China and the development of the winter monsoon.
12:00 – 12:30	Wei-Ming Wang	Monsoon climate: different development and influence on the Late Cenozoic floras in Japan and East China.
Lunch: 12:30 – 14:00		
Other approaches of climatic reconstructions. Convenors: Popova S., Bruch A.A.		
14:00 – 14:30	Feng Qin, Syabryaj, S., Yifeng Yao, Jian Yang, Jinfeng Li & Yufei Wang	Climate reconstruction of the late Pliocene Zhangcun, Shanxi, China.
14:30 – 15:00	Dury M., François L., Warnant P., Lehsten D., Dullinger S., Hülber K., Cheddadi R., Laborde H., Sykes M. T. & Syngarayer J.	Modelling European tree species distribution change over the Holocene.
15:00 – 15:30	Zhou Zhekun Xing, Yaowu Su Tao, Huang Yongjiang & Hu Jinjin	Stomata densities of *Quercus pannosa* change over altitudinal gradient in Himalayas and its use in the reconstruction of palaeoaltitude.
Coffee break: 15:30 – 16:00		
16:00 – 16:30	Popova S., Bruch A.A., François L., Gromyko D., Herzog E., Mosbrugger V. & Utescher T.	Reconstruction of Cenozoic vegetation patterns of Western Siberia and the Far East of Russia based on diversity studies of plant functional types.
16:30 – 17:00	Bruch A.A., Iamandei S., Iamandei E. & Paraschiv V.	Environmental and climatic evolution in Carpathian Area during Neogene.
17:00 – 17:30	Țicleanu M., Munteanu M., Nicolescu R., Gheuca I., Ion A.	The essential role of the cyclo-stratigraphical studies of the coal-bearing formations for the outlining of the real climatic cycles of the Earth.

Friday, September 30		
New Projects: Portmann F.T., Utescher T.		
09:00 – 09:30	Utescher T., Böhme M., Micheels A., Mosbrugger V. & Portmann F.T.	Analysis of Cenozoic biodiversity and climate gradients on both sides of the North Atlantic – estimating Gulf Stream intensity from continental proxies. First Results.
09:30 – 10:00	Portmann F.T., Micheels A., Mosbrugger V. & Böhme M.	The Neogene climate response to the Gulf Stream intensity – Results for the Miocene.
Coffee break: 10:00 – 10:30		
10:30 – 12:00	Bruch A.A. & Utescher T.	Final discussion and synthesis, outlook to future activities.
Lunch: 12:00 – 13:00		
Optional 13-18.00	- A short sight-tour in Bucharest with a visit to the Parliament Palace (Ceauşescu's "People's house" the second biggest official building in the world after Pentagon). - Old Bucharest: Lipscani area, the Old (Royal) Court, Victory Avenue; - the Natural History Museum, the Peasant Museum & the Village Museum, close to our location; - The Geological Museum can be visited during symposium, we are already inside.	
19:00 – 21:00	**Farewell Party**	
Saturday, October, 1st		
All day	Optional: - participation to a **one day field trip to Oltenia**, SW Romania; **- departure.**	
Sunday, October 2nd		
Departure.		

POSTER SESSION
Wednesday, September 28 to Friday, September 30

1	Boura Anaïs & De Franceschi, D.	Can extant taxa give clues for paleoenvironmental reconstruction? Examples from diffuse and semi-ring-porous species.
2	Diaconu Florina	Main Mio-Pliocene Phytocoenoses reconstruction in SW of the Dacian Basin and their palaeoclimatic significance.
3	Iamandei E. Iamandei S., Bejan, D. & Ursachi, L.	Palaeoclimatic and palaeoenvironmental significance of the Late Miocene Moldavian Petrified Forest.
4	Kováčová M., Utescher T., Teodoridis V., Kvaček Z. & Kučerová J.	An integrated Approach in palaeoclimate Analysis based on selected Miocene Floras - a case study.
5	Kayseri-Özer Mine Sezgül	Late Eocene-Late Miocene climate and vegetation of Turkey.
6	Mine Sezgül Kayseri-Özer, Bruch A. Angela, & Wilde V.	Palaeoclimatic record based on the leaf floras in Miocene (Turkey).
7	Paraschiv, V.	Mid Miocene Flora of Vale Morilor, western part of Dacian Basin and its palaeoclimatic significance.
8	Feng Qin, Svetlana Syabryaj, Yifeng Yao, Jian Yang, Jinfeng Li & Yufei Wang	Reconstruction on the temperature parameters of the late Pliocene Zhangcun, Shanxi, using the method of Grichuk and his coauthors.
9	Teodoridis V., Bruch A.Angela., Vassio Elena, Kvaček Z. & Martinetto E.	Plio-Pleistocene floras of the Vildštejn Formation, Cheb Basin, NW Bohemia – new reconstructions of vegetation and climate.
10	Tsenov B. & Bozukov V.	Coexistence Approach palaeoclimate reconstructions, based on the taxonomical composition of two macro floras from SW Bulgaria

NECLIME

NECLIME

Abstracts

Miocene vegetation and climate of lignite–bearing sediments from western Turkey on the basis of palynoflora and macroflora

Mehmet Serkan Akkiraz[1], Funda Akgün[2],
Volker Wilde[3], Torsten Utescher[3,4], Angela Bruch[3] & Volker Mosbrugger[3].

[1]*Department of Geological Engineering, Dumlupınar University, 43270, Kütahya, Turkey. Email: serkanakkiraz@dpu.edu.tr*
[2]*Department of Geological Engineering, Dokuz Eylül University, 35160, Buca, İzmir, Turkey;*
[3]*Senckenberg Research Institute and Natural Museum, Senckenberganlage 25, D-60325 Frankfurt am, Germany;*
[4]*Steinmann Institute, University of Bonn, Germany.*

During the Miocene, western Turkey displayed a long term trend of decreasing marine influence. Alpine tectonics was active during the Late Cretaceous and Early Cenozoic periods, producing uplift of Taurides. The convergence between the Africa and Eurasian plates led to the development of two distinct realms during the Miocene and Pliocene: The Mediterranean and Paratethys seas.

Then lacustrine sediments were deposited in most of the Miocene basins in western Turkey. Also the Miocene lignite bearing-continental deposits from western Turkey (southeastern Mediterranean area) are especially well known due to economic potential [e.g., Manisa-Soma; Kütahya (Seyitömer and Tunçbilek); Çanakkale-Çan basins].

In this study the palynological assemblages have been enlarged by analysis of new samples from these lignite-bearing sediments. Also, the vegetation and palaeoclimate of Miocene sequences have independently been constructed by quantitative methods applied to the recovered palaeofloras.

In western Turkey, forested environments should have clothed much of the landscape during the deposition of Miocene sediments, since coniferous forest and evergreen to deciduous mixed mesophytic forests were dominant. This is indicative of the homogeneity in floral composition.

Although open herbaceous formations in the southern Mediterranean area are known since the Burdigalian, herbaceous plant communities on western Turkey had a very restricted distribution above mentioned areas where the open environments had not developed yet.

Implication of the fossil woods for climate reconstruction of southern Primory'e (Far East of Russia) in the Pliocene

Olesya V. Bondarenko & Nadezhda I. Blokhina

Institute of Biology and Soil Science FEB RAS, Prospect Stoletiya Vladivostoka 159, Vladivostok,690022, Russia.
E-mail: laricioxylon@gmail.com, blokhina@biosoil.ru

In southern Primory'e, the only locality with numerous, well preserved and taxonomically diverse fossil woods of Pliocene age is the Pavlovskoe brown coal field. In order to reconstruct the climate of southern Primory'e in the Pliocene time we used the following methods: growth ring analysis (Francis, Poole, 2002), wood anatomy analysis, and the CA analysis (Mosbrugger, Utescher, 1997). Distinct growth rings are characteristic of the fossil wood that is the evidence of well pronounced seasonality. A total of 221 ring series were measured, ranging in length from 8 to 117 rings. Mean ring width per tree ranged from 0.14 to 3.99 mm, and MS ranged from 0.034 to 1.546. Of 221 fossil wood samples studied, 138 samples were characterized by MS<0.3 (trees grow evenly under a favorable and uniform climate). The other 82 wood samples had MS>0.3 (trees were "sensitive" to fluctuating climate parameters). On the basis of fossil woods anatomy, it may be supposed that climate was, probably, well pronounced seasonal, temperate - relatively warm throughout the year and with rather snowy and cool winter. Although, there were, perhaps, years with more severe weather conditions. The MAT of 5-16º C and the MAP of ~1000-1500 mm were estimated by the CA. The Pliocene climate of southern Primory'e was similar to that of the present South Korea with MAT of 5-16º C and MAP of 700-1500 mm.

To the end of the Pliocene, rather long arid seasons occurred, and savannah-like landscapes were prevalent in the planes (Korotkii et al., 1996). The MAP of 720-830 mm is characteristic of the present Primory'e. Because of more arid climate *Abies* aff. *sachalinensis, A. chavchavadzeae, Keteleeria zhilinii, Pseudotsugoxylon pavlovskiense, Picea* cf. *bicolor, Piceoxylon pavlovskiense, P. ussuriense* as well as *Larix olgensis, Laricioxylon blokhinae, L. pavlovskiense, L.* aff. *chelebaevae, L.* aff. *korfiense* and *Fagus,* whose NLR grow in conditions of relatively high humidity, have disappeared from Primory'e during the post Pliocene time.

The present MAT of Primory'e is 3.3-5.6º C. Because of fall in temperature during the post Pliocene time *Abies sachalinensis, A. chavchavadzeae, Picea bicolor, Piceoxylon pavlovskiense, P. ussuriense, Laricioxylon blokhinae, L. pavlovskiense, L. chelebaevae, L. korfiense, L. sichotealinense, Quercus primorica* as well as the representatives of *Keteleeria*, *Pseudotsugoxylon*, *Tsuga, Biota, Magnolia, Celtis, Pterocarya, Carya, Castanea* and *Fagus* have disappeared from Primory'e and *Larix olgensis* has reduced its distribution range.

This work was supported by the Russian Foundation for Basic Research (project no. 11-04-01208), and Presidium of the Russian Academy of Sciences (RAS) and Presidium of the Far East Branch of the RAS (project no. 09-I-P15-02).

Can extant taxa give clues for paleoenvironmental reconstruction? Examples from diffuse and semi-ring-porous species.

Boura Anaïs & Dario De Franceschi

UMR 7207 – Centre de recherche sur la paléobiodiversité et les paléoenvironnements- UPMC-MNHN-CNRS – CP 38 - 57 rue Cuvier, 75231 Paris cedex 05. boura@mnhn.fr

Wood is an excellent indicator of the tree growing environment. In most species, cambial activity is not constant throughout the year and anatomical structures, such as growth rings, vessels or fibres characteristics, record, during their formation, environmental events.

This study, at the interface of several disciplines, focuses on the analysis of the inter- and intra-specific wood anatomical variability and on the search for - climatic and environmental – markers recorded in the heart of the wood anatomical structure. Wood anatomical variability in ring-porous species has been successfully employed in the past few years to extract the climate (temperature, precipitation) and environmental signals from tree rings (flood, insect defoliation).

However, very little is known about the ability of diffuse- and semi-ring-porous species to record environmental signals in their xylem cells. This study was therefore undertaken to characterize the wood anatomical response of diffuse-porous species *Alnus glutinosa* and of the semi-ring-porous *Fagus sylvatica* and *Prunus avium*.

Wood anatomical response to environmental parameters was assessed through the analysis of wood anatomical differences of approximately 750 growth rings of the three species sampled along a geographic gradient from north Spain to north France and Czech Republic. Image analysis was used to measure diverse classical and original wood anatomical features as growth ring width, porosity index, mean vessel area...

Despite the existence of numerous distortions as false rings and narrow rings expressing respectively dominated and senescent states of the sampled trees, statistical analyses allowed us, to propose meteorological and global climate “answer scenarios” for each of the studied species. These last results can be used in the future for the re-examination of fossil wood material, in an attempt of palaeoclimatic and palaeoenvironmental reconstruction.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Environmental and climatic evolution in Carpathian Area during Neogene.

Bruch A.Angela[1], Iamandei Stănilă[2], Iamandei Eugenia[2] & Paraschiv Valentin[2]

[1]*Senckenberg Research Institute and Natural Museum, Senckenberganlage 25, D-60325 Frankfurt am, Germany, email: Angela.Bruch@senckenberg.de*

[2] *Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: iamandei@gmail.com*

Any attempt to reconstruct the palaeoenvironment and the palaeoclimate is confronted to many difficulties and must be very comprehensive. The present paper refers to the Carpathian region which include a large area, partially developing within the Romanian territory, and have a long history sketched still from Mesozoic times, the mesocretaceous phase of the alpine orogenesis being the most important moment of their life. The stratigraphic column of Carpathians include Precambrian and Palaeozoic rocks more or less metamorphosed, stacks of sedimentary Palaeozoic and Mesozoic rocks mostly of marine origin under a Cainozoic cover of various origin, marine to continental.

The palaeogeography of the Carpathian area during Neogene was a result of the regional movements of plates and microplates during Eocene to Pliocene interval, which determined the opening, the evolution of Paratethys and its closing with one of the last remnants of it – the Dacian Basin, marked the Romanian geology.

Related to the land areas of Carpathian region during Neogene an interesting vegetation of various types evolved, conditioned by latitude, altitude and dry or wet environments. Evaluating the palaeobotanical studies already made in this area it was possible to follow it during late Oligocene to late Pliocene when Paratethys closed.

Using the taxonomic identifications offered by more than a hundred and fifty years of palaeobotanical studies of fossil leaves, fruits or seeds, but of fossil wood and pollen also on this area, a Climate Analysis by Coexistence Approach method was done, climatic development in time correlated to other punctual results with previous qualitative interpretations made by some other authors. The results of this analysis are presented and discussed here, including the temperature and precipitation evolution in time and space during Neogene within Romanian Carpathian Area, plotted on palaeogeographic maps.

As a conclusion, the evolution of the Neogene Carpathian palaeoclimate has typical spatial patterns in relation to palaeogeographic development, climate change and development of seasonalitiy.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Oligo-Miocene stable isotope paleoclimate records from palaeosols in the North Alpine Foreland Basin

Campani Marion[1], Mulch Andreas[1], Kempf Oliver[2] & Schlunegger Fritz[3].

[1] *Biodiversität und Klima Forschungszentrum BiK-F, Senckenberganlage 25, D-60325 Frankfurt am Main, Germany, email: marion.campani@senckenberg.de;*

[2] *Bundesamt für Landestopografie swisstopo, Geologische Landesaufnahme, Seftigenstr. 264, Bern, 3084, Switzerland;*

[3] *Institut für Geologie, Universität Bern, Baltzerstr. 1+3, Bern, 3012, Switzerland.*

The development of the North Alpine Foreland Basin has been strongly influenced by the tectonic evolution of the adjacent Alpine orogen. Detailed knowledge of the stratigraphy, facies relationships, and chronology of sedimentation provides an exceptional case to establish a detailed terrestrial stable isotope record for the climatic evolution in Central Europe. We present detailed oxygen and carbon isotopic records for Oligo-Miocene terrestrial paleosols developed in the North Alpine Foreland Basins of Switzerland, including the Oligo-Miocene boundary and the mid-Miocene climatic optimum (MMCO).

These paleosols consist of reddish pedogenic mudstones containing abundant carbonate concretions and calcified roots. These soils developed in overbank settings of the Hörnli, Napf, Kronberg and Speer alluvial fan systems at the Alpine thrust front and have been dated by magnetostratigraphy with ca. 100 ky precision. $\delta^{18}O$ values for the calcrete are relatively constant at 25 ‰ (SMOW) between 30 and 21 Ma, decrease to 20 ‰ between 21 and 17 Ma and show the lowest values in the entire section between 17 and 14.5 Ma. Miocene pedogenic mudstones show a similar isotopic trend than their associated nodules.

The reason for exceptionally low $\delta^{18}O$ values during the MMCO is not completely clear. One possible interpretation is that the decrease to exceptionally low values reflects the formation of significant Alpine topography responsible for reorganizing the air circulation patterns. The subsequent isotopic increase at 14.5 Ma in the paleosols mimics the general trend of the global oceanic oxygen isotope records and also corresponds to a general rapid cooling event, well documented in Central Europe, following the MMCO.

We therefore interpret these measurements to record a global climatic variation in the mid-Miocene. This isotopic record from the North Alpine Foreland Basin provides a detailed database for climate changes in Central Europe consistent with paleontological observation and suggests that the growth of the Alpine topography in the Central Alps has been responsible for local climate change and reorganization of the air circulation patterns.

Main Mio-Pliocene Phytocoenoses reconstruction in SW of the Dacian Basin and their palaeoclimatic significance

Diaconu Florina

Iron Gates Region Museum, 2, Independenței Str, 1500 Drobeta-Turnu Severin, Mehedinti, Romania.

E-mail: florinadiaconu@yahoo.com

The first attempts to reconstruct the Pliocene coalgenerating vegetation in Oltenia (Ro) based macrofloras researches were made by Țicleanu et al. (1982, 1985, 1986). They were refined up to the reconstruction of the vegetal communities until to the paleophytocoenose level (Țicleanu (1992, 1995a; Țicleanu & Diaconu, 1997). The best reconstruction of the coalgenerating swamps in western part of the Dacian Basin, based also on an attempt of Petrescu et al. (1989), was made by Diaconu & Țicleanu (2006), with a detailed analysis of paleobiotops and plant communities (paleophytocoenose and vegetal associations). So, a marginal zone could be separated, a seasonally flooded zone also, an almost permanently covered (by water) zone, and a permanently covered zone (of more or less 2 m).

The main coal-generating paleophytocoenoses in Pliocene of Dunăre-Motru were dominated by one of the taxa: *Glyptostrobus europaeus, Byttneriophyllum tiliaefolium, Phragmites oeningensis, Salix* ssp.*, Pandanus* ssp. In these paleophytocoenoses some secondary elements appear: *Carya denticulata, Platanus platanifolia, Acer tricuspidatum, Carpinus betulus, Typha latissima, Liquidambar europaeum*, a.o.

The paleoecological analysis of latest Miocene to Pliocene flora identified in much more sites: Batoți, Crivina, Ilovița, Crăguieşti, Dedovița - Balota, Husnicioara open pit, Bâcleş indicated some distinct paleobiotopes, as follows: a mesophytic association characterized by the occurrence of an allochthonous flora, a marsh-type, coal-generating association, a lower floodplain forest, and higher at high hills with coniferous forests of *Sequoia*, a lowland forest paleobiotop. Anyway, the presence of some Lauracee at Ilovița marks a warm-humid climate, with average temperatures above 15^0 C. In other sites (Batoți and Crivina), two distinctive paleobiotopes were separated: a mesophytic association characterized by the occurrence of an allochthonous flora dominated by *Fagus, Quercus, Castanea, Carya and Pterocarya* etc. and a marsh-type, coal-generating association with *Alnus cecropiaefolium* in a coal facies dominated by *Glyptostrobus* and *Byttneriophyllum*.

Taking into account this phytocoenosis and the frequency of leaves of *Fagus silesiaca*, similar to that in the association of Batoți, we assume the existence in the local vegetation of a "Mixed mesophytic forest region" type, associated with species of *Quercus, Pterocarya, Ulmus*, etc. Concerning climate parameters, Petrescu et al. (2001) estimated a MAT of 14-15º C, and a MAP exceeding 1200 mm/year.

Modelling European tree species distribution change over the Holocene

Dury Marie[1], François Louis[1], Warnant Pierre[1], Lehsten Dörte[2], Dullinger Stefan[3], Hülber Karl[3], Cheddadi Rachid[4], Laborde Henri[4], Sykes Martin T.[2], Syngarayer Joy[5]

[1] *Unité de Modélisation du Climat et des Cycles Biogéochimiques (UMCCB), University of Liège, Liège, Belgium. E-mail: marie.dury@ulg.ac.be*

[2] *Department of Earth and Ecosystem Sciences, Lund University, Lund, Sweden*

[3] *Vienna Institue for Nature Conservation and Analyses (VINCA), Vienna, Austria*

4 Institut des Sciences de l'Evolution de Montpellier (ISEM), Université de Montpellier II, Montpellier, France

[5] *Department of Geography, University of Bristol, Bristol, United Kingdom*

The postglacial re-colonization of Europe by temperate tree species from a few glacial refugia during the Holocene (10,000 BP) is a very interesting case to study the mechanisms of the vegetation dynamics. The relative roles that played the climate conditions, the species dispersal capacities and the inter-specific competition in the re-colonization rates remain controversial.

We investigate these different aspects with the CARAIB dynamic vegetation model (CARAIB DVM). Transient runs were performed over the Holocene using the HadCM3 AOGCM-reconstructed climate. European-wide species migration at 0.5° x 0.5° is represented in the model using migration rates derived from a high resolution cellular automaton, CATS-UPSCALE. Individual tree species migration rates were pre-calculated with CATS-UPSCALE every 1000 years over each grid cell used by the DVM in the climatic conditions reconstructed by the AOGCM.

The impacts of competition between species on plant dispersal are not taken into account by the automaton. Thus, in CARAIB, a function has been constructed to reduce the potential CATS migration rates in competition conditions. It is based on the species dispersal kernel and on the species net primary productivity. The migration of one species, from its 10,000 BP refugia, is studied within a landscape defined by a set of other species for which no dispersal limitations are assumed. Here, we illustrate the results obtained for two wind-dispersed (*Abies alba* and *Picea abies*) and for a no wind-dispersed (*Fagus sylvatica*) tree species. We compare the HadCM3 climate outputs with reconstructions of some climate variables from fossil dataset. The speeds and the paths of the postglacial spread obtained with the DVM are compared to the past distributions of the three species reconstructed from pollen and macrofossil data. The Holocene climate conditions simulated by the HadCM3 AOGCM do not constrain the European re-colonization of the studied species, except in Scandinavia at the beginning of the period for *Picea abies*. We observe that, during the past 10,000 years, species occupied regions where climate conditions were different from present observed species climate requirements, notably in the 10k species refugia.

This result may imply that at present the species do not occupy their potential distribution area and thus that the postglacial re-colonization is not completed yet. We also show that species dispersal capacities cannot explain the observed species migration over the Holocene and that competition has played an important role. Indeed, when we use the potential migration rates (no competition), species migration rates are too fast.

Climate and vegetation change in the Pannonian of the Pannonian Basin – a detailed study.

Erdei Boglarka[1], Hably Lila[1], Mosbrugger Volker[2,3], Tamás Júlia[1] & Utescher Torsten[2,3,4]

[1]*Hungarian Natural History Museum, Botanical Dep., Budapest, H-1476-POB222, Hungary. Email: paleobot@bot.nhmus.hu*

[2] *Senckenberg Research Institute and Natural History Museum, Senckenberganlage 25, 60325 Frankfurt/Main, Germany*

[3] *Biodiversity and Climate Research Centre (LOEWE BiK-F), Senckenberganlage 25, 60325 Frankfurt/Main, Germany*

[4] *Steinmann Institute, University of Bonn, Nußallee 8, 53115 Bonn, Germany*

Having an extensive palaeobotanical record and a number of well dated sites the Pannonian Basin represents a key area to study palaeoclimate change and response of local and regional vegetation in the context of a changing palaeogeography.

In the study presented here we reconstruct palaeoclimate and vegetation layers for five time slices.

The analysis is based on 15 sites with macro-palaeobotanical records, located nearshore or in the closer neighbourhood of the lake that can be assigned to one of the time slices within reasonable accuracy. All floras considered have been recently revised (publication by L. Hably in progress).

To reconstruct quantitative palaeoclimate data we use the Coexistence Approach (CA), combined with a carefully revised NLR concept for all fossil taxa encountered.

Vegetation types comprising low-diverse lowland/delta plain communities, and more diverse upland associations, are identified by detailed, qualitative evaluation of the single floras complemented by quantitative approaches, i.e. diversity studies of plant functional types and application of multivariate statistics.

Currently work is in progress to analyse palynofloras from macroflora-bearing levels in order to complete our picture and gain access to shorter-term climate variability and vegetation response.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Palaeoclimate and palaeoenviroment reconstructions using the fossil wood - case study.

Iamandei Eugenia & Iamandei Stănilă

Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: iamandei@gmail.com

Despite of the common sense, it might be reconized that the fossil wood is one of the most frequent fossils on the Earth. Not considering such fossils able to help the palaeoclimatic and palaeoenvironmental reconstruction of the terrestrial conditions is a wrong position, which must be reconsidered. It's a reason for what we brought some analysis and arguments here. There are some possibilities to use the fossil wood in such reconstructions:

- Based on microscopical observations on specialized cells and tissues;
- Based on correct taxonomical identifications and, as most as possible, comparing to the extant correspondents (NLR);
- Based on vegetation reconstruction of typical associations or biomes;
- Based on correlations to other complex studies.

A long part of the Neogene time, the Carpathian Arch was a large insular region of the Paratethys Sea. As remains of this quassi–mediterranean sea, the Pannonian Lake, the Transylvanian Lake and the Dacian Lake evolved during late Miocene and Pliocene when closed step by step. Contemporaneously in the same region an intense volcanic activity triggered and related to its extracraterial products, a lot of plant remains were preserved. At least in South Apuseni a complex petrified forest, in Prăvăleni-Ociu area, was described, and 41 mid to late Miocene taxa were identified. A lahar formation preserved numerous trunks and smaller fragments of trees, thousands samples are still in study. Till now we tried to do correct the taxonomical identifications and, comparing to the extant correspondents we reconstructed a forest with numerous tropical elements, which suggest us a warm temperate climate in an insular palaeoenvironment, very similar to a "Mediterranean domain", maybe slightly wetter: MAT ~ 12-17, MAP ~ 1100-1500. A slightly storied forest is also suggested and a palaeoaltitude can be discussed. The studied microscopic structures confirmed such conclusions, rarely we observed false rings, the annual rings were well marked signaling a marked seasonality and the presence of dominant ring porous or half ring porous structures indicated at least that one of the seasons was wetter. Anyway, the presence of some tropical taxa, palms included, suggested a relatively equally palaeoclimate.

As conclusion a systematic and well conducted study of fossil wood in a rich deposit of this fossil can be very useful in reconstructing the palaeovegetation and the palaeoenvironment of the region but also of its detailed palaeogeography.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Palaeoclimatic and palaeoenvironmental significance of the Late Miocene Moldavian Petrified Forest.

Iamandei Stănilă[1], Iamandei Eugenia[1], Bejan Daniel[2] & Ursachi Laurențiu[3]

[1] Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: iamandei@gmail.com

[2] University „A.I.Cuza", Geography & Geology Faculty, Carol I Blvd., 20A, Iaşi, Romania.

[3] "Vasile Pârvan" Museum, Natural Sciences Departm., 235th Republic Street, Bârlad, Romania.

The Moldavian late Miocene is especially reach in plant remains, since the Dacian Basin retired southward step by step. This paper presents the results of the palaeoxylotomical study of a material coming from the central part of Moldavia, Northward of Bârlad, from a fluvio-deltaic sandy formation of Maeotian age, with thin levels of sandy clays or gravels. The gravel levels comprise rounded elements of "sandstones" (in fact broken fragments of *trovants*) and of petrified woods, both coming from an early Sarmatian formation which occurs *in situ* more Northward, in Avereşti-Soleşti area.

Previously, palynologic or palaeobotanical studies of fruits, leaves or wood allowed the identification of an interesting late Miocene fossil flora on the Moldavian Platform. In the same area lignotaxa of conifers but of numerous oaks and elms as well, were described. The here studied material is represented by numerous rounded fragments of petrified wood brought by palaeorivers from the Moldavian platform as sedimentary elements.

Fossil lignotaxa	***Extant equivalent***	**%**
Cupressinoxylon sp.	*Thuja, Juniperus*	<1
Tetraclinoxylon sp.	*Tetraclinis*	8
Taxodioxylon sp.	*Taxodium*	<1
Quercoxylon sp.	*Quercus*	38
Lithocarpoxylon	*Lithocarpus*	<1
Ulmoxylon sp.	*Ulmus*	25
Betuloxylon sp	*Betula*	<1
Alnoxylon sp.	*Alnus*	<1
Prunoidoxylon sp.	*Crataegus* (Rosaceae)	<1

The results of the complex comparative study are materialized in the following species identifications which are the fossil equivalents of extant species and this can have a scientific significance which can help to palaeoclimatic and paleoenvironmental reconstruction for the late Miocene in this region. The list of identified plants is short, but new collection is still in study.

Anyway the presence of *Tetraclinoxylon* and of *Lithocapoxylon* in list still confirm a quassi-mediterranean climate maybe with some steppic influences from the Russian Platform in condition where the Dacian Basin retired southward leaving behind a fluvial-deltaic plain.

In conclusion pioneering vegetation was installed, rarely found as petrified remains.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Neogene palaeovegetations of China and the development of the winter monsoon

Frédéric M.B. Jacques, Gongle Shi, Wei-Ming Wang

Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 39 East Beijing Road, 210008 Nanjing, PR China. E-mail: frederic.jacques@nigpas.ac.cn

Palaeovegetations are important for palaeoenvironment reconstructions because they shape the biomes. Chinese Neogene is a key period for the establishment of the modern Chinese climates as it corresponds to the development of the summer and winter monsoons. Among the quantitative and semi-quantitative methods for palaeovegetation reconstruction, the Integrated Plant Record (IPR) vegetation analysis starts to be quite routinely used for Eurasian Neogene palaeovegetations.

During the IPR analysis, each fossil taxon, whatever the organ preserved and its proportion in the assemblage, is assigned to a component reflecting its taxonomy and its autecology. The type of palaeovegetation is reconstructed according to the proportion of the different components. Spatial interpolations allow the reconstruction between fossil sites. Our study focused on the Chinese Neogene fossil sites.

During the Neogene, we observe a clear latitudinal gradient in broad-leaved deciduous components and broad-leaved evergreen components: evergreen taxa are replaced northwards by deciduous taxa. The forests change from broad-leaved evergreen to mixed-mesophytic, and to broad-leaved deciduous on a south-north gradient. Even if latitudinal temperature gradient might have been smaller in warm periods, this gradient was strong enough during the Neogene to create a vegetation latitudinal gradient in China.

During the Pliocene, there is an increase in the proportion of herbaceous taxa in Tibet, Central and North-East China. This clearly indicates the development of more opened vegetation, and correlate with the development of loess deposits. The replacement of former deciduous forest by more opened vegetation is the sign of an aridification. This aridification is not visible in South China, where other proxies indicate an increase in the summer monsoon.

Therefore, the aridification in northern China is linked with an increase in the winter monsoon. The increase of the winter monsoon is correlated to the cooling at high latitudes and the development of a northern pole ice cap.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Tortonian small-scale vegetation dynamics within a solar-cycle influenced lake-environment

Andrea K. Kern[1], Mathias Harzhauser[1], Ali Soliman[2], Oleg Mandic[1], Werner E. Piller[2]

[1] *Natural History Museum Vienna, Geological-Palaeontological Department, Burgring 7, 1010 Vienna, Austria*
e-mail: andrea.kern@nhm-wien.ac.at

[2] *University of Graz, Institute for Earth Sciences, Heinrichstrasse, 26, 8010 Graz, Austria*

Recent studies of mainly Holocene sediments often report a strong connection between environmental changes and the amount of energy from the sun reaching the Earth. Cycles with periodicities around approximately 88, 208, 500 or 1000 years have been detected in different proxy data all around the world, fitting well to regular changes of solar radiation. Further back in Earth's history, such signals are still scarcely detected, especially due to the lack of an appropriate time resolution.

Therefore, we focus on high-frequency records of different environmental indicators within sediments of the long-lived paleo-lake Lake Pannon in the Vienna Basin. Decadal to centennial scale cyclicities were already highly presumed for this ancient lake system and can now be verified by 600 data-point measurements of gamma-ray and magnetic susceptibility with a sample density of 1 cm, representing approximately one decade of time.

The oscillations in the data series show a good fit with the durations of solar cycles such as the 1000-year and 500-year cycles as well as with the deVries/Suess cycle (208 years) and even the Gleissberg cycle (88 years).

In a next step we try to correlate these cycles with environmental shifts in relation to Lake Pannon. Pollen and spores indicate vegetation change, dinoflagellate cysts give information on lake level changes, water chemistry and nutrient content, and ostracodes record bottom water conditions.

These data are analyzed in the same sample resolution of 1 cm for a shorter interval of 150 cm/samples representing roughly 2000 years of Tortonian time. Shifts within the assemblages are present, showing generally a transgressive signal; though, further analysis is needed to interpret distinct changes.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

An integrated Approach in Palaeoclimate Analysis based on selected Miocene Floras - a case study.

Kováčová Marianna[1], Utescher Torsten[2,3], Teodoridis Vasilis[4], Kvaček Zlatko[5] & Kučerová Jana[1]

[1] *Comenius University, Faculty of Sciences, Dept. of Geology and Palaeontology, Mlynska dolina, SK-842 15 Bratislava, Slovak Republic, mail:* kovacova@fns.uniba.sk

[2] *Steinmann Institute, Bonn University, 53115 Bonn, Germany*

[3] *Senckenberg Research Institute, 60325 Frankfurt a. M., Germany*

[4] *Department of Biology and Environmental Studies, Faculty of Education, Charles University in Prague, M.D. Rettigové 4, 116 39 Prague 1, Czech Republic*

[5] *Faculty of Science, Charles University, Albertov 6, 12843 Praha 2, Czech Republic*

In an integrated approach we studied leaves and pollen floras from Slovak Republic and interpreted palaeoclimate using CLAMP and CA. One of the studied flora comes from the Late Badenian locality Nováky (Hornonitrianska Kotlina Depression, Slovakia) and have been identified on the basis of comparative morphology. The determined flora consists of 38 determined taxa.

Three partial ecological associations representing different habitats were distinguished. Slope association is represented by *Ailanthus confucii, Daphnogene polymorpha, Carpinus grandis, Zelkova zelkovifolia, Betula* sp. and *Vitis strictum*. Back swamp association includes *Glyptostrobus europaeus, Acer tricuspidatum, Salix varians* and *Myrica* sp. Wet soil association is represented by *Ulmus* sp.*, Alnus julianiformis, Fagus sp., Fraxinus sp., Populus populina, Byttneriophyllum tiliaefolium, Liquidambar* sp. and *Cercidiphyllum crenatum*. The characteristics of the flora have been studied (NLR) and palaeoclimatic estimates using the leaf physiognomy (CLAMP) were obtained. The vegetation corresponds to broad-leaved forest suggesting subtropical humid conditions.

The CLAMP analysis predicted climate parameters for the locality Nováky (Late Badenian) as follows: mean annual temperature (MAT): 14.47°C, warm month mean temperature (WMMT): 21.88°C, cold month mean temperature (CMMT): 7.87°C, length of the growing season (GROWSEAS): 8.27 months, mean growing season precipitation (MGSP): 165.43 mm, mean monthly growing season precipitation (MMGSP): 18.82 mm, precipitation during the three wettest months (3WET): 89.37 mm, precipitation during the three driest months (3DRY): 22.51 mm, specific humidity (SH): 9.93 g/kg, relative humidity (RH): 77.73 %, Enthalpy (ENTHAL): 32.65 kJ/kg.

Using the CA, 32 taxa were analysed and the main climate parameters were produced as follows: mean annual temperature (MAT) 15,6-15,7°C (*Engelhardtia* sp. – *Betula papyrifera*), mean annual precipitation (MAP) 897 – 1355 mm (*Liquidambar styraciflua – Vitis vulpina*), the warmest month temperature (WMT) 24,7 – 25,1°C (*Engelhardtia* sp. – *Betula pubescens*) and the coldest month temperature (CMT) 5,0 – 5,1°C (*Engelhardia* sp. - *Betula papyrifera*). In the same way we studied fossil floras from Veľká Čausa (Eggenburgian), Kalonda (Late Eggenburgian – Early Ottnangian), Cígeľ, Lehota (Late Badenian) and compared macro and microfloristic data.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

Altitudinal effects on palaeotemperature reconstruction by use of the coexistence approach based on plant macrofossil assemblages in central Japan

Arata Momohara

Graduate School of Horticulture, Chiba University, Japan, email: arata@faculty.chiba-u.jp

Pleistocene plant macrofossil assemblages in central Japan are often found in fluvial sediment at the distal end of fan developing from mountains. Those assemblages are assumed to include plants derived from higher altitude.

The colder temperature requirement of components in such assemblage would be reflected in the temperature interval reconstructed by using the Coexistence Approach (CA). Decreasing species diversity with the altitude increasing should also influence on the climatic resolution in high altitude fossil sites in glacial stages.

Based on tree composition data of modern vegetation at each 100 m altitude along altitudinal transects between 200 and 2800 m in three mountain areas by Takahashi (1962), I compared the actual temperature (MAT, CMT, WMT, and Warmth Index) at each site with the temperature interval in which all tree taxa distributed in each site can coexist.

Another test was applied to assemblages including all taxa distributed in sites up to the 600 m higher site. Temperature requirements of tree taxa recorded along the transects were estimated based on 100 m scale altitudinal distribution data in local floras in and around Japan with the 1 km mesh altitude – climate database of the Japan Meteorological Agency (2002).

Temperature interval of coexistence expanded with the altitude increasing and the species diversity decreasing. The coexistence intervals extending to warmer temperature than the actual temperature at sites suggest that the warmest (lowermost) limit temperature of plant distribution is more variable, depending possibly on local factors as competition and soil condition, than the coldest limit controlled by the cold tolerance.

In the case of assemblages including taxa up to 600 m higher than the site, the temperature range at the highest coexistence rate deviated to colder value than the actual temperature. The deviation increased with the altitude decreasing.

Middle Miocene flora of Morilor Valley, western part of Dacian Basin and its palaeoclimatic significance

Paraschiv Valentin

Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: paleovaly@yahoo.com

New palaeobotanical data allow us to understand the phytostratigraphy of Sarmatian deposits from the Dacian Basin and to correlate the Morilor Valley paleoflora to those of the synchronous deposits of Transylvanian Basin, Pannonic Basin and Moldavian Platform.

The extant relationships of plant megafossils described in this study provide clues to the palaeoenvironment of western Dacian Basin during the middle Miocene.

The palaeoenvironment may have been warm-temperate accommodating subtropical to cool temperate plant species. The probable climatic character corresponds to the recent climate zone Cfa in the sense of Köppen.

Vegetation and palaeoclimate in the western Carpathian Foredeep during Middle Miocene

Paraschiv Valentin

Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: paleovaly@yahoo.com

The palaeovegetation has been reconstructed based on the presence and frequency of leaves, fruits and seeds assemblages for the sites studied within the basin. The middle Miocene reconstructed vegetation in the western Carpathian Foredeep can be interpreted as an mosaic of habitats affected by continued replacement of the dense evergreen forest by deciduous forest and shrubland.

Exotic elements continued to disappear, tropical elements decreased, warm-temperate deciduous forest expanded at low and middle elevations, and montane coniferous forest developed further in the highlands. The main vegetational units display a pronounced altitudinal distribution and are best comparable with the Mixed Mesophytic Forest Formation and Broad-leaved Deciduous Forest Formation which co-dominate the Miocene forests of Europe. Regional refugias for rare and relict taxons (*Eostangeria, Berberis, Mahonia, Matudaea, Cedrelospermum, Celtis, Hydrangea, Hedera, Periploca*) are documented and demonstrate a complex history of the Miocene age vegetation.

The palaeoclimate induced by plant assemblages testify warm-temperate humid conditions with a greater seasonality of climate and significant but gradual drying on the late Miocene time.

Reconstruction of Cenozoic vegetation patterns of Western Siberia and the Far East of Russia based on diversity studies of plant functional types

Svetlana Popova[1], Angela A. Bruch[3], Louis François[2], Dmitry Gromyko[1], Elena Herzog[4], Volker Mosbrugger[3,4], Torsten Utescher[3,4,5]

[1] *Laboratory of Palaeobotany, Komarov Botanical Institute of RAS, 197376, 2, Prof. Popova str., Saint Petersburg, Russia, email:celenkova@gmail.com*

[2] *Unité de Modélisation du Climat et des Cycles Biogéochimiques (UMCCB), Université de Liège, Bât. B5c, Allée du Six Août 17, B-4000 Liège (Belgium)*

[3] *Senckenberg Research Institute und Nature Museum, Senckenberganlage 25 D-60325 Frankfurt am Main (Germany)*

[4] *LOEWE - Biodiversity and Climate Research Centre (LOEWE BiK-F), Senckenberganlage 25 D-60325 Frankfurt am Main (Germany)*

[5] *Steinmann Institute, University of Bonn, Nussallee 8, D-53115 Bonn (Germany),*

In the present study ca. 148 Cenozoic carpofloras from Western Siberia (WS) and the Far East of Russia (FE) (Nikitin, 2006) are analysed with respect to diversity of plant functional types (PFTs). The available stratigraphical data allow for consideration of 10 time different slices covering the period from the middle Eocene to late Pliocene.

The PFT classification we use comprises a total of 26 herbaceous to arboreal functional types (Francois et al., in prep.) as well as an aquatic component. In applying a method described in detail in Utescher et al. (2007), diversity spectra are obtained for the fossil floras that can be interpreted in terms of vegetation. Spatial and temporal diversity patterns are shown in series of maps and in composite records for 4 key regions (WS North, WS South, FE East, FE West).

According to our first data, the diversity spectra obtained for the carpofloras reflect not only local, edaphic conditions, but also regional and global signals. The local signal is primarily expressed in the diversity of the aquatic component being highly variable and hence excluded from further analyses. In the WS key regions, the mesophytic herbaceous PFT shows a very significant, steady increase, from ca. 10 % of total diversity in the late Eocene to over 50 % in the early Pliocene, whereas diversity of arboreal PFTs declined.

In the FE, in contrast, arboreal diversity stayed at a high level from the late Oligocene on while and herbaceous PFTs did not exceed 15 %. The increase of mesophytic herbs observed in WS represents a regional signal, reflecting the opening of landscapes in the continental interior of Eurasia and the phylogenetic evolution in primarily herbaceous plant families. The diversity proportion of thermophilous evergreen broadleaved vs. deciduous shrub and tree PFTs shows a step-wise decline from the middle Eocene on, thus reflecting the global cooling trend.

Higher diversities of evergreen broadleaved PFTs in the middle Miocene of the WS South key region can be related to the warm phase of the Mid-Miocene Climatic Optimum (cf. Popova at al., in press), while in WS North, broadleaved evergreen trees occurred for the last time in the early Miocene.

In the FE, diversity proportion of thermophilous broadleaved evergreens first declined from the late Oligocene to middle Miocene, thereafter an increase is recorded culminating in the early Pliocene supposed to represent a comparatively warm phase in the high latitudinal Pacific realm (e.g., Matthiessen et al., in press).

Studies on detailed, regional patterns are in progress. [Bik-f (E. 1.12 R80573)].

References

François, L., Erdei, B., Favre, E., Henrot, A., Mosbrugger, V., Suc, J.-P., Utescher, T., in prep. Vegetation reconstruction for the Miocene of Eurasia using the CARAIB dynamic vegetation model and validation with proxy data.

Matthiessen, J., Knies, J., Vogt, C., Stein, R., in press. Pliocene palaeoceanography of the Arctic Ocean and subarctic seas. Philosophical Transactions of the Royal Society A. doi:10.1098/rsta.2008.0203.

Nikitin, V.P. 2006. Palaeocarpology and stratigraphy of the Paleogene and the Neogene strata in Asian Russia. Novosibirsk.

Popova, S., Utescher, T, Gromyko, D., Bruch, A.A., Mosbrugger, V., in press. Palaeoclimate Evolution in Siberia and the Russian Far East from the Oligocene to Pliocene–Evidence from Fruit and Seed Floras. Turkish Journal of Earth Sciences.

Utescher, T., Erdei, B., Francois, L., Mosbrugger, V., 2007. Tree diversity in the Miocene forests of Western Eurasia. - Palaoegeography, Palaeclimatology, Palaeoecology 253, 226-250.

The Neogene climate response to the Gulf Stream intensity – Results for the Miocene.

Felix T. Portmann[1], Arne Micheels[1], Volker Mosbrugger[1,2], Madelaine Böhme[3]

[1] *LOEWE - Biodiversity and Climate Research Centre (LOEWE BiK-F), Senckenberganlage 25 D-60325 Frankfurt am Main (Germany) E-mail: felix.portmann@senckenberg.de ;*

[2] *Senckenberg Research Institute und Nature Museum, Senckenberganlage 25 D-60325 Frankfurt am Main (Germany);*

[3] *Tuebingen University Institute for Geoscience Sigwartstr. 10 72076 Tübingen, Germany.*

The meridional overturning circulation in the Atlantic Ocean and, hence, the northward ocean heat transport intensified in the Neogene, not least because of an open Central American Isthmus.

However, the effect of a weaker-than-present ocean circulation on climate on either side of the North Atlantic is still an open issue, especially with regard to the Neogene climate cooling.

We present results of climate modelling sensitivity experiments, which focus on the climate response to different heat transports in the North Atlantic Ocean using an earth system model of intermediate complexity.

The sensitivity experiments are designed for Miocene and for present-day conditions. The analysis of the model results aims at the differences in the climatic gradients and possible teleconnection patterns.

In order to validate the model results and to figure out the climatic relevance of heat transport changes in the Neogene, we will compare the model scenarios with the terrestrial fossil record as a further step in the recently started research project.

Climate reconstruction of the late Pliocene Zhangcun, Shanxi, China

(Reconstruction on the temperature parameters of the late Pliocene Zhangcun, Shanxi, using the method of Grichuk and his coauthors)

Feng Qin[1], Svetlana Syabryaj[2], Yifeng Yao[1], Jian Yang[1], Jinfeng Li[1], Yufei Wang[1]

[1] *State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, China; E-mail: wangyf@ibcas.ac.cn ;*

[2] *Institute of Geological Sciences, National Academy of Sciences of Ukraine, Kiev 01601, Ukraine.*

To reconstruct the Cenozoic climate changes in the terrestrial ecosystem, different quantitative bio-methods, e.g. the Climate Leaf Analysis Multivariate Program (CLAMP) and the Coexistence Approach (CA), have been developped. The method of Grichuk and his coauthors (MG) is another one among those of quantitative bio-methods.

Here we reconstructed the Late Pliocene temperate parameters of Zhangcun, Shanxi Province applying MG, based on our palynological assemblage published. The Zhangcun site is located on the eastern edge of the Chinese Loess Plateau, and falls in the modern Chinese warm temperate monsoon zone. The studied profile is in the middle to upper part of the Zhangcun Formation and is dated from 2.77 Ma to 2.52 Ma.

The Zhangcun palynoflora we published contained 63 palynomorphs assigned to 50 families, covering angiosperms (49 types of palynomorphs), gymnosperms (7 types of palynomorphs), pteridophytes (5 types of palynomorphs) and algae (2 types of palynomorphs). The MG results show that the mean annual temperature (MAT) ranges from 8.7 - 18.3°C, the mean warmest monthly temperature (MWMT) 20.4 - 27.0°C, the mean coldest monthly temperature (MCMT) -3.0 - 9.5°C, the temperature difference between coldest and warmest months 10.9 -30.0°C. The find indicates a much warmer climate than today (MAT 8.8°C, MWMT 22.4°C, MCMT -6.8°C) in the Late Pliocene Zhangcun area.

At the same time, the temperature ranges estimated by MG are close to those by CA although the ranges by MG are wider than those by CA, which might be caused by applying the different methods and referring to the different data on the distributions of the nearest living relatives of fossil taxa.

Wiemann et al.'s numerical model for reconstructing palaeoclimate based on angiosperm wood: case study of Neogene Rauscheröd and Palaeogene Helmstedt (Germany)

Jakub Sakala

Charles University in Prague, Faculty of Science, Institute of Geology and Palaeontology, Albertov 6, 128 43 Praha 2, Czech Republic, E-mail: rade@natur.cuni.cz

The numerical model developed by Wiemann et al. (1998, 1999) represents a very useful tool for reconstructing palaeoclimate based on angiosperm wood. Its applicability is however constrained by the fact this model requires more wood types than usually are present at a single locality.

In the Tertiary of Europe, there are two localities, exceptionally rich in fossil angiosperm wood: Early Miocene Rauscheröd and Late Eocene Helmstedt. Rauscheröd has 22 species (or 16 wood types) of angiosperm wood which were analyzed using both Coexistence Approach (Böhme et al. 2007) and Wiemann et al.'s model (Sakala 2007).

On the other hand, Helmstedt, which contains 23 morphogenera of fossil angiosperm wood described by Gottwald (1992) and probably represents the richest site in Europe, has never been analyzed so far.

The present study provides the first results of an application of Wiemann et al.'s model on Helmstedt xyloflora.

This research is supported by the grants GA205/08/0643 and MSM0021620855.

References:

Böhme, M., Bruch, A. A. and Selmeier, A. (2007): The reconstruction of Early and Middle Miocene climate and vegetation in Southern Germany as determined from the fossil wood flora. Palaeogeography, Palaeoclimatology, Palaeoecology 253, 91–114.

Gottwald, H. (1992): Hölzer aus marinen Sanden des Oberen Eozän von Helmstedt (Niedersachsen). Palaeontographica, B 225, 27–103.

Sakala, J. (2007): The potential of the fossil angiosperm wood to reconstruct the palaeoclimate in the Tertiary of Central Europe (Czech Republic, Germany). Acta Palaeobotanica 47, 127–133.

Wiemann, M. C., Manchester, S. R. and Wheeler, E. A. (1999): Paleotemperature estimation from dicotyledonous wood anatomical characters. Palaios 14, 459–474.

Wiemann, M. C., Wheeler, E. A., Manchester, S. R. and Portier, K. M. (1998): Dicotyledonous wood anatomical characters as predictors of climate. Palaeogeography, Palaeoclimatology, Palaeoecology 139, 83–100.

Plio-Pleistocene floras of the Vildštejn Formation, Cheb Basin, NW Bohemia – new reconstructions of vegetation and climate.

Vasilis Teodoridis[1], Angela A. Bruch[2], Elena Vassio[3], Zlatko Kvaček[4] & Edoardo Martinetto[3]

[1] *Department of Biology and Environmental Studies, Faculty of Education, Charles University in Prague, Czech Republic.*
e-mail: vasilis.teodoridis@pedf.cuni.cz

[2] *Senckenberg Research Institute and Natural Museum, Senckenberganlage 25, D-60325 Frankfurt am, Germany*

[3] *Department of Earth Sciences, Torino Univesity, Torino, Italy*

[4] *Institute of Geology and Palaeontology, Faculty of Science, Charles University in Prague, Prague 2, Czech Republic*

Plant assemblages (foliage, fruits and seeds, pollen, wood) obtained from cores and outcrops of the Vildštejn Formation in the Cheb Basin (NW Bohemia) have been known since pioneer studies by Karl Rudolph in 1935 and more systematically evaluated by Bůžek, Holý, Konzalová, Kvaček and Stuchlik in 1982 to 1991.

The fluvio-lacustrine deposits of the Vildštejn Formation have been dated to 4.7-1.4 Ma by palaeomagnetic studies (Bucha et al. 1990) although these data must be taken just as rough estimates (Špičáková et al. 2000).

According to the palaeofloristic analysis (Bůžek et al. 1985), the succession of plant spectra throughout the sections (Vonšov and Nová Ves members) crosses in the upper part of the plant-bearing deposits (Nová Ves clay pit) the Pliocene – Pleistocene boundary as currently accepted (Gauss/Matuyama boundary) and offer analytical datasets of vegetation changes provided by Integrated Plant Record (IPR) vegetation analysis and "Plant Community Scenarios" (PCS) method as well as palaeoclimate development evaluated by methods of Coexistence Approach (CA) and Leaf Margin Analysis (LMA).

The IPR-vegetation method provides information about general zonal vegetation. The results indicate a vegetation transition from Ecotonal vegetation of Mixed Mesophytic Forest / Broad-leaved deciduous forests to Broad-leaved Deciduous forests and show a distinct increasing trend in the abundance of Broad-leaved deciduous components in the Vonšov Mb. and a similar trend for mesophytic and dry herbaceous components in the Nová Ves Mb. The herbaceous component change may indicate increasing openness of the environment.

The PCS method visualizes the local vegetation structure including the azonal component of vegetation. Using only the carpofloras, this application shows a transitional change in the local environment and proves also the above mentioned vegetation trends.

Paleoclimatic signals derived from LMA and CA methods generally show warmer than the present-day temperatures and are comparable to the present precipitation data. Results for the floras of the Vonsov Mb. give values higher than 13 °C for mean annual temperature, winter temperatures above Zero, and an annual precipitation of more than 900 mm.

Data for the Nova Ves Mb. show a decreasing trend in temperatures as well as in precipitation with a mean annual temperature below 11°C and winter temperatures well below Zero in the upper part of the succession. This may indicate the beginning of a cooler phase on the Pliocene/Pleistocene boundary in the Bohemian Massif area.

References

Bucha V., Horáček J., Malkovský M. 1990. Palaeomagnetic stratigraphy of the Tertiary of the Cheb Basin (W Bohemia). Věstník ÚÚG, 65 (5), 267-278.

Bůžek, Č., Kvaček, Z., Holý, F. 1985. Late Pliocene palaeoenvironment and correlation of the Vildštejn floristic complex within Central Europe. Rozpr. ČSAV, Ř. mat.-přír. Věd, 95, 1-72.

Špičáková, L., Uličný, D., Koudelková, G. 2000. Tectonosedimentary Evolution of the Cheb Basin (NW Bohemia, Czech Republic) between Late Oligocene and Pliocene: A Preliminary Note. Studia Geophysica et Geodaetica, 44 (4), 556-580.

Coexistence Approach palaeoclimate reconstructions, based on the taxonomical composition of two macro floras from SW Bulgaria.

Boris Tsenov & Vladimir Bozukov.

Institute of Biodiversity and Ecosystem Research, Bulgaria Acad. Georgi Bonchev Str., Bl. 23, 1113, Sofia, E-mails: boristsenov@abv.bg, vladimir_bozukov@yahoo.com

We made palaeoclimate reconstructions based on the taxonomical composition of two macro floras from SW Bulgaria, using Coexistence Approach method. The two macrofloras are different in age but are located close to each other.

First one originates from the flora bearing sediments of the Sivik Formation (SW Bulgaria). Based on a comparative taxonomical analysis with other palaeofloras from Europe, the age of the sediments has been determined as Middle Miocene (Early Badenian),.

The second fossil macro flora originates from the Baldevo Formation. The age of the Formation is considered to be Late Miocene (Pontian), on the base of the mammal fauna, established in its base layer.

The fact that the two palaeofloras are located close to each other and are different in age, gives us the opportunity to compare the palaeoclimate data, derived on the base of their taxonomical compositions and make an assumption about the development of the climate parameters on this territory during the Middle to Late Miocene period.

Preliminary data show a climate change tendency from subtropical to warm temperate climate (MAT at about 15.5°C for Middle Miocene to at about 13.7°C for the Late Miocene).

Palaeoclimatic estimations from Miocene of Romania, based on palynological data

Daniel Țabără & Gabriel Chirilă

„Al. I. Cuza" University of Iaşi, Department of Geology700506, Iasi, Romania;
E-mails: tabara_d@yahoo.com , gabriel.chirila@uaic.ro

Few climatic parameters available for the stratigraphic interval between Aquitanian – Pontian from Romania, have been obtained after analysis of the palynological associations using the Coexistence Approach. The results obtained for MAT (mean annual temperature), MAP (mean annual precipitations), WMT (mean temperature of the warmest month), CMT (mean temperature of the coldest month), have been synthesised and palaeoclimatic diagrams have been plotted, revealing visible climatic fluctuation for the analysed interval. Palaeoclimatic curve was calculated for Dacian Basin, covering the southern and eastern part of Romania and Transylvanian Basin (Central-Western area of the country).

The lower part of Miocene shows a slight increasing of the palaeoclimatic parameters compared with the end of Oligocene, to a MAT value of 18,4°C during sedimentation of Gura Şoimului Formation (Slănic-Oituz Half-Window). In Transylvanian Basin, the highest values of MAT (approximately 17,8°C) and MAP (approximately 1353 mm) have been calculated for Borod area with Burdigalian age. The microflore from Middle Miocene deposits of Dacian Basin from South Dobrogea (Gherghina and Țibrinu) indicate a value of MAT between 15,6 – 17,2°C and MAP of 897 – 1281 mm. The Upper Badenian from North-Eastern part of Dacian Basin (Moldavian Platform) indicates a slight increase of MAT to approximately 18°C and a MAP between 897 – 1520 mm.

The Lower Sarmatian from the same area shows a decrease of MAT with approximately 1,5°C compared with Badenian values. Palaeoclimatic values at the beginning of the Upper Miocene come from the interpretation of a microflore from Moldavian Platform. The climatic parameters of Upper Bessarabian have approximately similar values to those identified in the upper part of the Middle Miocene. The MAT value was 16.4 – 17°C, MAP was between 1052–1234 mm, CMT between 5.8 to 8.7°C and WMT values was 26.5°C. Palaeoclimatic estimation of Pontian deposits come from microflora assemblage of South-Western part of Romania.

Therefore the values calculated for these deposits are: MAT of approximately 16.4 – 17.2°C, MAP coexistence interval of 1162-1355 mm, CMT value was 5.8°C and WMT about 26°C.

Acknowledgements. The authors thank Dr. Torsten Utescher (Steinmann Institute, Bonn University) for providing values of coexistence intervals for palynological taxa used in the palaeoclimatic estimations presented in this paper.

ANUARUL INSTITUTULUI GEOLOGIC AL ROMÂNIEI 77

Special Issue

The Neogene' climate from the perspective of the real dynamic (cosmic) cycles of the Earth

Mircea Țicleanu[1], Dorina Nimigean[2]

[1] *Geological Institute of Romania, 1st Caransebeş Street, sect. 1, Bucharest, Romania, e-mail: mircea.ticleanu@yahoo.com*

[2] *Ex - I.P.G.G., 1 Caransebeş Street, Bucharest 32, Romania.*

A good climatic characterization of the Neogene is possible especially by reporting this period to the phases of the real dynamic (cosmic) cycles of the Earth. These cycles are almost without exception climatic cycles with obvious warm and cold phases. In relation to the Neogene's duration (about 22 million years) we have cycles with longer periods and other shorter cycles.

The longest are the universal super-megacycles (with about 2,56 Ga period), followed by the meta-galactic cycles (Vail-Payton cycle, of about 362 Ma), the galactic years (~181 Ma) and the Raup-Sepkoski cycles (~26 Ma). In relation to the universal super-megacycle, the Neogene is placed entirely in his last cold super-phase which started about 950 Ma ago, and with the possible end after about 340 Ma in the future.

In relation with the pulsating meta-galactic cycle (Vail-Payton cycles), the Neogene is also placed entirely in a phase of expansion of the terrestrial globe which will be finished after about 115 Ma, accompanied by a planetary regression and by the cooling of all shells of the Earth (including the atmosphere). In relation to the last (incomplete) galactic year (starting about 65 Ma ago), the Neogene is placed at the final part of the last galactic winter whose maximum was reached around the Mesozoic/Neozoic boundary.

So, the Neogene is situated before a galactic summer which will begin after about 5 Ma and which will expand over about 90 Ma in the future. In relation with the Raup-Sepkoski cycles in Neogene is placed, about 13,5 Ma ago, a moment of extinction, in the middle of an oligotaxis epoch. This moment was preceded by an eutaxis epoch (placed in Oligocene, about 26,5 Ma ago) and was succeeded by another similar moment placed in time at the Pliocene-Quaternary limit (~ 1,8 Ma ago).

In relation with the climatic cycles with shorter periods than the Neogene duration, the best climatic characterization can be achieved with the climatic phases of the Valach cycle (~ 4.1 Ma). In Neogene 6 (six) warm phases and 5 (five) cold phases of this climatic cycle can be highlighted. The warm phases (of about 2 Ma) are very well illustrated by the coal-generating stages of the Neogene with the following stratigraphical positions: Uppermost Chattian–Lower and Middle Aquitanian, Middle Burdigalian, Middle Badenian, Middle Sarmatian, Middle Pontian and Pliocene.

Using this climatic cycle, whose warm phases can be consistently followed untill Santonian, for a cyclostratigraphical chart of the Neogene will create a more complete climatic model and allow a better understanding of this temporal sequence.

Even before Santonian stage some phases of this Valach climatic cycle can be traced until the Uppermost Ordovician (including the Hirnantian, a cold phase of the Valach cycle). The data concerning the coaly complexes of the Donetz Basin allow us to separate between the upper limit of the Visean and the lower boundary of the Permian 6 (six) warm phases and 7 (seven) phases of the Valach climatic cycle. They correspond stratigraphicaly to the Namurian (A, B and C), to the Westphalian s. str. (A, B, C and D) and to Stephanian. Also, the so called glaciation from the upper part of the Valanginian (Groke, 2005) is simply only a cold phase of this climatic cycle. Note also that between the warm phases of this cycle that led to the very well individualized coal-generating stages in Santonian and Thanetian (Upper Paleocene) the favorable effects of the warm phases of this cycle do not lead to significant coaly deposits, due to the last galactic winter.

It is also remarkable the good representation of the coaly facies of the Paleogene deposits of the north-western part of the Transylvanian Basin. These reflect the coal-generating stages stratigraphicaly placed in Uppermost Eocene (Priabonian)-Lowermost Oligocene (Curtuiuş Beds), in Middle Rupelian (Lower Cetate Beds), in Lower Chattian (the upper horizon of the Zimbor Beds) and also in Uppermost Oligocene-Lower and Middle Aquitanian (Sânmihai Beds), the last equivalent to the coaly complexes of the Petroşani Basin.

The climatic characteristics of this cycle could be explained by the possible cause of this cycle: pulsations of the Solar System. To note in this context that the Quaternary Ice Age is the last cold phase of the Valach climatic cycle. Also it is important to note that the salinogene stages of the Miocene are synchronous with the coal-generating stages within the same interval of time (therefore reflecting the warm phases of the Valach cycle, but linked to the lagoon environment and to a dry and warm climate).

Regarding this climatic cycle it is also very important to note that the temporal level which coincides with the lower limit of the Santonian stage, placed at 85,8 Ma in the past, corresponds to a milestone. This lower limit of a warm phase of the Valach climatic cycle allows, using the period of this cycle of about 4,1 Ma, to check the viability of the Valach cycle in the past at least to the end of the Ordovician and, in more recent times than Santonian, till the last phase of this cycle (the Quaternary Ice Age), with its beginning placed at about 1,75 Ma ago. For the climatic characterization of the Neogene it is also important to consider the classical cycle with small periods of time like the short cycle of orbital eccentricity (with about 100,000 years duration) and the precessional cycles.

The first is very well reflected by the main coal strata of the Neogene coaly complexes and the warm phases of the precessional cycles are reflected by the main banks of these coal seams. But take notice that for all the Neogene (prior to about 40,000 years ago) the period of the precessional cycle was only about 14,000 years, so much smaller than the duration of the new precessional year of about 26,000 years.

Is also obvious that the cold phases of these cycles can be correlated with the deposits without coals developed between the main coal strata and between the main banks of the same coaly complexes of the Neogene.

Regarding the most favorable epochs for the development of plant masses leading to the formation of the Neogene coal seams it is possible to assert that these strata reflect simultaneously the effects of at least two warm phases of different climatic cycles.

So, for example, the main coal seams of the Pliocene coaly complex reflect on the one hand the last warm phase of the Valach climatic cycle and on the other hand the warm phases of the short cycles of orbital eccentricity. And, against, the Pleistocene glacial stages (or phases) reflect on the one hand the last cold phase of the Valach climatic cycle (the Quaternary Ice Age) and on the other hand the cold phases of the short cycles of orbital eccentricity.

The essential role of the cyclo-stratigraphical studies of the coal-bearing formations for the outlining of the real climatic cycles of the Earth

Mircea Țicleanu[1], Marian Munteanu[1], Radu Nicolescu[1], Ion Gheuca[1] & Adriana Ion[1]

[1]Geological Institute of Romania, 1 Caransebes street, 012271, Bucharest 32, Romania, e-mail: mircea.ticleanu@yahoo.com

This paper sustains with some representative examples the special importance of the sequential analyses concerning the coal-bearing deposits which make possible especially the underlining of the climatic character of all dynamic cycles of the Earth. We put special focus on the outlining of the warm phases of the galactic year (ca. 180 Ma) in correlation with the occurrence of the coaly complexes of the Upper Paleozoic (Carboniferous-Lower Permian) and of Mesozoic (Jurassic-Lower Cretaceous), but also with the possible connection between the Precambrian graphitic facies and the galactic summers of the Proterozoic.

A summary of the cyclo-stratigraphic analysis of the Carboniferous (Pennsilvanian) deposits of the Donets Basin suggests the effectiveness of the warm phases of a climatic cycle previously defined by us in the Paratethys area, only for the Santonian-Pliocene interval (the Valach or Walachian climatic cycle with a period of about 4.1 Ma).

We remind the very good connection between the last cold phase of this cycle and the Quaternary Ice Age, but also the correspondence among the warm phases of the short cycle of orbital eccentricity (with ca. 100,000 years period) and the main coal seams of the Neogene coaly complexes.

In this context it also is necessary to take into account in the sequential analyses that, for times older than 40 ka BP it is possible to use only the period of the old precessional cycle (ca. 14,000 years). Also, this paper looks at the sequential analyses concerning the coal-bearing deposits as a cyclo-stratigraphical study by means of the absolute age of all geological limits implied and on the temporal content of all climatic cycles reflected by the sequenses with coal strata.

Analysis of Cenozoic biodiversity and climate gradients on both sides of the North Atlantic – estimating Gulf Stream intensity from continental proxies. First Results

Torsten Utescher[1,2,3], Madelaine Böhme[4], Arne Micheels[1,2], Volker Mosbrugger[1,2] & Felix Portmann[1,2].

[1] *Senckenberg Research Institute and Natural History Museum, Senckenberganlage 25, 60325 Frankfurt/Main, Germany;*

[2] *Biodiversity and Climate Research Centre (LOEWE BiK-F), Senckenberganlage 25, 60325 Frankfurt/Main, Germany;*

[3] *Steinmann Institute, University of Bonn, Nußallee 8, 53115 Bonn, Germany, e-mail: utescher@geo.uni-bonn.de;*

[4] *Senckenberg Center for Human Evolution and Paleoecology (HEP), Institute for Geoscience, University of Tübingen, Sigwartstr. 10, 72076 Tübingen.*

At present, the Gulf Stream is a main factor causing milder, maritime climates for Western and Northwestern Europe when compared to conditions in North America at the same latitude. Actually, the topic is very active and a slowing-down or cessation of the thermohaline circulation in the North Atlantic and its consequences for Western Europe are discussed within the context of future climate change.

To study the impact of a reduced intensity of the Gulf Stream we analyse past continental climate and biodiversity patterns in various Cenozoic time slices within 2 transects on both sides of the North Atlantic.

Our study includes quantitative palaeoclimate reconstruction from the palaeobotanical record using CA (Coexistence Approach) and CLAMP (Climate Leaf Analysis Multivariate Program), analyses of diversities of plant functional types and model experiments.

First results based on a total of ca. 250 fossil floras of an Eocene and two Miocene time slices indicate that in both transects studied, longitudinal temperature gradients do not show the pointed difference in steepness presently observed and primarily related to northward heat transport by the Gulf Stream.

On the other hand it is shown that mid- and higher latitude floras from the European transect had a more thermophilous aspect and tend to reveal higher temperatures when compared to North American floras of comparable latitude.

Modelling experiments are under way to study potential mechanisms of northward heat transport in times of a weak Gulf Stream. [grant: DFG MI 926 / 8-1]

Miocene Paleoclimate and Paleovegetation of the Yenice Kalkım Basin From Northwestern Turkey

Sariye Duygu Üçbaş[1], Mehmet Serkan Akkiraz[1] & Funda Akgün[2]

[1] *Department of Geological Engineering, Dumlupınar University, 43270, Kütahya, Turkey.* Email: s.duyguucbas@dpu.edu.tr

[2] *Department of Geological Engineering, Dokuz Eylül University, 35160, Buca, İzmir, Turkey*

The study area is situated in the northwestern part of Turkey in the southern of Çanakkale on the Biga Peninsula (NW Turkey). Three lignite-bearing basins with different sedimentary history may be distinguished there, such as the Lapseki-Biga Basin, the Çan-Etili Basin and the Yenice-Kalkım Basin. Cenozoic volcano-clastic sediments of the Yenice Kalkım Basin unconformably overlie the basement originated from the İzmir-Ankara and Sakarya sture zones, and constitute from bottom to top as the Hallaçlar Volcanics, Soma Formation, İlyasbaşı Formation and Bayramiç Formation.

The Miocene Soma Formation, which is the main subject of this study, start with thick lignite seams at base, and continues upward with fine-grained sediments and pyroclastics. Lignite seams with gypsum and sulphur, fine-grained sediments and volcanic levels also occur in the upper parts of the Soma Formation.

In this study, totally 9 stratigraphical sections were measured and palynologically sampled. Palynological assemblage is mainly made up of coniferous forest and riparian vegetation elements. Mixed mesophytic and broad-leaved forests are in low percentages. Water plants, swamp and herbaceous plants are represented by minor percentages.

Coniferous forest predominantly includes Pinaceae, Taxaceae and Cupressaceae. *Pinus, Pinus* haploxylon type, *Cedrus, Cathaya and Podocarpus* represented by low persentages accompany to the coniferous forest. Riparian vegetation is mainly made up of *Alnus* and *Platanus/Salix.* In this belt, *Zelkova, Carya, Pterocarya, Liquidambar and Ulmus* also occur. Mixed mesophytic forest is determined by evergreen *Quercus, Quercus spp. and Fagus. Also Carpinus, Cycas, Acer, Corylus, Oleaceae, Betula, Tilia, Phillyrea, Ilex* and Juglandaceae have been observed within this environment. Broad-leaved forest consists mainly of Engelhardia, Cyrillaceae-Clethraceae and Castanea. Swamp forest plants are chiefly represented by Taxodiaceae Nyssa and Myrica.

Quantitative palaeoclimate results on the basis of palynological assemblage range from 16,5 to 18,4 °C for the mean annual temperature, 5,5 to 12,5 °C for the temperature of the coldest month, 27,3 to 27,9 °C for the temperature of the warmest month. Mean annual precipitation changes between 1122 and1355 mm. The climate results obtained are compared with the coeval sediments in western Turkey.

Monsoon climate: different development and influence on the Late Cenozoic floras in Japan and East China

Wei-Ming Wang

Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008, China.

E-mail: wmwang@nigpas.ac.cn

Floristically, East China and Japan belong to the East China-Japan Forest Floral Subregion. Some well represented Tertiary plants, such as *Keteleeria, Glyptostrobus, Carya, Liquidambar*, etc. in Japan, are currently only growing in China.

A comparative study on the Neogene pollen floras shows that the early stage of the Neogene floras in Japan are mostly comparable with these in North China. Both floras are represented by coniferous and amentiferous elements in high values, followed by a distinctive floral flourishing period at the late Early Miocene-early Middle Miocene.

Since the Middle Miocene (ca. 14 Ma), the flora in Japan has undergone a prevailing marine condition, characterized by the fluctuated occurrence of Taxodiaceae, Picea, Tsuga, evergreen Quercus and now-extinct Tertiary types, while the one in North China under an ever intensified continental condition resulting in the rise of land herbs. Some important events, such as the complete opening of the Sea of Japan beginning at about 16 Ma ago, the initiation of Kuroshio, and the Middle Miocene climatic cooling, are closely related with the changes.

It is suggested that both places were under the control of an intensified summer monsoon climate, accompanied with a gradual climatic resuming process in the Early Miocene, followed by a period of “Mid-Neogene climatic optimum” in the late Early-early Middle Miocene. Subsequently, the climate in North China underwent a gradually intensified winter monsoon with a tendency of becoming dryer and cooler, while the climate in Japan was modified by the marine condition susceptible to the global changes and experienced a constant humid condition.

Stratigraphic distribution of plant macrofossil shows a gradually extinction of Tertiary plant types in the Pliocene-Pleistocene of Central Japan. It is deduced that these extinct events are closely related with the global climate cooling, racial crustal movement, formation of the modern mountain system, and frequent volcano activities, etc.

This work was supported by the Pilot Project of Knowledge Innovation, CAS (KZCX2-YW-155), and the National Science Foundation of China (40730210/40872014).

Stomata densities of *Quercus pannosa* change over altitudinal gradient in Himalayas and its use in the reconstrucation of paleoaltitude

Zhou Zhekun Xing[1], Yaowu Su Tao[2], Huang Yongjiang[2] & Hu Jinjin[2]

[1] *Xishuangbannan Tropical Botanical garden(XTBG), Chinese Academy of Science (CAS). E-mail: zhouzk@xtbg.ac.cn*

[2] *Key laboratory of Biodiversity and Biogeography - Kunming Institute of Botany, Chinese Academy of Science*

The observation that changes in atmospheric CO2 partial pressure have led to changes in stomatal density provided proxy to reconstruct pale-elevation in geological time by counting stomatal density from the fossil leaves.

Quercus pannosa is a middle sized tree which is widely distributed from 2500 to 4500 m in Himalaya region. A lot of fossil leaves were found from Neogene in the same region. *Quercus pannosa* has been identified as the nearest living relative of those fossils.

Variations of stomata of this species among altitudinal gradient were reached in order to found the relationships between stomatal and venation density with CO2 density and reconstruct paleo-CO2 density.

Stomatal density increase with altitude in *Quercus pannosa* from 565 to 752 /mm2 when altitude increasing from 2500 to 4160 m. However, Stomatal density is sharply decreased from 752 to 539/mm^2, when altitude over 4200 m.

Fossil stomatal density of *Quercus pannosa* were counted. The CO_2 density in Neogene and present-day can be compared. Anthropogenic influence on atmospheric composition can be discussed.

The project is supported by National Natural Science Foundation of China (41030212, 30970206)

Guide of excursion

(From already published papers of the authors)

Iamandei, S., Iamandei E., Paraschiv, V. Diaconu F. & Țicleanu, M.

NECLIME

Description of the itinerary

The field trip itinerary will be as it follows:

Departure from Bucharest at 8:00.

Bucharest – Piteşti (Highway), 126 km.

Piteşti – Râmnicul-Vâlcea – Târgu-Jiu (national road) : 179 Km

Stops:

- **Costeşti - Stop to see the trovants**
- **Horezu – stop for lunch and to see specific ceramics**
- **Slatioara, geological site early Sarmatian plants;**
- **Ciocadia, geological site early Sarmatian plants;**
- **Targu-Jiu – sculptural ensemble of Brâncusi : the Never-ending Column, the Kissing Door, the Table of Silence;**

Târgu-Jiu – Motru (national road), 44 Km for open pit visit in a Pliocene coal deposit.

Motru – Piteşti – Ştefăneşti

Stop for wine testing at Ştefăneşti

Ştefăneşti Bucharest

Regional geology

Authors: Iamandei S., Iamandei E. & Diaconu F.

The Carpathians extend in a geologic system of parallel structural ranges. The Outer Carpathians - whose rocks are composed of flysch - run from near Vienna, through Moravia, along the Polish-Czech-Slovak frontier, and through western Ukraine into Romania, ending in an abrupt bend of the Carpathian arc north of Bucharest.

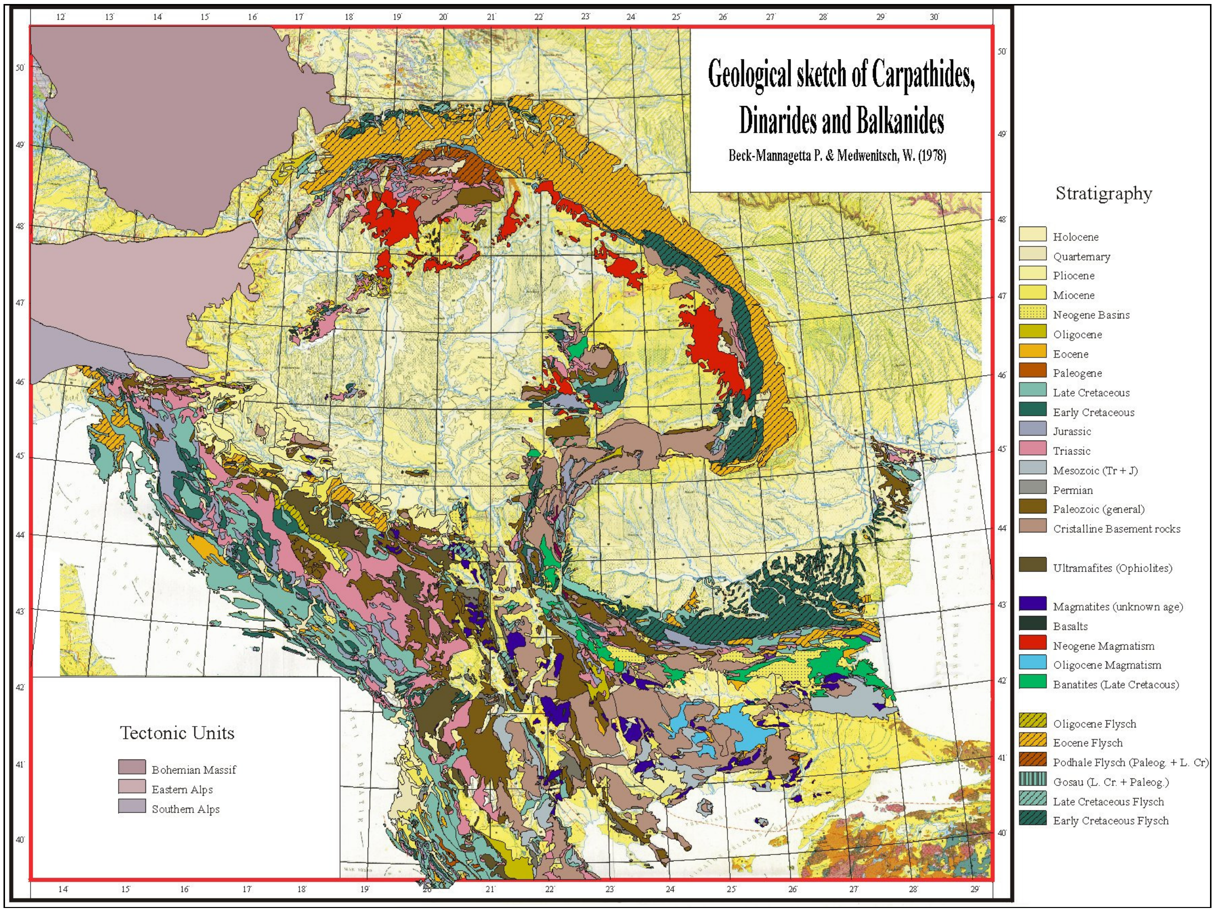


Fig. 1. Geological sketch of Carpathides, Dinarides and Balkanides
From Beck-Mannagetta P. & Medwenitsch, W. (1978): Geology with Tectonics. In: Atlas of the Danubian Countries, ed. by Österreichisches Ost- und Südosteuropa-Institut, Wien, Plate 131.

In this segment of the mountains, a number of large structural units of nappe character (vast masses of rock thrust and folded over each other) may be distinguished. In the eastern part of the Outer Carpathians this fringe is formed by the Skole Nappe, and in the western part it is formed by the Silesian Nappe, both of which are split by the longitudinal central Carpathian depression. Overthrust on the Silesian Nappe is the Magura Nappe, the counterparts of which in the east are the Chernogora (Chornohora) and the Tarcau nappes.

The Inner Carpathians consist of a number of separate blocks. In the west lies the Central Slovakian Block; in the southeast lie the East Carpathian Block and the South Carpathian Block, including the Banat and the East Serbian Block. The isolated Bihor Massif, in the Apuseni Mountains of Romania, occupies the centre of the Carpathian arc. Among the formations building these blocks are ancient crystalline and metamorphic cores onto which younger sedimentary rocks - for the most part limestones and dolomites of the Mesozoic era (245 to 66.4 million years ago) - have been overthrust.

The third and innermost range is built of young Tertiary volcanic rocks formed less than 50 million years ago, differing in extent in the western and eastern sections of the Carpathians. In the former they extend in the shape of an arc enclosing, to the south and east, the Central Slovakian Block; in the latter they run in a practically straight line from northwest to southeast, following the line of a tectonic dislocation, or zone of shattering in the Earth's crust, parallel with this part of the mountains. Between this volcanic range and the South Carpathian Block, the Transylvanian Plateau spreads out, filled with loose rock formations of young Tertiary age.

In Romania, orogenic, or mountain-building, movements took place along the outer flank of the Carpathians until late in the Tertiary period (less than 10 million years ago), producing foldings and upheaval of the sedimentary rocks of the sub-Carpathian depression; the result was the formation of a relatively lower range called the sub-Carpathians adjoining the true Carpathians.

The relief forms of the Carpathians have, in the main, developed during young Tertiary times. In the Inner Carpathians, where the folding movements ended in the Late Cretaceous epoch (97.5 to 66.4 million years ago), local traces of older Tertiary landforms have survived. Later orogenic movements repeatedly heaved up this folded mountain chain, leaving a legacy of fragmentary flat-topped relief forms situated at different altitudes and deeply incised gap valleys, which often dissect the mountain ranges. In this way, for example, the gap sections of the Danube and of some of its tributaries developed.

The last Ice Age affected only the highest parts of the Carpathians, and glaciers were never more than about 10 miles long, even in the Tatras, where the line of permanent snow ran at 5,500 feet above sea level.

Neogene and Dacian Basin

During the Neogene, within the Romanian Carpathians Area, coal deposits were formed within three coal-generating phases: the first phase - developed during the early Sarmatian (Volhinian), the second phase developed during the early-middle Pontian and the third phase, the most important, developed during the Pliocene, in most favorable conditions for the accumulation of vegetal remains created into the Dacian Basin, especially between Danube and Olt river, i.e. Oltenia region.

Over 3 billion tones of brown woody coal (lignite) have been evaluated within this coaly region situated in the western part of the Dacian Basin. Oltenia is the most important late Neogene coaly region (with Motru–Rovinari and Dedovița-Husnicioara-Pinoasa areas), followed by Muntenia (with Schitu-Goleşti area), and with numerous exploitations as mines or open pits (Figure 2). Researches were done and numerous scientific papers were written on the Neogene coals from Carpathian area and on their genesis by: Răileanu (1963), Preda *et al.* (1981), Pauliuc & Barus (1982), Petrescu *et al.* (1987), Barus (1987), Pauliuc *et al.* (1988), Țicleanu (1986a,b, 1992a,b, 1995a,b, 2006), Țicleanu & Andreescu (1988), Țicleanu & Bițoianu (1988, 1989), Țicleanu & Diaconița (1997), Țicleanu *et al.* (1982b, 1985, 1988, 1999, 2001, 2004), Diaconu (2000a,b,c, 2001, 2002b, 2004a,b,c., 2005, 2006a,b,c, 2008).

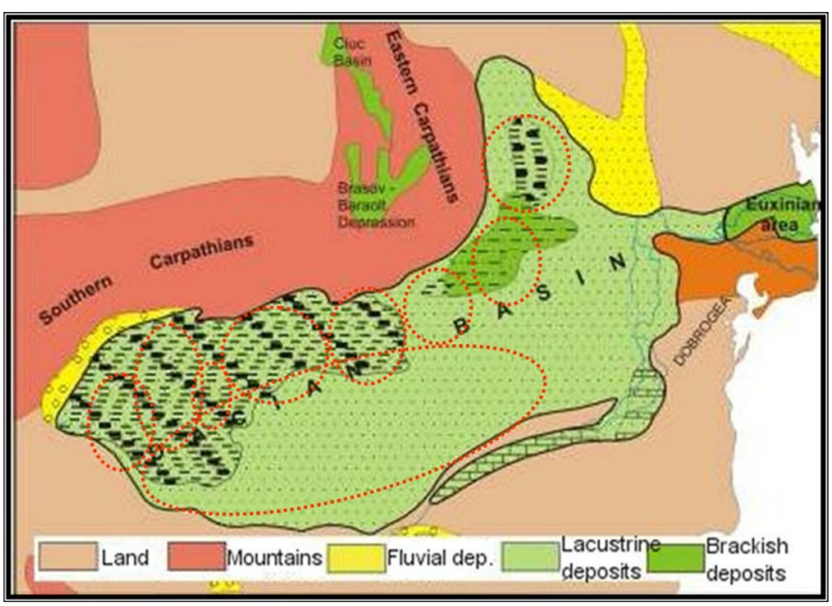


Fig. 2. Areas of the Neogene Coalgeneses within the Dacian Basin
(map after Hamor et al., 1988, with modifications).

Thus, Oltenia region has an extended Pliocene coal-genesis, represented by more than twenty thick lignite seams, some of them largely distributed within the Dacian Basin. They were explored and partially exploited by mining or in open pit, most of them being abandoned now.

Other coal-geneses are poorer. For example some small lenses or decimetric seams of coals were discovered within the sediments from the Maeotian till the Pliocene in the Subcarpathians, in Moldavia region, between the rivers Trotuş and Buzău (Figure 2). Comăneşti area is more important – with Comăneşti, Asău, Dărmăneşti coal deposits – exploited by the mines Comăneşti, Lăloaia, Lapoş, Sălătruc, Larga, Leorda and Vermeşti. Less important is Focşani-Odobeşti area with some occurrences of thin levels of lignites (at Pralea-Căiuți, Gospei-Secu, Reghiu-Poenița or Milcov Valley), and in Buzău area (at Ojasca, Berca, Ariceşti). Also in the Southern Subcarpathians (beside the Schitu Goleşti area which is better developed), some coal seams were mined at Aninoasa, Doiceşti, Şotânga, Filipeştii de Pădure and Ceptura. Almost all of these coal deposits have smaller economic importance (Răileanu 1963; Petrescu *et al*. 1987) and even if they were locally exploited, they were not included in a distinct coal-genetic phase (Țicleanu in Jipa 2006).

During the Pliocene, some intramountainous basins developed within the Carpathians, resulting in coal deposits, locally exploited as those from Braşov-Baraolt (or Bârsei-Baraolt) depression (at Vârghiş, Doboşeni, Căpeni, Baraolt, Herculian, Bățanii Mari, Bodoş-Aita, Vlădeni, Ilieni, Arcuş-Criş Valey, Ghidfalău), and from Bilbor, Borsec and Jolotca small depressions. Nearly all of these coal deposits were subject of local exploitation by mining or quarry, beginning with the 19th century, being now abandoned.

The sediments of all these coal deposits include clayey levels providing fossilized leaves, fruits, seeds and pollen coming from the plants which lived around or in the coal-generating area. Most of the Romanian palaeobotanists focused on these sediments. They realized and published a lot of specialized studies, in an attempt to reconstruct the coal-generating palaeovegetation, the palaeoenvironment, the palaeoclimate and the palaeogeography of those final stages of Neogene: Pop (1936), Barbu (1954, 1960), Givulescu (1967, 1992, 1996), Petrescu & Kolovas (1983), Petrescu *et al*. (1987, 1989a,b), Țicleanu (1986), Țicleanu & Andreescu (1988), Țicleanu & Bițoianu (1988, 1989), Țicleanu & Diaconița (1997), Țicleanu & Paraschiv (2000) Țicleanu *et al*. (1982a, 1985, 1988, 2002, 2004), Iamandei (2000), Iamandei & Iamandei (2000), Diaconu (2000a, 2002a, 2004a, 2007), Diaconu & Țicleanu (2008), Popescu (2001a,b), Popescu *et al*. (2006). A small synthesis of their researches on the Pliocene coals will be included in this paper.

The Dacian Basin, as a remnant of Paratethys, was an important area of sedimentation. Here, especially during Pliocene, ideal environmental conditions were created for the development of vegetation with a great quantitative growing and replacement ratio. This way the basin of accumulation was fed for a long time with vegetal material, within a fluvial, deltaic or lacustrine environment with specific sedimentation. Huge quantities of vegetal material, often mainly a woody one, were accumulated. Periodic catastrophic precipitations can be assumed, at least as a logical explanation for those lignite seams looking like “log deposits”, from Motru-Rovinari area.

Most probably since the Messinian crisis it was not only a regional event within the Mediterranean, but it became a global change. At least within the Carpathians, this interval corresponds with the progressive closing of the Dacian Basin, a part of Paratethys marked by a very important Pliocene coal-generating episode. Also here, during the Pliocene, the palaeoenvironment was rapidly modifying, the Carpathians being an active zone which is still moving. The last Pliocene volcanism was still acting, and the mountains are still arising nowadays. The last small intramountainous basins were filled by sediments, sometimes including variably sized coal levels.

All the observations and the studies done till now on these coal deposits give us an idea not only on the palaeoenvironment and the sedimentation style, but on the vegetation of those times. Unfortunately few palaeoxylotomical investigations were done in these coals in order to clarify the taxonomic composition of the xylitic coal seams (Iamandei & Iamandei 2000).

Dacian Coal Basin History

The Dacian Basin was a part of the late Paratethys (Figure 3). This basin was intensely studied from all points of view, not only because of its huge coal deposits, which were formed during the most important Neogene coal-genesis within the Carpathian area, the Pliocene one. For comparison it might be useful to mention also the previous two coal-geneses on Romania’s territory, in terms of the Romanian scientific literature:

I. The Sarmatian coal-genesis is represented by the early Sarmatian (Volhinian) lignite of the Borod basin (Popa 2000; Petrescu 2003). Also some Volhinian occurrences were described by Țibuleac (2001) in Fălticeni area (at Fălticeni, Boroaia, Bogdăneşti), on the Moldavian Platform (Fig. 1), where a coal-generator peat formed on the parallic plains of the Dacian Basin which had a typical peat vegetation with *Glyptostrobus, Myrica?, Alnus, Salix, Liquidambar* and also with *Phragmites* and *Typha*. Even if the biotic and climatic conditions were convenient, the tectonic and palaeogeographic conditions were not too favorable and therefore few coal seams of reduced thickness and extension were formed.

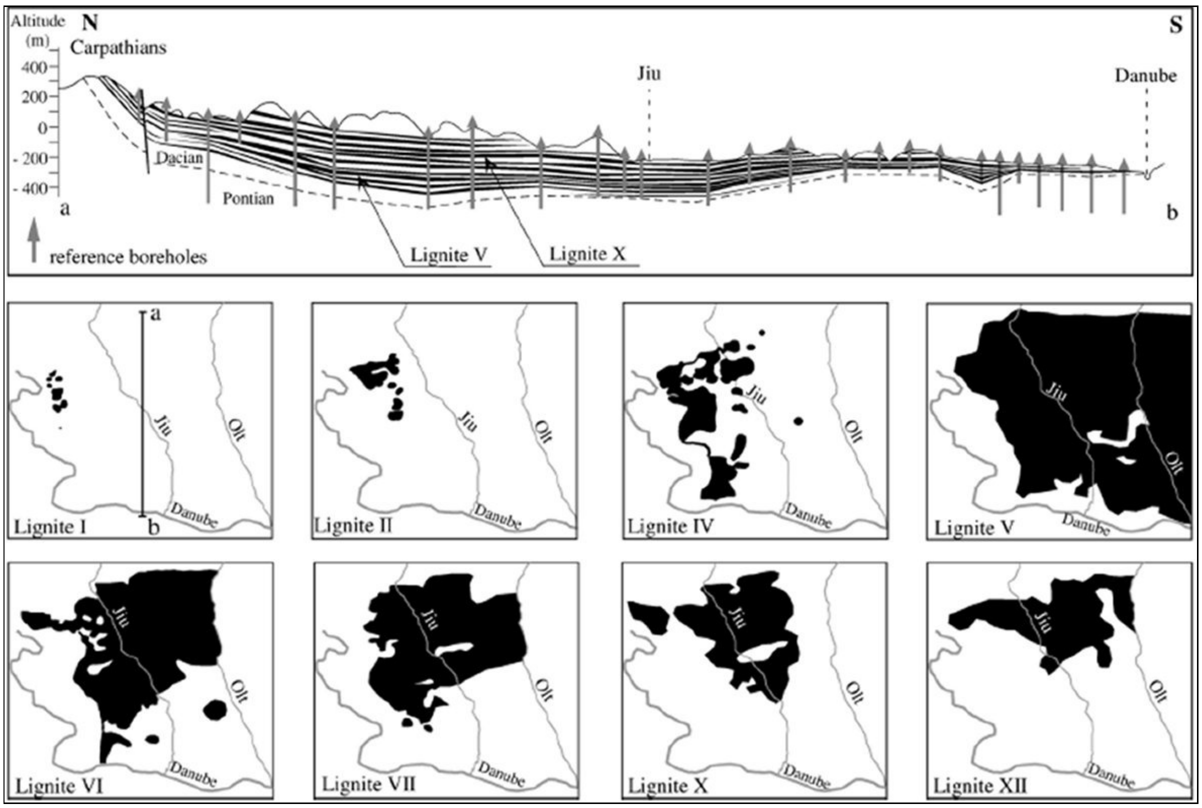


Fig. 3. Extension of main coal layers within Dacian Basin
(reproduced from Popescu et al. 2006, by courtesy)

II. The Pontian coal-genesis was developed especially in Muntenia region (Fig. 2), in Schitu-Goleşti area (exploiting points at: Berevoieşti, Godeni, Pescăreasa, Poienari and Jugur), as well as in some other places where thinner coal intercalations within middle Pontian appear (in Petrescu et al. 1987). Aninoasa and Doiceşti coal deposits could be added, but other coal deposits in the same Subcarpathian region, situated much to East (Filipeştii-de-Pădure, Şotânga and Ceptura) are more recent (Pliocene) and were not included in this phase of coal-genesis. The Pontian coal-genesis developed only in the inner part of Carpathian Foredeep, where the palaeorivers resulted in not too extended alluvio-lacustrine accumulation plains with a continuous subsidence (e.g. between Argeş and Topolog rivers), with a wet and warm-temperate climate, favorable to a coal-generating peat and of large forests with *Glyptostrobus europaeus, Alnus cecropiaefolia, Bytneriophyllum tiliaefolia*, a. o…, as other Pontian forests in Carpathian area show (Givulescu 1967, 1992, 1996, 1997; Țicleanu & Paraschiv 2000; Țicleanu *et al*. 2002; Petrescu *et al*. 2002; Diaconu 2004a).

III. The Pliocene coal-genesis developed within the Dacian Basin which still had a large extension during the Pliocene, especially during the Dacian stage to the middle-late Romanian (Figure 2). The Dacian Basin had a fluctuant evolution in relation with the Euxinian Basin during the Dacian stage, as well as during the Romanian stage. As a result, favorable conditions were created for an extended coal-genesis on the depositional plains situated at the foot of arising Carpathians. The type of sedimentation consisted dominantly of a fluvial facies and swampy, but into the basin – a proximal (littoral) or distal (of deeper water) sedimentation can be separated. The stratigraphic columns in this area show many lignite seams: around 22 coal seams can be counted from the early Dacian up to the late Romanian, in Oltenia coaly region (Figure 4). Some small coal seams appear up to the early Pleistocene, but of small economic importance (Țicleanu, 2003). It is interesting that the area covered by the lignite layers is variable. This was demonstrated on the basis of the drilling results. For example the 5th coal seam, which is marked by a strangely high level of radioactivity, is the most extended one (Ţicleanu in Jipa 2006; Figure 4). There is a palaeogeographic and tectonic explanation: the Dacian Basin was a variably extended alluvio-lacustrine accumulation plain situated in front of the mountains. It had a longtime stable subsidence rate which was equal to the accumulation velocity of coal-generating vegetal material and this happened during 2,000 up to 18,000 years (Ţicleanu et al. 2004; Ţicleanu in Jipa 2006).

Within the inner foredeep, the thickness of the coal layers or of the coal complex (coals ad associated sediments) is more developed than in the outer foredeep of the Carpathians, because a role in the subsidence could be paid to the differentiated compaction of the sediments (Ţicleanu 2003; Ţicleanu *et al*. 2004). The negative relief of the platform also had much importance in the coal accumulation and again, the tabular and the compactional subsidence could be considered. In fact, these structural and palaeogeographic conditions favored the coal accumulation in these polygenetic accumulation-plains of fluvial, deltaic and lacustrine origin, which is characteristic of the molassic basins situated in front of the mountains. The Dacian Basin was also filled with sediments, since it seems that the entire region was arising as a result of plate movements, and the lower Danube was born.

The trovants in Romania

Ticleanu M.

Hypothesis on the paleodynamic (paleoseismic) origin of the trovants ("Sandsteinkonkretionen") Ticleanu et al. 2008. Some sand beds of different ages are characterized by the presence of local overconsolidated, cemented zones of spheroidal shape. These were improperly considered as "sandstone concretions" and were named "trovanti" in the Romanian geological papers (Murgoci, 1907), a synonym for the German term "Sandsteinkonkretionen".

The term "dogger" designating "concretionary masses of calcareous sandstone" is too restrictive in comparison with the actual meaning of the term "trovant" which we propose to define properly these pseudoconcretions.

In the Carpathians area the study of the trovants has started as far back as in 1883 (Cobâlcescu) and by 1900 Koch had given out opinions about their origin. The diameter of the trovants vary from 1-2 cm to 2-3 m. Complex aggregates of two ore more trovants can often be found. There is no mineralogical difference between these pseudoconcretions and the surrounding sands. Their cement is often carbonate-type and no distinct nucleus can be found inside them. Many hypotheses have been produced on their origin, some of them fantastical. Anyway the epigenetic origin (a building of the trovants under the action of external agents or subsequent chemical solutions) is out of discussion.

In our opinion the trovants represent diagenetic textures reflecting paleodynamic (paleoseismic) conditions and correspond to specific compactions of the sandy sediments containing locally solutions (especially carbonate) accumulated in the sand, which during important seismic shocks and under the influence of the internal cohesion forces tended to spherical forms. In the process are involved: gravitation force, seismic shocks, solution cohesion forces (particularly surface tension) and the adhesion strength between the sand grains and the liquid.

The great trovants found in the thick sand beds reflect great initial amounts of solutions in the bulk of the sandy sediment. The perfect spherical shapes which sometimes can be found suggest great magnitudes and durations of the paleoearthquakes.

A hypothesis on the seismic origin of the trovants is very well sustained by many laboratory experiments of which the most relevant are those in which sand spheres are obtained out of wet sand on fine sieves under mechanical shocks. On Earth trovants of different ages have been recorded: lower Permian (Siberian Platform), middle Jurassic (Yorkshire, Russia), upper Jurassic (Siberian Platform) and Cretaceous (Wyoming).

In the Carpathians area the ages for the trovants studied were: Eocene, Oligocene, middle Miocene (Badenian and Sarmatian), upper Miocene (upper Meotian and Pontian) and Pliocene also. In Romania there are particularly numerous the lower Sarmatian trovants which are very diversely shaped. The apparition of the trovants could be linked up with the seismic shocks caused by the great meteorites (asteroids). The Cretaceous and Eocene trovants could be also a consequence of the well-known impact shocks at the end of Cretaceous and Eocene.

Some sand beds of different ages are characterized by the presence of local overconsolidated, cemented zones of spheroidal shape. These were improperly considered as "sandstone concretions" and were named "trovanti" in the Romanian geological papers (Murgoci, 1907), a synonym for the German term "Sandsteinkonkretionen". The term "dogger" designating "concretionary masses of calcareous sandstone" is too restrictive in comparison with the actual meaning of the term "trovant" which we propose to define properly these pseudoconcretions.

In Romania there are particularly numerous the lower Sarmatian trovants which are very diversely shaped. The apparition of the trovants could be linked up with the seismic shocks caused by the great meteorites (asteroids). The Cretaceous and Eocene trovants could be also a consequence of the well-known impact shocks at the end of Cretaceous and Eocene.

The firstly described in Romania by Gh. Munteanu Murgoci, a it comes most probably from italian, where **trovànte,** according to De Mauro, is a rarer variant of **"masso erratico",** which translates **"erratic boulder"** according to lots of sources. (*Trovànte* nm (geog) **erratic block**, erratic, **erratic boulder;** trovante sospeso perched block).

In the Carpathians area the study of the trovants has started as far back as in 1883 (Cobâlcescu) and by 1900 Koch had given out opinions about their origin. The diameter of the trovants vary from 1-2 cm to 2-3 m.

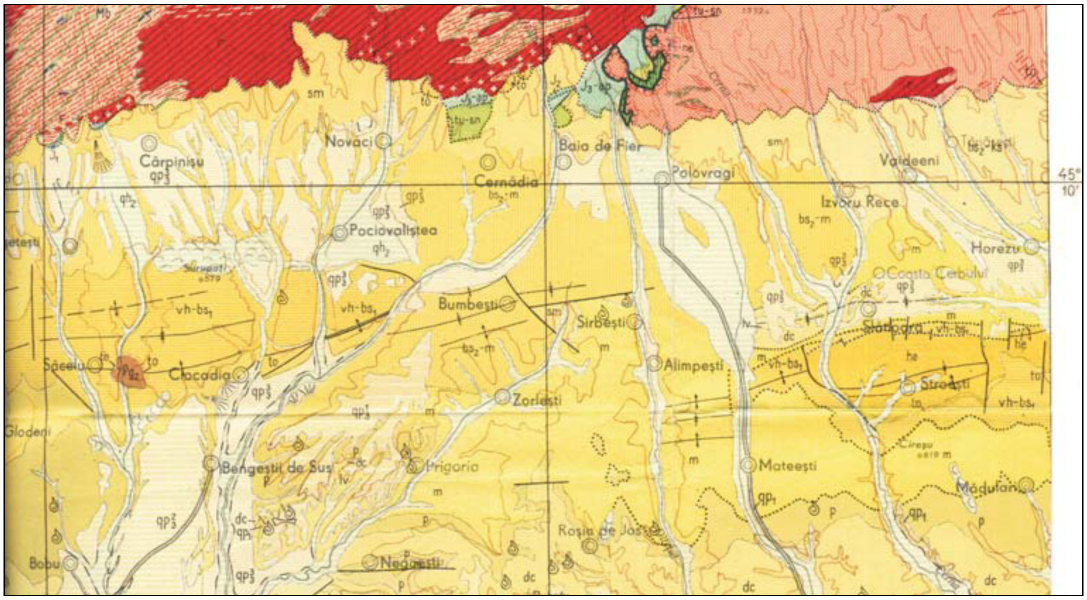
Complex aggregates of two ore more trovants can often be found. There is no mineralogical difference between these pseudoconcretions and the surrounding sands. Their cement is often carbonate-type and no distinct nucleus can be found inside them. Many hypotheses have been produced on their origin, some of them fantastical. Anyway the epigenetic origin (a building of the trovants under the action of external agents or subsequent chemical solutions) is out of discussion.

The trovants could represent diagenetic textures reflecting paleodynamic (paleoseismic) conditions and correspond to specific compactions of the sandy sediments containing locally solutions (especially carbonate) accumulated in the sand, which during important seismic shocks and under the influence of the internal cohesion forces tended to spherical forms. In the process are involved: gravitation force, seismic shocks, solution cohesion forces (particularly surface tension) and the adhesion strength between the sand grains and the liquid.

The great trovants found in the thick sand beds reflect great initial amounts of solutions in the bulk of the sandy sediment. The perfect spherical shapes which sometimes can be found suggest great magnitudes and durations of the paleoearthquakes. A hypothesis on the seismic origin of the trovants is very well sustained by many laboratory experiments of which the most relevant are those in which sand spheres are obtained out of wet sand on fine sieves under mechanical shocks.

On Earth trovants of different ages have been recorded: lower Permian (Siberian Platform), middle Jurassic (Yorkshire, Russia), upper Jurassic (Siberian Platform) and Cretaceous (Wyoming). In the Carpathians area the ages for the trovants studied were: Eocene, Oligocene, middle Miocene (Badenian and Sarmatian), upper Miocene (upper Meotian and Pontian) and Pliocene also.

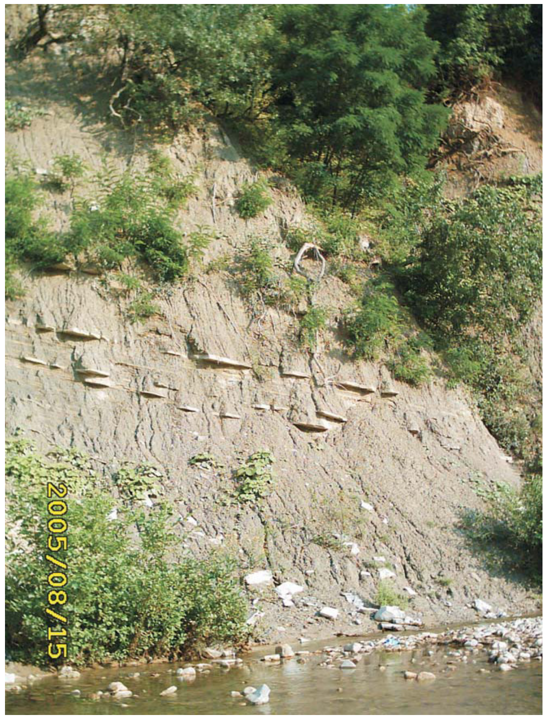
Mid-late Miocene flora:
Slatioara fossiliferous site (Paraschiv V.)



After a Leguminosites described by Marius & Laurent (1898), only Barbu (1942, 1954) and Ticleanu N. (1983) described a complex flora with *Pinus, Pseudotsuga, Betula Carpinus, Fagus, Castanea, Zelkova, Ulmus, Tilia, Acer, Ficus, Sapindus, Persea, Cinnamomum, Engelhardtia,* etc revizuite de Givulescu (2001) . After this, Dabu (1999) and Ticleanu & Paraschiv described species of *Pinus, Libocedrites, Laurophyllum, Daphnogene, Parittia, Fagus, Castanea, Quercus, Ficus, Juglans, Acer, Carya, Sophora, Vitis, Tetraclinis, Sequoia, Persea, Palaeocarya*, etc.

Acer tricuspidatum Bronn
Acer sanctae crucis Stur
Andromeda protogaea Unger
Anona eliptica Unger
Betula dryadum Sap.
Carpinus cf. *grandis* Ung.
Carpinus orientalis Mill.
Cassiophyllum berenices (Ung.) Kr.
Castanea kubinyi Kov. ex Ett
Colutea salteri Heer
Cystoseirites partschi Stbg.
Daphnogene polymorpha (Al.Br.) Ett
Fagus silesiaca Walt. et Zast.
Fraxinus sp.
Laurophyllum brauni (Heer) Nem. et Kn.
Palaeocarya orsbergensis (Wess. et Web.) Jähn. Friedr.
Periploca cf. *graeca* L.
Phragmites oeningensis Al. Br.
Pinus maritima Poir
Pinus leptophylla Sap.
Pseudotsuga aff. *douglasi* Carr.
Quercus neriifolia Heer
Sapindus falcifolius Al. Br.
Tilia sp.
Ulmus pyramidalis Goepp
Zelkova zelkovaefolia (Ung.) Buz. et Kn.

Ciocadia fossiliferous site (Paraschiv V.)



The Ciocadia fossil flora is the richest and the most important late Badenian – early Sarmatian flora from Romania with more than 40 taxa consisting of leaves, fruits, seeds and flowers. In several studies, Paraschiv (2005, 2008, 2010) revised some floras of Oltenia Province (Forecarpathian Basin).

Before this Popescu (1953), Tudor (1955), Marinescu (1969) Țicleanu (1984) and Huică (1994) studied in detail the Ciocadia Valley's geology and stratigraphy. The fossil plants are preserved in dark grey marls of the so-called "Spirialis Marls" unit, which represent the Late Badenian (Kossovian) and laminated marls of the Early Sarmatian (Volhynian). In 2001 Givulescu revised the lisT of flora identified till this moment:

Acer cf. *platanoides* L.
Acer tricuspidatum Bronn
Betula sp. aff. *macrophylla* (Brngt.) Heer
Carpinus sp. ex gr. *betulus* L.
Carpinus sp. ex gr. *caroliniana* Walt.
Carpinus sp. ex gr. *kisseri* Berger
Castanea kubinyi Kov. ex Err.
Carya sp.
Daphnogene polymorpha (Al.Br.) Ett.
Gleditsia aquatica (Heer) Mai
Gleditsia lyelliana (Heer) Hantke
Juglans acuminata Al. Br.
Palaeocarya orsbergensis Wess et Web, Jähn., Fridr.
Persea princeps (Heer) Schimp
Phyllites sp.
Phyllites sp. aff. *Leguminosites* sp.
Pinus cf. *halepensis* Mill.
Pinus maritima Poir.
Tetraclinis salicornioides (Ung) Kv.
Trigonobalanopsis rhamnoides (Rossm.) Walt. et Kv.
Ulmus brauni Goepp.

The list of flora given by Paraschiv (2005-2010):

Sphaerites sp.
Cystoseirites partschii STERNBERG
Eostangeria cf. *ruzinciniana* (PALAMAREV, PETKOVA et UZUNOVA) PALAMAREV & UZUNOVA
Tetraclinis salicornioides (UNGER) Z. KVAČEK
Cunninghamia sp.
Glyptostrobus europaeus (BRONGNIART) UNGER
Pinus sp.
Picea sp.
Pinaceae sp.
Laurophyllum sp.1
Laurophyllum sp.2
Daphnogene polymorpha (AL. BRAUN) ETTINGSHAUSEN
Platanus sp.
Berberis sp.
Fagus silesiaca WALTHER & ZASTAWNIAK
Quercus kubinyii KOVÁTS ex ETTINGSHAUSEN
Quercus gigas GOEPPERT emend. WALTHER & ZASTAWNIAK
Betula cf. *macrophylla* (GOEPPERT) HEER
Betula longisquamosa MÄDLER
Alnus sp.
Carpinus sp. div.
Myrica sp.
Juglans sp.
Carya denticulata (WEBER) W. SCHIMPER
Engelhardia orsbergensis (WESSEL & WEBER) JÄHNICHEN, MAI & WALTHER
Engelhardia macroptera (BRONGNIART) UNGER
Byttneriophyllum sp.
Ulmus sp.
Cedrelospermum sp.
Leguminosites parschlugianus (UNGER) KOVAR-EDER & Z. KVAČEK
Podocarpium podocarpum (AL. BRAUN) HERENDEEN
Acer sp. div.
Ziziphus sp.
Hedera auriculata HEER
Fraxinus macroptera ETTINGSHAUSEN
Dicotylophyllum sp.1-5

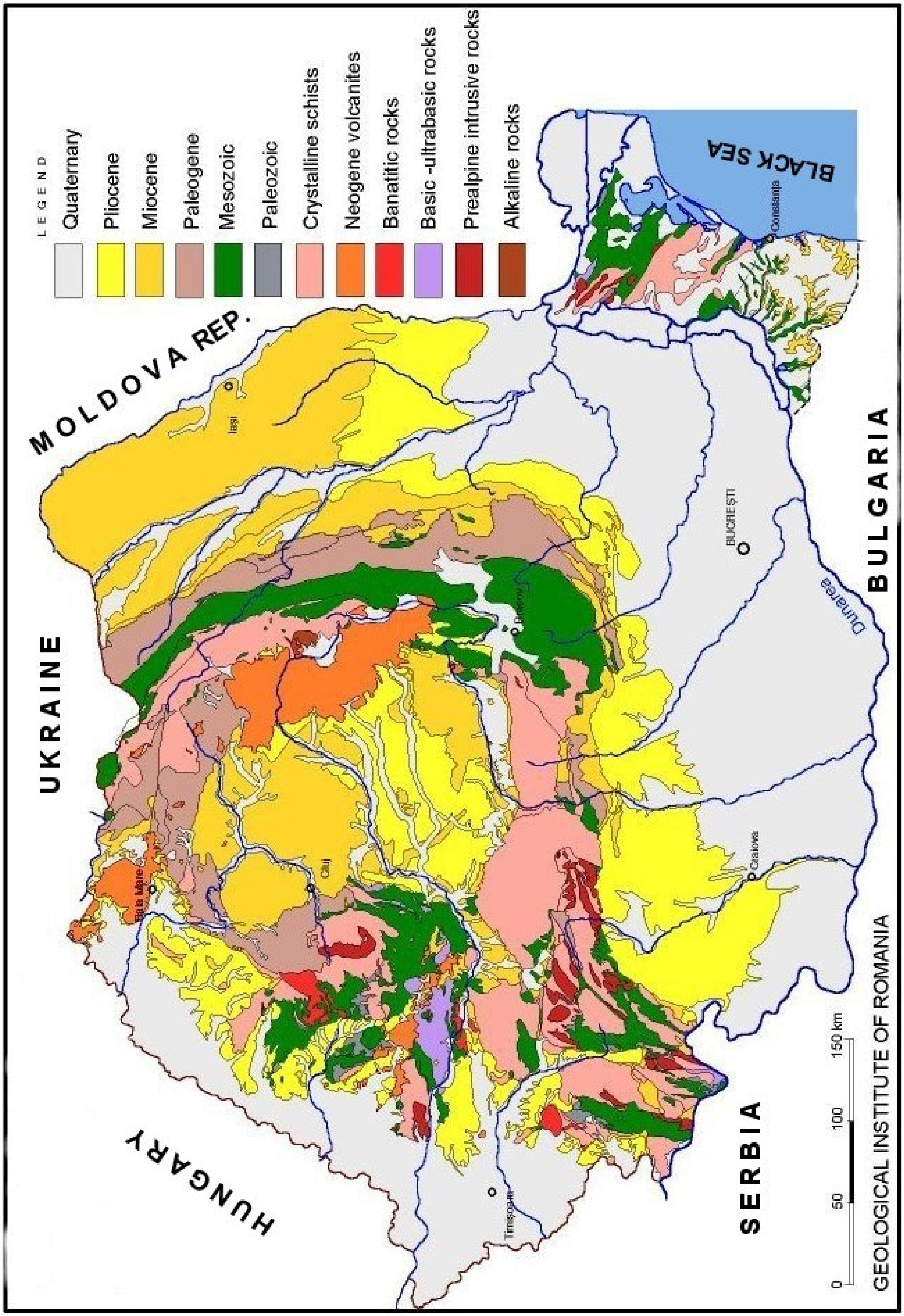
The Latest Miocene and Pliocene of Motru area (Diaconu F.)

Although in the Danube - Motru sector the majority of the Pliocene deposits are sandy, because of the large development of the Berbesti Formation, even if in these were found fossil plants too, just like in the case of the fossil site from Dedovita, from were Ticleanu et al. (1982) described and illustrated a late Dacian flora with: *Pinus* sp., *Sequoia abietina* (BRONGNART) KNOBLOCH, *Glyptostrobus europaeus* (BRONGNART) Unger, *Alnus* sp., *Betula* cf. *macrophylla* (GOEPPERT) HEER, *Carya serraefolia* (GOEPPERT) KRAUSEL, *Juglans acuminate* AL. BRAUN, *Salix integra* GOEPPERT , *Salix* sp. aff. *S. varianus* AL. BRAUN, *Liquidambar europaeum* AL. BRAUN, *Rhamnus* cfr. *gaudinii* HEER.

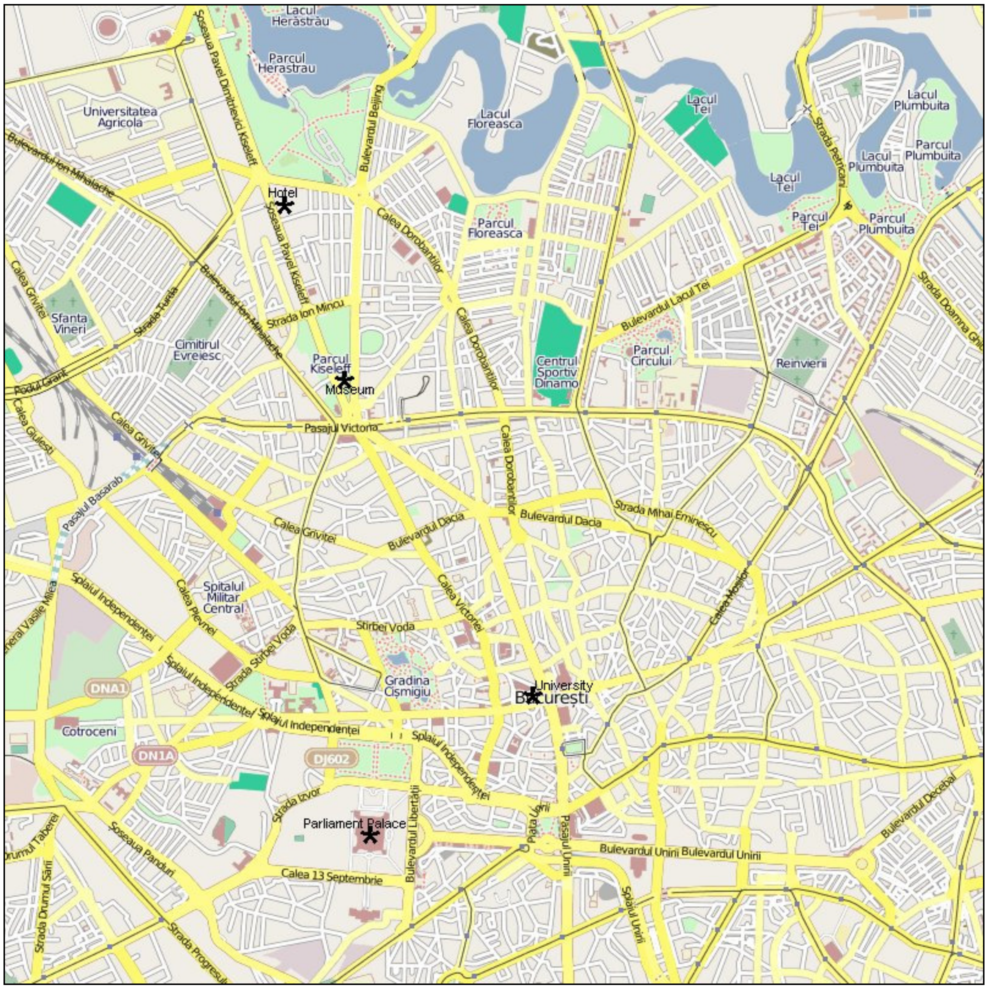
Fossil plants coming from the roof of the IV coal layer in Husnicioara open pit were identified as the following taxa: *Byttneriophyllum tilliaefolium* (AL. BRAUN) KNOBLOCH & KVACEK, *Glyptostrobus europaeus* (BRONGNART) HEER, *Glyptostroboxylon tenerum, G. europaeus, Carya denticulata* (WEBER) ILJINSKAIA, *Platanus platanifolia* (ETTINGSHAUSEN) KNOBLOCH and *Carpinus betulus* LINNÉ *Salix stefanescui* LAURENT & MARION, *Salix* sp., *Potamogeton* cf. *nodosus* POIR, *Phragmites oeningenussis* AL. BRAUN, *Ceratophyllum* sp. aff. *C. demersum* LINNÉ, *Quercus* sp. and *Acer* sp. and three species of *Pandanus*. The palyonology researches (Petrescu, 1989) were interpreted from a paleoclimatic viewpoint reaching the following conclusions: arctotertiary elements (*Sciadopitys*, *Picea*, *Tsuga*, *Pinus* s. *diploxylon*, *Carpinus*, *Fagus*, *Ulmus*, *Compositae* etc.) and intermediate ones (*Cedrus*, *Carya*, *Pterocarya*, *Zelkova*) are dominated, but the thermophile elements (*Myrica*, *Reevesia*) are sporadic.

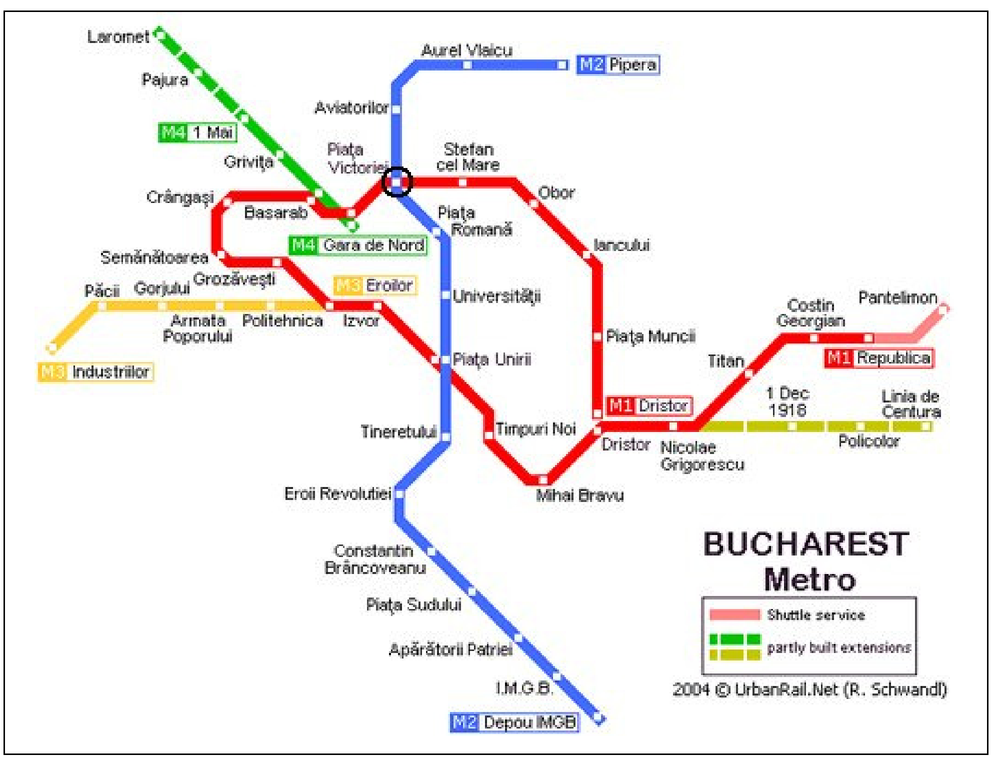
The Romanian deposits of Bâcleş (clays and silty clays), gave plant remains identified by Ticleanu et al. (2001) as the following species: *Taxodium dubium* (STERNBERG)HEER, ?*Platanus platanifolia* (ETT.) KNOBLOCH, *Ulmus laevis* LINNÉ*, Quercus roburoides* GAUDIN, *Quercus* cf. *muehlembergii* ENGELMAN, *Carya serraefolia* (GOEPPERT)KRAUSEL, *Acer*cf. *tricuspidatum* BRONN. and *Salix* sp. and Diaconu (2006) added four new taxa: ?*Sequoia abietina* (BRONGNART) Knobloch, *Ulmus pyramidalis* Goeppert, *Acer* cf. *campestre* LINNÉ and *Alnus* sp.

Geological Map of Romania



Bucharest maps





List of participants