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A B S T R A C T S

VOLUME 3

SYMPOSIA:

4. "BIOSEDIMENTOLOGY"
5. "ECONOMIC POTENTIAL OF THE NEOGENE FORMATIONS"

Institutul Geologic al României
Bucureşti–1995

Volume 3

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Symposium 4

Biosedimentology

THE CASPIAN SEA PALEOFACIES CONDITIONS IN PLIOCENE-PLEISTOCENE

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Reconstruction of conditions of sedimentation in old basins is one of the main objectifs of paleosedimentology. In this connection the use of a complex of features characterizing the fauna-sediment system takes on a special significance.

Studies of micro-bioelemental and mineralogical compositions as well as of organic components of sekeletal matter of Pliocene-Pleistocene Caspian mollusks (class Bivalvia) and the formations containing them allowed to restore of Caspian basin geochimical facies peculiarities in Pliocene-Pleistocene. The obtained data have been used for carrying out the paleofacies analysis. Research of area and vertical distribution character of studied features allowed to reveal the dinamic of sedimentation geochimical conditions developement of Caspia in Pliocene-Pleistocene. So, the character of lithofacies and geochimical conditions formed in the burial medium of organisms is the main factor causing the transformation of the original mineral composition of fossil remains of invertebrates into the calcite one. The process of aragonite-calcite recrystalization proceeds in aleurite-arenaceous and rudaceous rocks setted in the oxidizing geochemical facies in which the value of pH is peculiar to the alkaline medium (7,2-9) and that arises from the instability of aragonite and its ability to transform into calcite under the alkaline conditions. The data obtained allows to consider the presence of diagenetic calcite in aragonite shells as a diagnostic feature peculiar to oxidizing geochemical facies in sedimentation medium.

The ratio of the ferrous monoxide forms to ferrous oxide forms and the gross amount of this element in skeletal tissue of the invertebrates and in the enclosing rocks are the important informative indications caracterizing the geochemical conditions of basins of sedimentation. The latter considerably increases in samples confined to oxidizing geochemical media.

Study of the ratio of chloroform bitumoids to alcohol-benzol bituminoids showing the degree of reduction of bitumoids in the fossil faunistic and stone material is also of a particular interest.

LES BIVALVES NEOGENES DES FACADES ATLANTIQUES ET MEDITERRANEENNE DU MAROC SEPTENTRIONAL. RELATION ATLANTIQUE-MEDITERRANEE DURANT LE NEOGENE.

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La répartition paléobiogéographique de 140 espèces récoltées dans des gisements tortoniens (27 espèces), messiniens (75 espèces) et pliocènes (107 espèces) des façades atlantique et méditerranéenne du Maroc septentrional, permet de mettre en évidence des migrations ou des échanges à travers les voies de communication atlanto- méditerranéennes.

Les 27 espèces tortoniennes sont générelment présentes dès le Miocène inférieur dans la plupart des bassins atlantiques et méditerranéenes. Parmi elles, 20 (91 %) existent déjà au Miocène inférieur en Atlantique, ce qui souligne l'affinité atlantique de cette faune tortonienne. Ceci résulte des échanges fauniques entre l'Atlantique et la Méditerranée, avec un sens dominant du premier vers le deuxième. Au Miocène moyen, 25 espèces sont citées dans de nombreux gisements atlantiques et méditerranéens. Le nombre d'espèces rencontrées en Atlantique et en Méditerranée est presque identique. C'est la conséquence de nombreux échanges réalisés entre la Méditerranée et l'Atlantique, dans le sens dominant vers l'Atlantique (Ben Moussa et Demacq, 1990) et probablement à la suite du rafraîchissement qui a affecté les eaux littorales de la Méditerranée, qui demeuraient toutefois, en moyenne et à latitude égale, plus chaudes qu'en Atlantique (Demarcq, 1984).

Parmi les 75 espèces messiniennes, 54 (soit 72 %) sont apparues au Miocène inférieur et 10 autres au Miocène moyen. Le nombre élevé (43/ 54) des espèces retrouvées dans le Miocène inférieur du domaine atlantique est aussi un critère de l'origine atlantique de la fa- ne messinienne. Venant renforcer cette indication, 9 espèces, citées dans le Miocène inférieur, sont apparues dans l'Aquitanien du domaine atlantique. Ceci montre bien la migration de ces 9 espèces atlantiques vers la Méditerranée durant cette période. Au Miocène moyen, les 64 especès présentent une large répartition, généralement homogène. On trouve 61 espèces en Atlantique et 58 en Méditerranée. Cette distribution homogène résulte des communications établies entre les deux domaines. Au Miocène supérieur, la répartition

des 75 espèces est assez étendue durant le Tortonien et se cantonne, par la suite, au "sanctuaire" d'Alboran. Il constitue un milieu marin à salinité normale et alimenté par les eaux atlantiques grâce aux deux couloirs nord- bétique (fermé probablement au sommet du Tortonien) et sud- rifain et à travers l'archipel tectonique d'Alboran lui- meme. Par ces voies migreront des espèces, correspondant au résidu de la faune miocène. Ces espèces et leurs descendants repeupleront la Méditerranée dès la base du Pliocène. Parmi cette faune messinienne, *Spondylus concentricus* et *Hyotissa squarrosa*, espèces de mers chaudes, disparaissent définitivement de la Méditerranée vers le sommet du Pliocène et s'installent dans le domaine indo- pacifique.

Les bivalves pliocène (107 espèces) renferment 63 espèces apparues au Miocène inférieur, dont 48 sont citée en Atlantique. Parmi ces 48, 14 sont retrouvées seulement dans ce domaine. Ceci permet aussi de mettre en évidence l'origine atlantique de notre faune pliocène. Les 34 espèces atlantiques retrouvées ailleurs indiquent certainement des échanges l'Atlantique et la Méditerranée. Au Miocène moyen, les 17 espèces apparues sont connues en Atlantique (5 espèces), en Méditerranée (3 espèces) et dans ces deux domaines (9 espèces). Les 80 espèces sont largement répandues dans ces deux domaines. Au Miocène supérieur, 14 espèces sont apparues soit en Atlantique, soit en Méditerranée et dans ces deux bioprovences. La répartition des différentes espèces, surtout au Tortonien, est souvent homogène. Au Messinien, dont les sédiments à macrofaunes benthiques sont rares en Atlantique, les espèces se rencontrent généralement dans la mer d'Alboran. Après l'ouverture du détroit de Gibraltar, les eaux atlantiques envahissent la Méditerranée et permettent des apports fauniques assez importants et des échanges à travers ce détroit, dont certains se sont faits avec le domaine nordique. Les 107 espèces pliocènes sont largement répandues en mer du Nord (50 espèces), en Atlantique (la presque totalité) et en Méditerranée. Les 13 espèces apparues au début du Pliocène se trouvent aussi bien en Atlantique qu'en Méditerranée.

Le repeuplement différentiel et sélectif de la Méditerranée au Pliocène est originaire des bioprovinces lusitanienne *s.s.* et d'Alboran. Après ce repeuplement la faune pliocène va subir des dégradations climatiques durant le Pléistocène. Ces dégradations sont à l'origine de la disparition de certaines espèces ou de la migration d'autres soit vers le domaine nordique, soit vers le domaine indo- pacifique. La faune actuelle de bivalves de la Méditerranée, héritée du Néogène, résulte d'une part de l'ensemble des échanges et des apports fauniques réalisés pendant le Néogène et d'autre part de la disparition et de l'apparition de nombreuses espèces. Ces disparitions et apparitions reflètent les variations

des différentes conditions du milieu, notamment les conditions physico- chimiques, édaphiques, thermiques, courantologiques, etc.

BIODIVERSITE DE LA MER D'ALBORAN AU MESSINIEN : L'EXEMPLE DE LA BRYOZOAIRES ET DES BIVALVES DU MAROC NORD-ORIENTAL

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L'analyse paléontologique du contenu fossilifère des différents sédiments littoraux du Miocène supérieur (Messinien) du Maroc nord-oriental a permis d'identifier 199 espèces de bryozoaires (148 cheilostomes et 51 cyclostomes) et 75 espèces bivalves. Il s'y ajoute d'autres groupes associés : les gastéropodes (48 espèces), les échinides (28 espèces), les scléractiniaires (15 espèces) les brachiopodes (4 espèces), quelques crustacés et annélides. Cette richesse specifique traduit la grande variété des milieux de vie.

La diversité des bryozoaires et de bivalves, groupes dominants du benthos de la mer messinienne, est en expansion croissante en Méditerranée occidentale depuis le Miocène inférieur (Tabl.). Les conditions écologiques offertes à ces faunes benthiques messiniennes apparaissent presque similaires depuis le Miocène inférieur, permettant d'assurer la diversité spécifique dans cette région occidentale de la Méditerranée indépendamment de "la crise de salinité messinienne".

BIODIVERSITE / PERIODES GEOLOGIQUE	NOMBRE D'ESPECES	
	BRYOZOAIRES	BIVALVES
ACTUEL	337	406
PLEISTOCENE	97	206
PLIOCENE	169	285
MIOCENE SUPERIOR	253	130
MIOCENE MOYEN	225	83
MIOCENE INFERIEUR	170	59

Tableau --: Richesse spécifique des bryozoaires et des bivalves de la mer d'Alboran dans l'Actuel et au Néogène

Dès le Pliocène, le milieu néritique de la mer d'Alboran est repeuplé, contrairement au Miocène, beaucoup plus par les bivalves que par les bryozoaires. Ce repeuplement

différentiel semble etre lié à plusieurs facteurs : importance de l'endémisme, pouvoir de dispersion par voie larvaire qui intervient dans le temps du transfert des immigrants (larves lécitotrophiques à durée de vie trés courte chez la plupart des bryozoaires)...

Compte tenu des lacunes actuelles dans la connaissance des faunes, cette diversité croissante laisse voir des disparités très marquées au Pléistocène, aussi bien chez les bryozoaires que chez les bivalves ; celles-ci sont la conséquence des modifications climatiques au cours de cette période.

NEOGENE OF CENTRAL ALGARVE (S. PORTUGAL)

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Some new lithological and biostratigraphical data on the Neogene deposits cropping out in the coastal fringe of Southern Portugal are presented. Recent research has focused on the Galé- Olhos de Agua coastal segment.

The limestones at Galé are characterized by the abundance of skeletal remains of coralline algae. The algae are associated with large echinoids of the genus *Clypeaster* and bivalve faunas including *Spondylus crassicosta* and several species of scallops. These latter are extremely well preserved, frequently with valve joined. *Chlamys scabriscula* is dominating species and it indicates Serravalian age (zone PN 5 in Demarcq's pectinid zonation). Apart from *Ch. scarbiscula* the pectinid assemblage from Galé contains also *Aequipecten radians, Pecten subarcuatus, Flabellipecten fraterculus* and *Fl. solarium.*

In our opinion the limestones from Gaé pass laterally into the Lagos - Portimào Formation, overlying discordantly Mesozoic deposits. The geological age of this Formation had been previously determined as "Helvetiano" (Ferreira 1951) or as Burdigalian to Early Langhian (*ffide* Antunes and Pais 1992).

The spongioliths from the Mem Moniz Formation yield an abundant but poorly diversified calcareous nannoplankton. The dominant species in this coccolith assemblage are the reticulofenestrids (*Reticulofenestra gelida, R. minuta, R. minutula/ haquii, R. pseudoumbilica*) , *Coccolithus pelagicus* and *Calcidiscus leptoporus* as well as the helicosphaers *(Helicosphaera carteri, H. minuta, H.philippienensis).* The discoasters and sphenolithids frequent in the Mediterranean area are here absent. Taxonomic composition of this assemblage (high abundance of reticulofenestrids and helicosphers) suggest cold waters and the nearshore deposition. The age of the spongioliths could be precised as the Midlle - Late Serravalian, zones NN 6-9 of the standard nannoplankton zonation (Martini 1971).

Apart from coccoliths, the planktonic assemblage contains also nannoforaminifers and diatoms and it shows some similarities to the assemblage known from the Upper Badenian deposits of the Northern Croatia (Bajraktarevic 1983).

The silts observed in Olhos de Agua cliff are rich in oysters, branacles and contain the bivalve *Palliolum excisum*. The foraminifera assemblage (Boski et al 1993) indicates the Late Pliocene age, in line with paleomagnetic studies carried out in the same profile. The presence of sharh teeth (*Carcharoclos megalodon, Isurus* sp.) in underlying sands may not be indicative of their age because all fossils originate from thin gravel layer (tempestite) from below and bear traces of transport and eolisation.

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COMPARISON OF MICROMAMMALS TAPHONOMY IN KARSTIC AND OPEN - AIR SITES. PREDATION AND FAUNAL LISTS BIAS IMPLICATIONS.

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Micromammal taphonomic methodology has been applied different types of sites.Predation has been recognized in open-ai sites (Olduvai Bed I, Pleistocene, Tanzania), as well as in karstic fissure filling (Pech Crabit, Oligocene, France) and Monte di Tuda (Holocene, Corsica). Predation produces strong biases in faunal representation of taxa due to vaiations in the hunting habits (opportunistic versus selective) of the predators involved in the fossil site formation.

Post-predation modifications include fragmentation due to trampling or transport, surface and sub-surface weathering and bioturbation. These processes operate in both open-air and karstic situations, with each site having a unique combination of post-predation modifications due to differences in accumulation processes and environmental agents. Similarly, diagenetic context may diffe considerably, and chemical analyses have shown enrichement in the two major constituents of bone: Ca and P. Mixtures of vaious predators, tansport and reworking can be found in all types of sites, and the only way to recognize mixing is to make a detailed taphonomic analysis of the fossil site. Chemical analyses are particularly important in providing criteria to distinguish between reworked assemblages.

The main differences in fossil distribution (both in space and time) between open-air and karstic sites result principally from their mode of sedimentation. Caves or fissures provide natural concentrating environments in which bones may accumulate, and they provide protection from

degenerative agents like weathering. Bones in open-air environments tend to become dispersed and are more exposed to weathering, but rapid burial may protect the bones from further damage.

Once the different agents and environmental conditions that acted during a site formation are recognized, patterns of faunal distribution can be analysed and over-representation or absence of peculiar taxa can be interpreted. This, therefore, provides a more precise and realistic palaeoecological and biostratigraphical interpretations of the site.

BIOTURBATION IN LOWER PLIOCENE SEDIMENTS OF THE NORTH-WESTERN MEDITERRANEAN AREA

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Several sections of the Lower Pliocene basins of Catalania (Baix Ebre, Baix Llobregat and Alt Empordà and the Gulf of Lyon (Roussillon,Orb, Rhône and Var) are studied. Ichnofabrics and trace fossil assemblages are discussed and compared in relation with the sedimentary facies and associations.

The most common sedimentary facies in these basins is constitued by blue-grey clays usually containing abundant shelly fossils. These clays are usualy completely bioturbated but trace fossils are very poor preserved. Only some Pahcichnia(*Planolites,* cf. *Scolicia*), little dwelling burrows and shelly filled *Thalassinoides* can be recognaized. This poorness is due to the homogeneity of the sediment and also to the absence of deep-tier structures developped in more consistent sediments where traces would have higher preservation potential. The Var Basin blue clays have a particular ichnofabric constitued mainly by distinct spreiten burrows (*Zoophycus,Teichichnus, Asterosoma*) with long *Diplocraterion, Helminthopsis, Planolites* and *Terebellina* suggesting a deeper environment hosting a more complex endobenthic paleocommunity.

The sandier units includes different types of facies and facies associations and the corresponding ichnofabrics and trace fossils assemblages.

At the Baix Ebre there are two sandy clay units, one below the blue clays (LSCU, transgressive) and one above them (USCU, regressive). The LSCU include two main ichnofabrics: shoreface bioturbated sands with *Skolithos* and sparse *Paleophycus* in a mottled background and bay interlayered sands and clays with sparse J-burrows, escape traces and epigenic trails. The USCU is formed mainly by clays interlayered with sand beds with *Teichichnus,* sinuous spreiten branched burrows, J-burrows, escape traces and very scarce *Scolicia* and *Neonereites.* This unit also includes a high scale cross-bedded sand bar with *Skolithos* and escape traces.

At the Baix Llobregat the Sandy Clay Unit overlays the Blue Clays. The trace fossils assemblages shows important changes along the basin. This distribution is consistent to an elongated ria with an important longitudinal gradient. The most common facies association is formed by alternating clays and sands with two clear distinct trace fossils suites related to sand deposition. The pre-event suite is mostly formed by dwelling burrows (*Skolithos,* sinuous branched burrows, tiny burrows, *Paleophycus*) and the post-event association includes mostly Pascichnia and Fodinichnia (*Planolites, Neonereites, Thalassinoides, Laminites* and *Cardioichnus*). Sandier deposits outcrop in one of the innest sections including sand bars and channels with *Ophiomorpha, Macarronichus* and *Paleophycus.*

At the Pichegu section in the Rhône area the sandy unit corresponds to a delta front with cross bedded sands. Only the muddier intervals includes long *Skolithos* and abundant *Planolites* and *Neonereites* related to thin carbonatic beds.

In Saint Isidore (Var Basin) the sandy units are intercalated to the blue clays and conglomeratic deposits. The characteristic ichnofabric is formed by thoroughly bioturbated silts and fine sands with *Planolites, Teichnus, Neonereites, Paleophycus,* sinuous branched burrows and sparse *Scolicia*-like burrows, *Diplocraterion, Skolithos, cf. Thalassinoides* and *Taenidium.* The more diverse and highly bioturbated ichnofabric suggest an deeper environment compared to the other basins as is also indicated also by blue clay ichnofabrics.

The study of the bioturbation in the Catalan and French Mediterranean Pliocene Basins reveal a certain similarity between them strictly from an ichnotaxonomic point of view. However, other considerations as icnodiversity, bioturbation rate and trace fossils distribution vary significatively between basins and even between sections in a same basin. These variations inthe ichnological features of the sediments are related to multiple environmental factors including bathymetry, salinity, rate of deposition and style of sedimentation.

INVESTIGATION OF THE AMPHISTEGINA GENUS (FORAMINIFERIDA). MIDDLE MIOCENE OF CENTRAL PARATETHYS. OLIMPOW SECTION

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The Miocene carbonates are infrequent phenomena both, in Polish Carpatians and Carpatian foldbelt as a whole. They remain a part of parautochthonous cover i.e. deposited in the piggy-back basins on the Carpatian flysch. This complex was strongly affected by syn-and postdepositional folding and degradation processess. Cause this intense tectogeny the sediments sustained in small and isolated profiles occuring patchily on a flysch substrate of the Outher Carpatian.

The study of Olimpow section is one of the seldom, preserved fragments of parautochthonous cover. At present it is the only accessible profile of Miocene carbonates in this region. The site represents Badenian chloralgal facies. The section yield rich marine biota (bryozoans, forams and calcareous algae predominate). Taxonomical study of the foraminifera fossils reveals that only one *Amphistegina* species is present in the profile - ***Amphistegina hauerina d'Orbigny 1846.*** Biometrical analysis of this larger foraminifera comunity display significant changes upward of the profile. Some features of depositional environment could be deciphered base on that.

SEDIMENTATION AND EARLY DIAGENESIS OF SERPULID- MICROBIALITE BUILDUPS OF ROZTOCZE (MIDDLE MIOCENE, SE- POLAND)

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The Carpathian foreland basin - the northernmost part of the Central Paratethys was restricted in Sarmatian (upper part of the Middle Miocene). The environmental conditions were unfavourable to most marine organisms; consequently taxonomically impoverished assemblage of stress- tolerant organisms (serpulids, bryozoans, some moluscs, foraminifers and ostracods) flourished in the basin. In the northern margin of the basin, serpulid- microbialite buildups up to 20 m thick developed. The buildups are accompanied by thin skeletal grainstones and marly clays.

The main skeletal framework component of the buildups are serpulids and bryozoans, but they constitute usually several percent of the limestone only. The bulk of the buildup limestone is made up of micrite. Thebuildups exhibit large growth porosity infilled with internal sediments and occluded by synsedimentary fibrous cements. Today the limestone consists of low- magnesian calcite.

Most of the micrites have originated within the buildups and are interpreted as microbially mediated calcium carbonate precipitates. The micrites from: (1) *in situ* originated coatings and crusts around or upon skeletal organisms, displaying dense or clotted, peloidal microfabrics, (2) peloidal stromatolites which may have formed partly due to *in situ* carbonate precipitation and partly by trapping and binding of loose paticles (mainly peloids), (3) peloidal grainstones constituing internal sdiments.

Crustose coralline algae and sessile foraminifers form scarse, discrete crusts (up to a few cm. thick) usually rimming growth haeds (bioherms) of serpulid-microbialite limestone. The foraminifers display often columnar growth. The crusts evidence probably the changes of envinronmental conditions.

Synsedimentary fibrous cements line intraskeletal pores and primary growth cavities. The cements form isopachous rims of more or less paralle crystals and crusts composed of fan-shaped bundles of fibrous crystals/ The spatial distribution of the cements is extremely variable.

The origin of serpulid-microbialite buildups was relates to unfavourable ennvironmental conditions in the Sarmatian, that caused the growyh of colonies of serpulides and bryozoans. The organisms constituted a delicate skeletal network. The real framework formed due to overgrowing and consequently strenghtening of the skeletons by synsedimentary lithified micrpobialites. That way a rigid buildup framework with widespread growth porosity creating the space for internal sediment accumulation and cementation originated.

The microte precipitation was probably closely realted to living functions of serpilid and bryozoans. On the other hand the lithified microbialites formed a hard substratum for ske;etal organisms. Such a joint-venture enabled fast sediment accretion and thus development of buildup with a significant positive relief.

BIOEROSION IN LOWER PLIOCENE ROCKY SHORES OF THE NORTHWESTERN MEDITERRANEAN AREA

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Rocky shores and associated conglomeratic deposits are frequen in the margins of the Lower Pliocene Basins of Catalonia, NE Spain (Baix Ebre, Baix Llobregat and Alt Empordà) and the Gulf of Lyon, S France (Orb and Var). Trace fossils and shells of encrusting organisms are the paleontological evidences of the presence of these rocky shores. Important similarities exist between the ichnoassociations of different basins, although each one presents certain particular characteristics.

The rocky shore in the **Baix Ebre** (Tarragona) is developped over pre- Pliocene conglomerates. The most dipping surfaces host encrusted organisms (*Hinnites, Ostrea, Balanus*) and bivalve and sponge borings (*Gastrochaenolites* and *Entobia).* These surfaces are associated to little reefs built by algae, serpulids and vermetids on the horizontal areas of the paleorelief. In other sectors the boundary between Pliocene and pre- Pliocene materials is covered by bored pebbles including *Gastrochaenolites, Entobia* and *Trypanites.*

In the **Baix Llobregat** (Barcelona) there are several outcrops where the Pliocene cliff is exposed. This is developped on Paleozoic slates except in one site where it is on Miocene limestones. The main present ichnotaxa are *Gastrochaenolites* and *Entobia. Caulostrepsis, Maeandropolydora* and also *Entobia* appear mostly on the encrusting pectinids and ostreids.

In the **Alt Empordà** (Girona) the Pliocene sediments overlay the Mesozoic and Paleogene limestones. Echinoid pits, *Gastrochaenolites* (sometimes in high densities) and *Entobia* are the most significant trace fossils and appear associated to encrusting bivalves and barnacles. In one locality bioerosion structures record an intraformational hardground

formed on Pliocene conglomerates where a prehardening and a post- hardening trace fossils suite can be recognized, both including mainly *Gastrochaenolites* and *Entobia.*

At the **Orb** Basin (Hérault) the paleocliff is established over the Messinian tuff. *Gastrochaenolites* and very abundant encrusting ostreids are the most obvious evidences of it.

Near Vence, in the **Var** Basin (Alpes Maritimes) the Pliocene overlay the Jurassic limestones. The boundary surface shows abundant borings- *Gastrochaenolites, Trypanites* and *Maeandropolydora*- and some encrusting pectinids and ostreids.

From an ichnological point of view the rocky shores from the studied basins are very similar. *Gastrochaenolites* and *Entobia* are the most representative ichnotaxa associated to *Maeandropolydora, Caulostrepsis, Trypanites* and echinoid pits. The ichnoassemblage is characteristic from shallow environments, sometimes very shallow as indicated by the high densities of *Gastrochaenolites* or the presence of echinoid dwelling holes. The *Gastrochaenolites- Entobia* ichnocoenose is characteristic not only from Pliocene shallow rocky shores but from, at least, Neogene and Quaternary ones in the Mediterranean and Atlantic as well.

PECULIARITIES OF ACCUMULATION OF DISPERSED ORGANIC MATTER IN MIOCENE- PLIOCENE SEDIMENTS IN WEST- KUBAN FOREDEEP

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It is generally known, accumulation of dispersed organic matter in marine basins occurs as accumulation of byproducts of (products of vital functions) zoo- a phytoplankton as decomposition well of different organisms a their excretion's products. The rate of accumulation of organic matter in sediments depends on the fossilization coefficient which, in its turn, is controlled by a variety of factors, such as sediment lithologics, its granularmetric composition, gas conditions in bottom waters, remouvet from the coastline, bottom relief, etc.

Thus, the accumulation of dispersed organic matorerin marine sediments depends on peculiarites of the sedimentation process. One of the most important features of the process is its transgressive/ regressive cyclies.

Comprehensive (lithological, paleontological, geochemical) studies of Middle Miocene-Pliocene deposits, thei organic matter and bituminous components in central West- Kuban foredeep and nearby flanks, this fact demonstrates that the accumulation and distribution of the organic matter had been influenced by sedimentary transgressive/ regressive cycles (both macro- and minor ones).

The occurrence of macro- and microfauna species suggests that changes in paleogeographic sedimentation environments cased by transgression and regression of the sea, requireng changes in bottom water gas conditions, facial situation sea water salinity, climat affected the distribution of the organic matter in the rocks, both areally and throughout the section. Thus where there in a general tendency of dicrease in dispersed organic matter average content up the section, several minor cycles can be distinguished in its distribution throughout the section.

The end of a higher order regressive half- cycle of the sedimentogenesis in the Tarchanian shows evicts itself in a decrease in average content of organic matter up the

section in Middle Maikopian through Lower Chokrakian sediments. Another transgressive/ regressive cycles of sedimentogenesis (accumulation of sediments) started in the Chokracian time (Middle Chokracian- Quaternary) consist in two minor transgression regression cycles, which is proved by peculiarities in distribution of the organic matter throughout the section.

The sea transgression, its /advancement/ on the shore during the Chokracian time prouded favourable condition for its fossilization. From the Lower Chokracian through the Middle Sarmatian, organic carbon average content in the rocks was being increassed; during a regression phase (Middle Sarmatian- Lower Pontian) in decreased. A short- term sea transgression started in mid- Pontian to give way to regression, shiinking of the basin, its desalination resulted in lower concentrations of the organic matter and in dramatic fauna changes.

Thus the rates of organic matter accumulation are influeced by sedimentogenesis cyclicity controlled by paleogeographic environments in which sediments are accumulated.

INCRUSTATION PATTERNS ON MACROFOSSILS AND THEIR IMPORTANCE FOR BIOSEDIMENTOLOGICAL PATTERNS

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Macrofossils of the Lower Miocene Zogelsdorf Formation from the Austrian Paratethys are commonly partially or wholly encrusted by diverse organisms including bryozoans, barnacles, serpulids and red algae. These components also dominate a number of facies within the limestones making up the formation. Complicated encrustation patterns and sequences are especially found on specimens of the irregular echinoids *Echinolampas* and *Clypeaster*. These were investigated as far as taxonomic presence, % coverage, direction of growth, and space competition of epibionts are concerned. The methodology used consists of mapping the presence and composition of the taxa using an image analysis program.

These encrusted macrofossils are seen as sites of carbonate production, not only for the encrusting filtering organism themselves as seen on the fossils, but also for encrusters attached through soft organs (i.e. brachiopods), as well as a mobile, vagile fauna. The results show complicated relationships among the diverse encrusters including bryoans, serpulids, barnacles, coralline algae and bivalves. The comparisons with incrustation patterns from the Northern Adriatic show furthermore the importance of soft bodied encrusters in these complicated encrustation patterns.

DID THE MEDITERRANEAN DRY UP ? - NEW INFORMATION FROM SEDIMENTATION PATTERNS AND PLANKTONIC FORAMINIFERA ASSOCIATIONS IN THE MESSINIAN OF SICILY

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The Late Miocene sediments of the central Sicilian Caltanissetta basin have long been celebrated for the light that they shed on the 'Messinian Salinity Crisis'. However, there are several flaws to the dessication model. In particular, it does not take into account the syndepositional multi- perched basinal nature of the Central Sicilian region. A tradition that regionally extensive diatomites (Tripoli Formation), are followed by universally distributed evaporites, as the Palaeomediterranean Sea desiccated should be reexamined critically.

Recent work has now established the existence of a complex ladder of thrust- top perched basins associated with thin- skin tectonics in what was originally considered to be a single Caltanissetta basin (Butler et al., in press). New field mapping and access to mine records conclusively shows that each perched basin contains a unique cyclic sediment association.

Correlation between perched basins is difficult, however, first cycle evaporites were in place before the Palaeomediterranean desiccation event. Post- desiccation onlap (culminating in the Pliocene, Trubi Formation maximum flooding surface) transgressed northwards across the evaporitic basins (by then also containing second cycle evaporite resediments in Sicily). This brought with it the diagnostic *Globorotalia margaritae* planktonic foraminifera community which traditionally has been used to zone the Pliocene of the Mediterranean.

However, our present work indicates that considerable caution should be exercised in using these faunas as the southernmost Miocene perched basins already contained the *G. margaritae* commuity early in the Messinian (i.e. before the first evaporites). In fact, *Globorotalia margaritae* and *Globorotalia puncticulata* are present in pre-Tripoli Formation clays near Riesi town and occur low within the Tripoli Formation further west at the Racalmuto river section, and to the south near Licata town. The two species are semi-continuosly present throughout the Messinian of the Riesi section. Furthermore, *Sphaeroidinellopsis seminulina* is also present in the pre- Tripoli Formation clays at Riesi and occurs within thick evaporites in the Racalmuto mine.

We conclude that elements of this fauna must have evolved within the Palaeomediterranean as they have not been recorded in pre- Pliocene strata elsewhere. This casts serious doubts on the magnitude of the 'Salinity Crisis' drawdown event, and on the validity of employing *Globorotalia margaritae, Globorotalia puncticulata* and *Spaeroidinellopsis seminulina* as Pliocene biostratigraphic indices.

It is concluded that:

i. Correlation of Mediterranean latest Miocene lithofacies by means of planktonic foraminifera alone could be erroneous in areas exhibiting deep water Messinian facies.

ii. A normal marine refuge was available somewhere in the Mediterranean region for planktonic foraminifera throughout the Late Miocene episode.

iii. The FAD of *Globorotalia puncticulata* in World ocean cores marks the first outflow of Mediterranean waters into the Atlantic.

LES BIOCONSTRUCTIONS COMPOSITES DU MESSINIEN DE SALEMI (SICILE, ITALIE): UNE MANIFESTATION DE L'ACTIVITE CONSTRUCTRICE MICROBIENNE

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Les plates-formes carbonatées messiniennes sont riches en bioconstructions de taille et de nature variées. Les principaux constituants des bioconstructions de dimensions métriques à plurimétriques, sont surtout des scléractiniaires, des algues corallinacées, des vers (serpules et hermelles), des vermetidés et des organismes microbiens (microbialites). L'activité constructrice microbienne, importante en Méditeranée au Messinien, se manifeste par la présance d stromatolites et thrombolites localement trés développés. Elle contribue également au renforcemen de la trame de bioconstruction composite impliquant des scléractiniaires. Un nouveau type de bioconstruction composite impliquant des microbialites a été observé dans les sediments messiens des environs de Salemi (Sicile occidentale).

Les bioconstructions étudiées constituent des anomalies morphologiques dont la hauteur atteint généralement 3 m sur une base de 4-5 m.Elles sont formées de deux ensembles bien distincts: 1)une partie centrale, essentielment micritique, formant un relief bien exprimé en forme de dôme ou de pain de sucre; 2) une couche périphérique atteignant ou depassant 1 m d'épaisseur construite par des colonies coralliennes entourées de manchons microbialitiques.

L'accrétion du dôme basal est caractérisée par la succession d'amas micritiques bothryoidaux et d'enccroûtements de différents organismes comme des corallinacées (*Lithoporella*), des bryozoaires (*Celleporaria*), divers foraminifères encroûtants (nubeculariides, acervulinides), des serpulidés...L'importance et la composition des encroûtements peuvent varier au long de la construction.

Le processus d'accrétion impliquant la formation de microbialite est homogène dans les parties successives du dôme microbialitique, dans la construction a scléractiniaires et microbialites, mais aussi dans d'autres bioconstructions similaires de Salemi, originales au Messinien.

Les bioconstructions composites de Salemi présentent des affinités avec nombre de constructions impliquant le développement des microbialites aussi bien dans les séries anciennes que dans les récifs coralliens actuels. La généralité des constructions microbialitiques au cours du Messinien, dans des sites et dans des conditions d'environnement variées, indique qu'il s'agit là d'un phénomène méditerranéen, dont l'expression semble dépendre surtout des conditions locales. La détermination des paramètres physico-chimiques des eaux marines méditerranéennes au Messinen devrait permettre d'en appréhender les causes.

PALEOTROPICAL ELEMENTS IN THE NEOGENE POLLEN FLORA.(LOWLAND AND PARATETHYS, CENTRAL EUROPE)

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The concept of paleotropical P and arctotertiary A geofloras introduced by Engler and expanded by Mai (1994) has been used to distinguish two flora types from the European Neogene. As paleotropical P are regarded evergreen plants genetically related to tropical P1 and subtropical P2 climatic zones, which are where recent equivalents of these plants are to be looked for.

Arcotertiary A components have been found to be deciduous plants partly loosing leaves for the winter, genetically related to warm temperate A1 or cool temperate A2 zones, and recently found in these zones presented by Planderova et al. (1993), Ziembinska- Tworzydlo et al. (1994).

The share of the two geofloras in the European Neogene was variable and strictly related to climatic fluctuations. Despite the fact that in zone of younger Neogene horizons the quantity of the paleotropical element was clearly increasing its species composition was in each case poorer than in older horizons.

On the basis of these changes several attempts were made to identify distinctive spores and pollen horizons which could serve as markers for the individual Neogene subdivisions.

For this purpose it is important to identify sites. In the reconstruction of the extend of the paleotropical element is regarded as being of major importance; 18 taxa representing both groups P1 and P2 have been selected as most distinctive and their occurrences in different periods are shown on the maps.

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LA RECONSTITUTION DES TOURBIERES PLIOCENES ET LEURS EVOLUTION AU SECTEUR OCCIDENTAL DU BASSIN DACIQUE

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Tenant compt de l'analyse taphonomique des plantes fossiles,des exigences écologiques de ces plantes et du comportement cénotique conu des certains représentants actuels ,ont a établi plusieurs paleophytocoenoses carbogeneratrices pliocénes pour le secteur occidental du Bassin Dacique. Chacun de ces paleophytocoenoses ont été dominé par l'un des principaux taxons: *Byttneriophyllum tiliaefolium, Glyptostrobus europaeus, Salix* div. sp., *Carex* div. sp. et *Phragmites oenigensis*. Un autre group des taxons, à faible fréquennce, seul ou avec les principaux taxons, former d'autres paleophytocoenoses.

La fonction indicatrice des paléophytocoenoses est déduite de celle des associations végétales récents, d'ici ont met en évidence les conditions carbogéneratrices. L'acumulation de la phytomasse carbogénératrice s'est réalisé "in situ", dans des tourbiéres eutrophyques existantes sur une plaine d'acumulation alluviale-deltaique-lacustre, dans un milieux predominant telematique et secondaire sousacvatique, à un pH variable (acide jusqu'a faiblement alcalin). Tout cela se réalisent en milieu anaerobique aux témperatures de la tourbe de 16-20,5 ^{o}C.

La distribution des paleophytocoenoses carbogéneratrice ont forni nombreuses nouvelles informations concernant tant les systèmes et ambiances dépositionelles, que l'evolution géologique et géomorphologique de basin pendant du Pliocéne.

Xth R. C. M. N. S. Congress, Bucharest 1995

Symposium 5

Economic potential of the Neogene formations

LES CARACTERISTIQUES PETROGRAPHIQUES ET CHIMIQUES-TEHNOLOGIQUES DES CHARBONS DES FORMATIONS NEOGENES DE LA ROUMANIE

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On présente les résultats des recherches effectuées sur les caractéristiques macro- et micropétrografiques et chimiques-tehnologiques des lignites et des charbons bruns de la Roumanie.

On present sommairment la géologie des principales gisements des charbons inférius cantonées dans les formations néogèniques de la Roumanie (les gisements des lignites de l'Olténie, de la Mounténie et de la Transilvanie, les gisements des charbons bruns de Tébea et de Comanésti).

Dans la seconde part sont presentées les caractéristiques pétrographiques et chimiques-tehnologiques des charbons des gisements décrits. On presente des listes, des diagrammes de variation des contenues et des profiles pétrographiques.

En final, on essaye une classification des ces gisements sur des criteres pétrographiques et chimiques, pour une valorisation plus efficiente des ces charbons.

A PALEOENVIRONMENTAL RECONSTRUCTION OF THE EARLY MIOCENE COAL-BEARING SEQUENCE IN THE BORSOD BASIN (N HUNGARY)

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The Salgotarjan Brown Coal Formation in the Borsod Basin (N Hungary, Lower Miocene) is composed predominantly of clays, silts and sands and includes 5 (E Borsod) and 3 (W Borsod) major paralic seams.

The Ottnangian age of Salgotarjan Brown Coal Formation was evidenced by its Nannoplanktons, Foraminifers and Molluscs. (A. Nagymarosy 1985, I. Korecz-Laky 1985, M. Bohn-Havas 1985).

The Ottnangian, transgression type coal in the Borsod basin seems to be deposited- after a terrestrial period- almost immediately on the uneven surface of the Lower Rhyolite Tuff bed (Gyulakeszi Rhyolite Tuff Formation) or, in some cases, on older rocks. The lower seams (Seam V., E Borsod; Seam III, W Borsod) are overlain, in a thickness of 200 to 300 m, by Ottnangian-Karpatian detrital brackish- marine molasse rocks indicating a gradual transgression. The Borsod Basin must have been a marine lagoon bordered by a more or less emerged landmass. The lagoon evolved through saltwater to brackish-water to freshwater stages with the times of maximum peat accumulation occuring in the freshwater stage. The swamp environment returned several times during the oscillatory- cyclic sedimentation.

In the areas where water has changed to freshwater and the subsoil was humid and marshy, plant associations of Alnus and Taxodiaceae, resp., settled. On the trees, Calamus climbing palms might have lived. Fern species are likely to have lived as an underwood. The forest swamp was surrounded by Myrica shallow swamp including sedge and reed. The fruits, seeds and pollens of *Typha, Potamogeton, Sparganium* and *Stratiotes* are frequent. Along the rivulets, an *Alnus-Salix* riparian forest with *Carya* and *Pterocarya* species existed. The coastal

margins of swamps were covered by mangrove forests, whereas the areas found at a higher altitude were covered by broadleaf type mixed deciduous and evergreen forest.

The molluscan and foraminiferal associations in the deposits between the coal seams excellently reflect the alternation of brackish lagoonal and a true marine environment (*Brotia-Unio; Congeria-Hydrobia-Melanopsis, Pitaria-Hinia-Cardium, Anadara-Corbula- Turritella; Rotalia-Nonion- Elphidium*).

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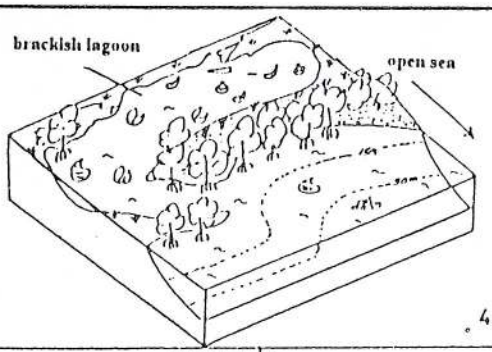


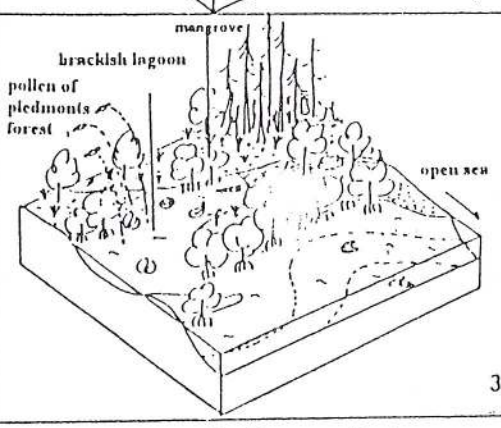
The beginning of a transgressional microcycle

- a dominant sedimentary environment represented by a lagoon with a fluctuating salinity, containing a macro-/microfauna sensitive to changes in facies and salinity

Molluscan associations

- Brotia-Unio
- Congeria-Hydrobia-Melanopsis
- Cardium-Pirenella-Theodoxus
- Crassostrea-Mytilus
- Pitaria-Corolium-Hinia
- Corbula-Turritella-Anadara

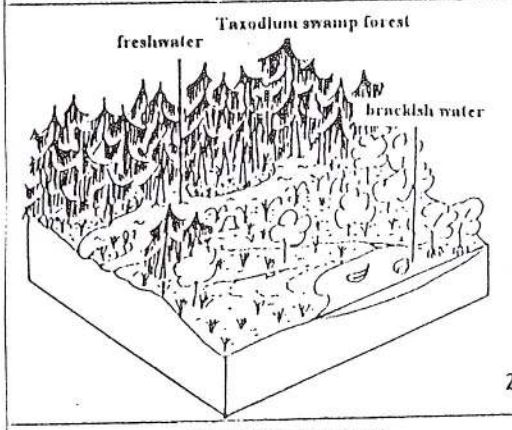
4.



The end of a swamp cycle

- gradual deterioration of freshwater swamp in respore to saline water occuring in the ground-water
- brackish marsh developed for a short period
- then replaced with the gradual dominance of brakish lagoon; including the appearence of a typical macrofauna/microfauna

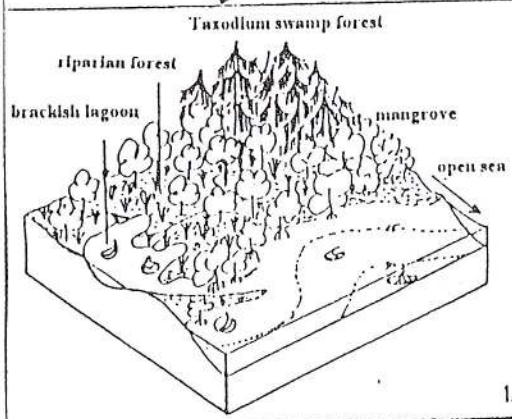
3.



The summit of a swamp cycle

- gradual dominance by a swamp rich in vegetation
- development of typical freshwater-paludal habitats; Taxodium swamp forests, Myrica swamp, hammocks intermediate open water surfaces
- instantaneous water influxes affecting small areas; reworked, separated macrofauna

2.



The beginning of swamp cycle

- filling-up of brackish lagoon
- an increasing dominance of Alnus - fern riparian forest
- the appearance of first representatives of swamp vegetation
- frequent reworking of the fauna in the contact zone between the marsh shore and the lagoon

1.

The block diagrams showing a model for lagoonal, coal-forming environment and its history of development

INFLUENCE OF THE NEOGENE TECTONIC ON THE ENTRAPMENT OF THE OIL RESERVES IN THE ZAGROS OROGENIC BELT OF IRAN

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The relative chronology of the orogenic events related to the closing of the South Tethys, during Neogene, significantly influenced the generation, migration and entrapment of petroleum in one of the world#s richest province, the Dezful Embayment of the Zagros orogenic belt of Iran, which contains more than 7 % of the global reserves in an area of only 40.000 SqKm.

Oil and associated gas are trapped in large size whaleback anticlines which resulted from the main Zagros compressive phase. This phase began towards the end of Early Miocene at around 20 Ma and continued throughout Middle/Late Miocene and Pliocene. Oil and gas accumulated in two calcareous reservoirs, the Sarvak Fm of Cenomanian/Turonian and the extremely prolific Asmari Fm. of Early Miocene, well protected by the evaporites of the Gachsaran Fm..

Three excellent source rocks, i.e. the Valanginian part of the Garau Fm, the Kazhdumi of Albian and the Padbeh of Middle to Late Eocene, were deposited in intracratonic depressions located in the Arabian Platform, when anoxic conditions prevailed. The Arabian Platform remained stable, with a low subsidence during Late Cretaceous and part of Cenozoic, up to Early Miocene, circa 30 Ma. The subsidence was slightly higher during the deposition of the Asmari, between 30 to 20 Ma, then a sudden increase between 20 to 3 Ma corresponded to the deposition of the Gachsaran evaporites, the Mishan Fm., and extremely thick, up to 4000 m, molasse-type sediments of the Agha Jari Fm. which resulted from the erosion of newly formed reliefs.

Modelling, using burial profiles and heat-flow assumptions based upon maturity indices, such as actual geothermal gradient, vitrinite reflectance and rock-eval parameters showed that these

three source rocks attained the oil window, during the deposition of the Agha Jari Fm between 10 and 3 Ma.

According to this chronology, oil was formed recently when the Zagros structures already existed. Therefore, oil migrated over short distances to the next trap within an already well characterized system of drainage areas, the geometry of which could be deduced from seismic data. Moreover, the Zagros folding induced an heavy fracturing observed on outcrops and in wells. This fracturing, which concerns limestones as well as marls, enhanced a subvertical transfer of generated hydrocarbons towards reservoirs and especially towards the well capped Asmari Limestone in which 75 % of the oil accumulated.

Due to such short distance migrations, oils could be directly related to the source rocks which generated them. These relations are confirmed by oil-to-source rocks correlations based upon stable isotopes (13 C,34 S) and biomarkers. Modelling applied for each drainage area provides estimates of the amount of the oil generated by each source rock. The calculated estimate was then compared to the oil-in-place really accumulated in the corresponding field.

Therefore, the use of such a modelling technique, which could provide before drilling, an estimate of the amount and the characteristics of the oil to be found was only possible because the Zagros structures already existed at the time of the oil migration.

GEOCHEMISTRY OF PLIOCENE COALS FROM WEST OLTENIA CORRELATION OF THE COAL BEDS BASSED ON TRACE ELEMENTS

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A detailed geochemical study (atomic absorbtion and flame emision spectrometry for 17 elements) has been made on same coal beds (beds V-XIII) from west Oltenia.

By the qualitative and quantitative determinations we separated two groups of coal beds (V-VIII and IX-XIII) with different geochemistry characteristics, which were generated, probably, by the paleogeographic evolution of the bassin on the Dacian/ Romanian boundary.

Concerning the spatial variation of the trace elements, the sedimentary bassin was divided in three geochemistry areas.

The statistical application bassed on the trace elements contents from the coal ash can be a real method, complementary to the clasics geological and paleontological studies used in the stratigraphy of the coal beds.

HYDROCARBON POTENTIAL OF THE RHARB BASIN, MOROCCO

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The Rharb Basin in northern Morocco is a tertiary forland filled by clastic series during the Miocene and the Pliocene times. These sediments characterized by two main turbiditic sequences are derived from the Prerif to the north-east and the mesta to the south overlaying a thick serie of the nappe complex thrust sheets.

Recent integrated studies based on high seismic resolution techniques and organic geochemistry have consecutively permitted to gain a deep insight of stratigraphy and distribution of biogenic gas lenses within the supra-nappe sequence and showed organic rich shale within the complex of the nappes.

Maturation model, hydrocarbon shows, seeps in outcrops and drilled wells throughout the area provide critical data for evaluating hydrocarbon generation and migration. Such evaluation in combination with structural configuration and seals allows assessment of different plays for oil exploration.

Based on this recent studies various new gas and oil plays are identified in the area.

NEOGENE FORMATIONS THE MOST OIL AND GAS PRODUCING FORMATIONS FROM ROMANIA

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Over 65% of Romania surface is covered by Neogene Formations. More than half of hydrocarbon reserves were discovered and produced from the same formations, and over 500 oil gas pools were discovered too.

The main discoveries for the future are prognosticated in the same formations also.

The detailed chronostratigraphyque studies of the last two decades (1970- 1990), Nannoplankton content mainly, have documented the including of the upper part of previous Oligocene formations in the lower part of Neogene. So, the Lower Miocene is including now a big part of the previous Upper Oligocene formations, from the Eastern and Southern Carpathians, such as, the Podu Morii Beds, the Vinetisu Beds, the Gura Sutii Beds and the Upper Kliwa Sandstone, where these entities were deposited.

As a consequence of this chronostratigraphyque correlations, we assume a heterochronism between the inner and external zones of the flysch and molasse formations, both in Eastern and Southern Carpathians. The Lower Burdigalian Formations are supposed to be continuous developed only in inner subunits of Tarcau Nappe; in the Marginal Folds Nappe didn't find it.

Geotectonic evolution of all sedimentary basins from Romania, especially where the Neogene formations are present, have favourised the deposition and conservation of source, reservoir and seals rocks. The thermal evolution was favourable, all the time, for hydrocarbon generation, both in the Carpathian area by overburden of the nappes and the inner depressions during the subsidence.

The traps were built by the primary lithological closing of the reservoirs during the sedimentation and also, by the tectonic evolution of the areas involved.

The future prospect areas for new discoveries is supposed that will be delimited in the same sedimentary basins, but in the subtle traps and deeper than previous ones.

DISTRIBUTION IN TIME AND SPACE OF NEOGENE SALT FORMATIONS FROM ROMANIA

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This work includes a synthesis of knowledge data with original interpretation, regarding two Neogene salt formations (low and upper) from Romania.

Low salt formation of low Burdigalian age, is genetically linked with the ending phase of savical fold, when to raising edge of central Carpathian anticlines the Carpathian Avantfosse was metched, the lonely area of occurrence of this formation. From lithological point of view, the low salt formation is made of sandstone-clay deposits, generally with gypsum, gypsums, rock salt and here and there delicvent salt. The thickness of formation is comprised between 300 m and 600 m, and was met in drillings untill the 2000 m depts.

The upper salt formation of upper Langhian age, represent the second deposition moment of salt formations and its spreading in the Carpathian Avantfosse, the Transilvania depression, and the Depression of Maramures.

The upper salt formation is present in this northern sector only on the external edge, lengtways pericarpathical line, while in the southern sector appears and by day, between the Cricov and Teleajen valleys. Towards, the southern part of Avantfosse, the salt Langhian absorbs a part of Getic Depression. Very known are the Badenian salt formations from Slanic, Drajna, Predealul Sarari Sinclines which arefind out between Teleajen and Prahova valleys, in a zone of plungement of Tarcau cloth. The breccias which accompanies salt massifs, are composed by a marly-argillaceous matrix with sandstone, green clays,grey marles and dysolythic schits elements, chaotically distributed, which proceed from Eocene and Oligocene facies of Pucioasa layers. In Transilvania Depression, the upper salt formation occupies an about 16500 km2 area, and presents average thickness of 250-400 meters. In the central part of the depression, are nomerous big doms, where we met the salt accumulations until 4000 m depth. The salt appears in outcrops on the

northern edge of depression and lengthways of the 2 big diapyric alignements, on the northern and western edges of those. Over the continuous salt counterpane, there are marl-argillaceous deposits. Formation with Langhian salt from Maramures Depression is transgressively disposed over Paleogene deposits with an area comprised between Ocna Sugatag and Sighet, continuously toward north-western part of Ucraina.

CLASTIC EVAPORITIC EVENTS IN THE LOWER NEOGENE OF THE PERICARPATHIAN UNIT

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The evaporitic sequences from the Carpathian Foredeep are parts of Lower- Middle Neogene "formations".

The "Upper Evaporite Level" at Teisani (Teleajen Valley) shows distinctive facies characteristics which recommand it as a evaporitic "megasequence" that comprises 4 units ("mesosequences") : rhytmites with intraclastes; slumps; algal mat/ laminated sulphate rhytmites; massive clastorudite evaporites. These units display a wide range of postdepositional (diagenetic) transformations.

Sequence description. a) The mesosequence of "rhytmites with intraclasts level" comprises centimetric couplets consist of laminated algal mats and gypsum laminae in which the frequence of black porphyroclasts- relict secondary gypsum from the anhydrite- is greater.

b) The mesosequence of "slumps" : covers erosional or dissolution surfaces and includes brecciated intraclasts in a convolute arrangement thet covers (or is covered by) the algal facies.

c) The mesosequence of "algal mats/ laminated sulphate rhytmites" : is clearly developed and constitutes the central part of the megasequence. It comprises 10- 30 couplets of algal mats/ sulphates in an individual thickness of 5- 20 cm.

d) The mesosequence of "massive clastorudite evaporites" : may be regarded as the upper unit of the megasequence and comprise a thickness range of maximum 12 m. Its planar boundaries are subaequeous dissolution surfaces that limit its irregular body by the "Radiolarian Shales and Spirialis Marls Horizon".

Facies interpretation. The facies of algal mats/ laminated sulphate rhytmites suggests a shallow-water setting, been accumulated within a marginal basin ("salinas type") probably installed on a tectonic depression, behind a costal barrier.

Stromatoliths may grow in protected shallow water settings within a photic zone, but other organic matter could be derived from seasonal phytoplankton blooms within the photic zone.

The active subsidence and the short-term cycles (of Vth - VI th order) controlled the rhytmic deposition of algal mats/ gypsum couplets and, consequently, the increase in sequence thickness.

The upper facies (clastic debrites), showing a deep-water setting, have been accumulated - by gravity-flow processes - at the base of a high-energy paleorelief, become submerged during eustatic rises; the source-area - placed in an arid climate - have comprised suspended evaporitic beaches and plains, at that time affected by weathering.

Depositional evolution. The evolution of depositional area toward a "transgressive-stand" basin may be argued - in addition - by the central basinal facies represented by the overlying megasequence of "Radiolarian Shales and Spirialis Marls".

The presence of clastic dykes and the irregular thickness emphasize the real overload within the frame of the basin after the debris-flow deposition and, also, the high grade of consolidation existing in the overlying units.

Evaporites deposited in low-relief basins are similar to shelf evaporites; they are exclusivelly composed of shallow water or mud flat facies.

In basins that had high relief shallow water/ subaerial facies may have formed on basin marginal shelves, been the terminal phases of the basin fill (after depositional relief was eliminated). Near basin edges they may pass laterally into an intermediate facies belt of slope deposits, characterized by reworked evaporites, mass flow deposits, slumps.

Economic considerations. The thickness and the quality of evaporitic megasequence at Teisani (as part of the Lower Neogene evaporites) recommmend it as sustainable for economic exploatation in quarry.

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PARAGENETIC SEQUENCE OF THE POLISH SULPHUR- BEARING DEPOSITS

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Native sulphur deposits located in the Carpathian Foredeep of southern Poland are the products of a complex sequence of physical and diagenetic events. As it has been assumed, the alteration of primary solid rocks (sulphates) into secondary lithologies (mainly limestones) was reflected by the presence of various structural and textural features of these economically important deposits. The most distinct sulphur-bearing rocks are gypsum-ghost limestones (i.e. limestones with void moulding selenitic gypsum crystals and preserved calcite or calcite-sulphur pseudomorphs after selenites). The gypsum-ghost limestones are common and characterized by a high content of native sulphur and a high porosity in comparison to other sulphur-bearing rocks. Thus, preserved postselenitic gypsum structures provide a well opportunity to study diagenetic alteration processes responsible for the mineral concentrations.

Both petrographic and cathodoluminescence analyses determined diagenetic events and various mineral generations within the diagenetic sequence. After removal of selenitic gypsum, empty voids were successively cemented mainly by calcite and native sulphur. These minerals are accompanied by minor contents of other minerals like : celestite, barite, pyrite, strontianite, aragonite and hydrocarbons as well as by clay and organic matter impurities, and detrital quartz. Calcite, sulphur and celestite commonly exhibit multiple cementation episodes and paragenetic assemblage was accompanied by other diagenetic phenomena such as : gypsum dissolution, calcite dissolution (connected with karstification) and recrystallization, sulphur recrystalization, brecciation, and fracturing. Generally, the study revealed a complex relationships between the main components of the gypsum-ghost limestones and allowed to distinguish two diagenetic stages: (1) pre-ore sulphur stage which includes gypsum dissolution, calcite cementation and dissolution accompanied by brecciation, recrystalization of calcite, pyritization, slight fracturing, and initial

phase of sulphur formation; (2) ore sulphur stage which includes main phase of sulphur concentration, as well as celestite, barite, pyrite and aragonite mineralization, and sulphur recrystalization.

CONTRIBUTION A L' ETUDE DES FORMATIONS AQUIFERES NEOGENE SUPERIEUR (entre Olt- Oltet)

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En cette ère post-industrielle ou notre civilisation cherche désésperement à gérer l'espace et maîtriser le temps nous decouvrons que notre univers est limité, ses ressources comptées et ses possibilités d'accuellir et de stabiliser les turbulences du développement de plus en plus restreintes.

En ce qui concerne la situation actuelle at le fait que la plupart des epreuves de l'eau de surface ne corespondent pas aux normes de consoumation se montre comme necessaire la decouverte des nouvelles resources d'eau souterraine appartenant aux structures situées dans le cadre des formations de profoundeur (dans ce cas, les formations néogène superieur, situées entre Olt- Oltet) qui ne sont pas encore contaminées par de sources nocifs.

Les resultats obtenus dans le cadre des recherches complexes, conduisent à l'amelioration du dégre de connaissance des structures aquifères du Bassin Dacique (entre Olt- Oltet- Jiu) et pour le futur puissent apporter des informations necessaires concernant les nouvelles strategies dans le domaine du Management des resources des eaux potables souterraines, par les modèles hidrogéologiques.

DELTA FRONT HEAVY MINERALS CONCENTRATION : UPPER NEOGENE OF TIGVENI ZONE (ROMANIA)

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Heavy minerals accumulations have been identified and explored in Upper Neogene deltaic bodies outcropping in Tigveni zone. Several microenvironments are apparent within the lacustrine deltaic units: delta plain, mouth bar, delta front and (occasionally) delta front base.

The delta front microenvironment is represented by gravitational mass- transported sandy sediments with thin interbeds of wave reworked sediments.

The sedimentological study indicates that a grain size and mineralogical segregation was active along the delta front slope. This is mostly indicated by the distinct features apparent at th upper and lower part of the delta front sequence. The upper part is singled out by higher freque of small size dispersed pebbles, as well as by the presence of thin heavy minerals- rich sa interbeds. Concetration of large mica grains and low frequency (or absence) of dispersed sm pebbles characterize the lower part of the delta front sequence.

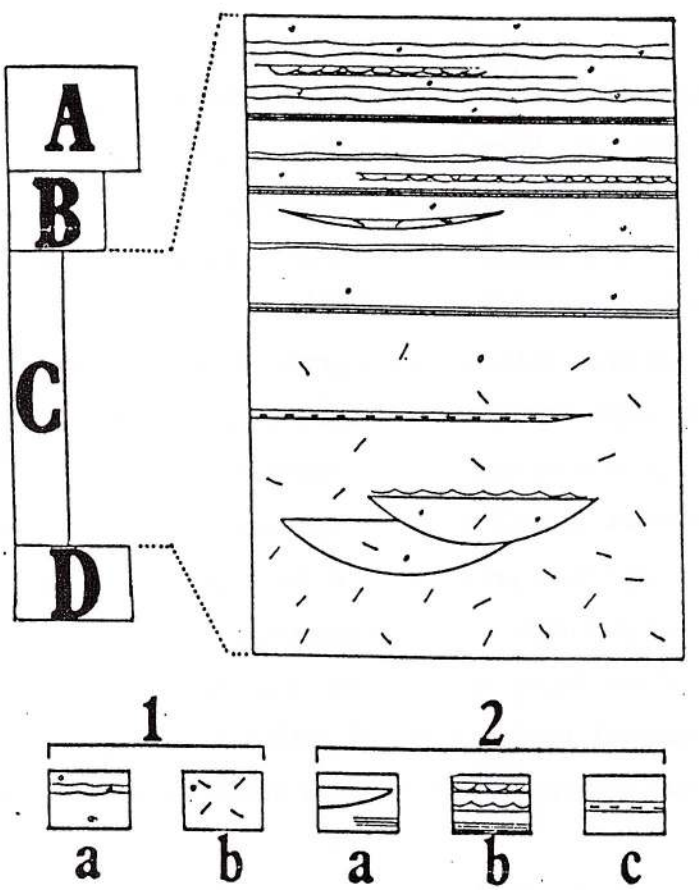
These data point out that heavy minerals and small pebbles have been the first fractio separated from the gravitational mass transported sediment flowing down the deltaic slop Consequently, heavy minerals concentrated on the upper deltaic slope and occur toward the top the delta front sequence.

With a high floating capacity, most of the large mica flakes fraction was deposited on t lower delta slope, marking up the basal part of the delta front sequence.

The primary accumulations of heavy minerals occur as dark coloured homogeneous, f grained sand, with scattered small pebbles.

The secondary heavy minerals accumulations result through wave reworking of the m flow originated heavy minerals sand beds. The internal structure of these accumulations consist parallel lamination and concave-up wave lamination.

Delta front facies model of Upper Neogene sediments from Tigveni



A.Delta plain. B.Mouth bar zone. C.Delta front. D.Delta front base.
1.Mass transport genetic facies. 2.Particle by particle transport genetic facies.
1a.Hommogeneous sand with heavy minerals and frequent scattered pebbles.
1b.Hommogeneous sand with large mica grains. 2a.Sand with parallel, cross lamination and small channels. 2b.Sand with wave generated lamination. 2c.Thin clay intercalations.

GEOLOGY AND HYDROCARBONS IN THE TRHOVISTE - POZDISOVCE GROWTH STRUCTURE IN THE WESTERN PART OF TRANSCARPATHIAN DEPRESSION

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The East Slovakian Neogene Basin represents the western portion of the Transcarpathian depression extending over 3390 km2 and filled up by 8.0 km thick filling of sedimentary and volcanic rocks of Eggenburgian to Holocene age. The basin occurs eastwards from Kosice along the Slovak-Ukrainian and Slovak-Hungarian boundaries, respectivelly. The Pre-Neogene basement of Paleozoic to Mesozoic age creates a spoon-like depression elongated in NW-SE strike.

Continuous geophysical and drilling exploration covering about 2/3 of territory proved hydrocarbons. Source rocks for hydrocarbons are the Miocene sequences : Karpatian, Badenian and Lower Sarmatian in age. The organic matter content fluctuate among 0.6- 1.1 %.

The most significant collector rocks are the sandstones deposited in shallow-sea-delta environment / Badenian to Sarmatian/. In rare cases, also volcanites and fissured basement rocks serve as collector for hydrocarbons. Sealing to pools is yielded by marls or by saline horizons of Karpatian and Middle Badenian age.

Hydrocarbons traps are mostly stratigraphic and structural types combined by faults.

The Trhoviste Pozdisovce structure carrying hydrocarbons of economic value is created by oblique faults in the Mocarany-Topla fault system of NW-SE orientation situated along the NE basin margin. Faults dipping 25°-45° are compressed in Middle and Lower Badenian and also uppermost Sarmatian and lowermost Pliocene. Synsedimentary faults dipping by 50°-60° to NE have been initiated by renewal of Pre-Neogene faults. Movements along main synsedimentary faults ceased in Sarmatian.

Productive horizons mainly occur in the Klcov Formation of Upper Badenian age. There are sands of delta plain passing into the delta front towards W-SW. Altogether 8 productive layers have

been stated mostly in 500-1654 m depth interval. Single horizons attain 2-20 m thickness. The porosity varies between 12-22 % and permeabilities are 30-261, 42-171 955,14 nm2. Pressures are by 12 % higher than the hydrostatic one.

Discovery of fault significance and that of facies may result in new hydrocarbon findings in the structure.

ETUDE GEOCHIMIQUE PRELIMINAIRE DU CONTENU EN MATIERE ORGANIQUE DES DYSODILES SUPERIEURES DU LITHOFACIES BITUMINEUX EXTERNE DES GRES DE KLIWA

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L'étude géochimique par pyrolyse Rock-Eval d'échantillons des affleurements de la Formation des dysodiles supérieures (Miocène inférieur de la Nappe des Plis Marginals) a permis de montrer que le contenu en matière organique varie entre 2 et 14 % de carbone organique total. Le faciès organique II est reconnu principalement dans la zone.

Les T_{max} enregistrés sont très variables (entre 419 et 435°C), mais les plus frequentes valeurs indiquent une matière organique avec un degré d'évolution thermique approché à la limite inférieure de la fenêtre à huile.

Les couches riches en matière organique se sont déposées dans un milieu anoxique. Parmi les principaux facteurs qui auraient controlé la sédimentation organique, la morphologie du bassin et lui relatif isolement par rapport au reste de l'océan apparaissent comme les plus influents.

ORE DEPOSITS AND GEODYNAMIC FRAMEWORK OF EASTERN BETIC MIOCENE BASINS (SOUTHERN SPAIN)

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Southeastern Betic ore deposits are known for a long time. Mining initiated during Bronze age was actively developed by Carthaginian and Roman miners; it was continuing still the last decade. Several mining fields (Cartagena, Mazarron) rank among the largest peri-Mediterranean ore deposits. The antiquity of mining is probably responsible for the relative desertification of the region, due to intensive and continuous deforestation.

Pb-Zn deposits (with Ag) are the most important but the paragenesis are widely diversified, including Au, Ba, Cu, F, Fe, Hg, Mn, Sb and Sn minerals.

A number of conflicting interpretations have been proposed for the genesis of the ore deposits. The prevailing theory, for a long time, considered the ores as syngenetic mineralizations developed within the Permo-Triassic material of the Betic nappes; various processes were proposed for later remobilizations. Another theory privileged the role of hydrothermalism related to late Miocene volcanism.

A regional survey of the Neogene basins located between Alicante and Almeria (1) provides new data for interpretating the Eastern Betic metallogenic event. The chief points may be summarized as follow:

* ore deposits are located within a narrow strip coinciding with a NE-SW trending strike-slip fault corridor which passes through the Eastern part of the Betic-Rifean realm: the so-called Trans-Alboran shear zone;
* diversified Miocene volcanism and plutonism are closely confined in the same corridor;
* late Neogene basins (Tortonien to Plio-Pleistocene) inscribed in the transcurrent corridor suffered a strong synsedimentary structuration due to the activation of the different trends of faults

which compose the strike-slip system. The stress field is characterized by a submeridian compressional axis fluctuating from NW-SE to N-S.

* the main metallogenic event occurred during a short interval of times, close to the Tortonian/Messinian boundary (N-S trending compressional axis);

* ore deposit locatons are submitted to:

- **tectonic control.** They occur close to the master lateral faults which bound the basin (Carboneras and Palomares senestral faults) at the crossing of fractures (mainly N-S, NW-SE and NE-SW faults); numerous mineralized veins follow the same trends;

- **lithologic control.** Most the ore stocks appear as impregnations of clastic sediments (Tortonian turbidites), substitutions of Miocene carbonates, stockwerks developed in fractured rocks (Triassic dolomites of the basin basement; volcanics). The spatial connection between hydrothermal halos and Miocene volcanic bodies is observed in several cases (Cabo de Gata, Mazarron) but it is not a general rule.

* as a result of the compressive tectonic context, both magmatic and metallogenic manifestations may display an explosive expression such as pebble dykes or pipes (for ex. Sn-bearing pipe rising up in Pb-Zn environment).

* Both magmatic and metallogenic events are indicative of a strong thermal anomaly which exactly underlines the transcurrent zone; the thermal crest is notably expressed by the end of Tortonian times.

* The transcurrent corridor is the superficial trace of a lithospheric boundary between a western "normal" crust and an eastern thinned crust. The thermal anomaly is probably related to a mantle rasing along this boundary during the late Miocene.

* It is to note that the thermal anomaly was not relayed by efficient convection process and has had little influence on surrounding basin deposits.

(1) For regional studies and references, see MONTENAT C. (edit) 1990. Les bassins neogenes du domaine betique oriental - Espagne.
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DEPENDENCE SOLIDE OF STRUCTURE ROCK

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In the sedimentary rock mass Sarmatian enough widely circulation structures with break bedding. They mostly be formed in the time of submarine landsliding sediments lead to breach and dislocation sediments: breach's bed attitude between the beds with normal attitude, various degree is dislocated bed rock, lower border of bedding is knife-edge, upper-little typical breach of bedding such, as well as dislocation arise in the syngenesis.

Determine of time from and time bedding structure it is important for correctly interpret by property rocks, correctly selections of typical quality, especially for construction on the landslide slope.

In the table snow property coals with breach and dislocations structure and normal structure, and property rocks with is structures but ... modern landslide (landslide rock). Rocks with breach structure have solidity and density smaller, humidity bigger, then it for rocks with normal structure. Landslide rocks from rock normal structure have solidity; density bigger than for breach structure.

Right description sarmatian's rock help building reliable geological profile. Detail research structure's rock help correctly do prognosis property (solidity) rocks.

Character's property Sarmatian rocks

space of selection rock	humidity % range property	density g/cm3 range	solidity MIIa range

Sarmatian coals with normal structure

on the	18	1.77	0.090
fundamental	15-20	1.62-1.90	0.030-0.150
slope			
landslide	21	1.68	0.028
rock	15-26	1.52-1,76	0.013-0.060

Sarmatian coals with breach and dislocation structure in the syngenesis

on the	20	1.72	0.073
fundamental	15-23	1.62-1.86	0.040-0.120
slope			
landslide	27	1.56	0.009
rock	18-32	1.52-1.73	0.001-0.015

SEDIMENTARY HISTORY OF THE MIDDLE MIOCENE BADENIAN GYPSUM IN THE CARPATHIAN FOREDEEP OF WEST UKRAINE

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Primary gypsum dominates in the middle Miocene Badenian of West Ukraine. The lower part of the gypsum sequence is built up of autochthonous gypsum. The upper part is composed of allochthonous gypsum that formed following a major tectonically-induced change in basin morphology. This change resulted in a destruction of the margins of the gypsum basin and important redeposition features.

There are facies transitions in many exposures of the Badenian gypsum. Important for the interpretation of sedimentary environments and history of deposition, is the most common facies continuum within the autochthonous gypsum complex:

microbial - - -> grass-like (bedded selenite) - - -> massive skeletal (massive selenite) - - -> sabre gypsum, which reflects an increasing salinity of the brine. It seems that all these facies represent a very shallow subqueous sedimentary environment. The particular facies reflect the brine salinity that was prevalent in any particular area during the deposition of gypsum, but the boundaries between these facies are clearly diachronous.

Individual facies are of limited continuity which is a common feature of shelf evaporites. These facies formed a mosaic of saline flats on which interbedded grass-like gypsum and stromatolites were deposited, separated from local brine pans in which skeletal and sabre gypsum originated.

Giant gypsum intergrowths forming the lower unit of Badenian gypsum in Podolia suggesting that a brine density stratification existed at the beginning of gypsum deposition. Later on, there is no evidence of brine density stratification, and the most of the area was located within the brine pan during deposition of other autochthonous facies. The gypsum flats periodically dried out completely and were exposed to rain during the deposition of the middle part of the gypsum sequence. Giant gypsum intergrowths are overlain by a unit of stromatolitic gypsum. A basal scoured surface of the stromatolitic complex and the presence of fragmented giant gypsum intergrowths suggest a periodic high-energy event that preceded the development of the stromatolitic complex. This was most probably related to a drop in sea level.

The deposition of stromatolitic gypsum and then of grass-like gypsum indicates a radical change in brine chemistry when compared to the earlier unit and the important influx of fresh water of meteoric origin. However, due to a general progressive increase in salinity the sabre gypsum terminates the autochthonous gypsum deposition.

The growth of selenites was possible due to a continual influx of marine brines. The interruption of growth, sometimes accompanied by a partial dissolution of crystals, can be best explained by an influx of fresh water from the adjacent land. Meteoric water could be eventually entrapped in fluid inclusions in bigger crystals when they continued to grow in more concentrated water. Initially, the bottom was repopuled by algae when the salinity was 80-150 g/l, as may be assumed from observations in modern salinas. The stromatolites became gypsified when a new layer of selenite was formed.

When the high-salinity conditions were longer lasting, thick complexes of massive selenite or sabre gypsum were formed. The growth was probably interrupted by dissolution and/or mechanical reworking which gave a sequence of minor cyclus as well as large-scale lens-like arrangements of skeletal gypsum.

This very shallow subaqueous environment, probably a few meters deep at most, in which skeletal and sabre gypsum developed was also subjected to major changes of chemistry although these were episodic, following the influxes of fresh water from the hinterland. The expression of that influx was deposition of intercalation of stromatolitic gypsum or microcrystalline/granular gypsum. Also a gradual transition of sabre gypsum into stromatolitic/clastic gypsum indicate influxes of fresh-water.

The pattern of the Badenian gypsum facies in the Ukraine indicates that the facies repetition may be related to climatically-controlled salinity changes and not to depth changes, as is commonly used to explain the repetition of sulphate facies in a vertical succession.

ASSOCIATION OF REDEPOSITED SALT BRECCIAS AND POTASH EVAPORITES IN THE LOWER MIOCENE OF STEBNIK (CARPATHIAN FOREDEEP, WEST UKRAINE)

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Potash evaporites of the Lower Miocene Vorotyshcha Formation are sandwiched in salt breccias in the Ukrainian part of the Carpathian foreland basin. These breccias have been traditionally interpreted in terms of tectonic deformations related to the overthrusting nappes of the Carpathians. The breccias are composed of fragments of sandstones and siltstones, and contain intercalations of sandstones and halite. The clasts are cemented by halite although in places individual clasts float in the matrix. The size of clasts in the breccias varies from 2-3 to 20-30 cm but blocks up to 2 m diameter are sometimes noticed.

The composition of clasts changes from place to place. The most clasts consist of intrabasinal sandstone, marlstone, halite and anhydrite but exotic clasts consisting of rocks that are characteristic of the Carpathian flysch rocks also occur.

The breccia beds are intercaled with salt layers containing sedimentary forms although some layers seem to be composed of detrital salt. These salt layers occasionally display graded bedding or cross-lamination, and continue over great distances. There are also slump structures associated with those bedded salts.

There existed two domains the deposition of the Vorotyshacha Formation: a shelf dominated by mixed clastic and halite deposition and the adjacent deeper basin with subaqueous halite precipitation. The salinity in the basin was high but intermittent inflows caused some brine dilution so that it could maintain halite precipitation for a long time. During a temporary reduction

of the supply of such large amounts of sediment-filled waters, brines in the basin could reach the sylvite-saturation level so that potash chlorides started to deposit. The potash was precipitated subaqueously. Based on arguments from the study of fluid inclusions it seems that the depth of the brine was 8-30 meters, and that figure agrees well with the supposed brine stratification in the basin that has been subjected to influxes of sediment-laden waters. Accordingly, the envisaged scenario assumed that the Lower Miocene salts originated by evaporation of mixed marine and non-marine parent waters that have been syn-depositionally recycled.

The Vorotyshcha Formation was deposited by cohesive flows and high density turbidity currents that operated in a brine body. The gravity-induced redeposition was initiated by tectonics in the Carpathians and was intensive prior to and after potash sedimentation; the potash beds originated during a tectonically quiet period. The sedimentary breccias of the Carpathian foredeep could, and often did subsequently suffer an important tectonization, but the analysis of the relation of breccias to evaporites suggests that both were formed in subaqueous environment a dozen to a few tens of meters deep.

THE MIOCENE PHOSPHOGENIC EPISODE OF MEDITERRANEAN: PALEOGEOGRAPHIC AND PALEOCLIMATIC CONDITIONS. CORRELATION WITH THE CRETACEOUS- EOCENE PHOSPHOGENIC EPISODE OF TETHYS.

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Comparison of the paleogeographic and paleoclimatic conditions of the Miocene phosphogenic episode in the Mediterranean with the Cretaceous-Eocene major phosphogenic episode of western Tethys, is attempted.

In global scale during Miocene, sea-level was much lower than at the late Mesozoic to Tertiary, characterized by sea level maximum. Due to lowering of sea level more land was exposed and subsequently the necessary for phosphorites formation shelf area, had been reduced. However, the activity of western boundary upwelling currents favoured an abnormally high phosphatization, specifically in mid-latitude areas.

On the contrary, due to high sea level stand at the Cretaceous-Tertiary, greater shelf area existed and that was reached by highly productive equatorial dynamic upwellings, responsible for the extensive Cretaceous Tethyan phosphatic belt.

It has also to be taken in consideration, that the Miocene phosphogenic periods were much cooler than the phosphogenic periods of Cretaceous, characterized by warm temperatures, that generally favour phosphatization.

The case of Miocene suggests, that low temperatures, in combination with the continents position and suitable sea level can also enhance phosphatization.

Both the Mediterranean and western Tethys had occupied an equatorial-low latitudinal area. Mediterranean was narrower than its older counterpart, the western Tethyan seaway, but broad enough to produce its own atmosphere circulation, that permitted comparatively limited phosphogenesis.

In Greece, small outcrops of non-economic Miocene phosphatic formations are known in the Ionian zone, as well as in the islands Cefallonia and Corfu, revealing a rather weak phosphogenic episode. However, the existence of Miocene phosphate occurrences-even minorcan provide valuable information concerning the general oceanic circulation of Mediterranean and the distribution of upwelling systems during the Miocene.

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LA GENESE DES PRINCIPAUX GISEMENTS DES CHARBONS NEOGENES DE LA PARTIE ORIENTALE DE LA PARATETHYS CENTRALE

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Pendant le Néogène, dans la partie orientale de la Paratéthys centrale se sont déroulées six étapes carbogénératrices dans les suivants intérvalles stratigraphiques: Aquitanien, Langhien, Kossovien- Volhinien, Bessarabien moyen, Pontien moyen et Dcien-Romanien moyen. Pendant toutes ces étapes on a été accumulé le matériel végétal parental des charbons dans les marécages eutrophes, transformé ultérieurement en gisements de charbons, plus ou moins importants, dans les suivants bassins charbonneux: Almaj-Agrij, Mehadia, Bozovici, Tebea-Brad, Borod, Comanesti, la Dépression de Brasov, Borsec, Simleul Silvaniei, Lugoj et quelques secteurs du Bassin Dacique, surtout dans sa partie occidentale.

Envisageant une nouvelle conception sur les rélations des facteurs génétiques (la structure, la tectonique, la paleogéographie, le climat, la végétation, les procès physico-mécaniques, la géothermie) et, aussi, sur les caractéristiques quantitatives et qualitatives des gisements des charbons, conception élaborée par N.Ticleanu, les auteurs présentent une analyse détaillée sur la génèse de principaux gisements des charbons néogènes de la Paratéthys centrale.

On est présenté, spécialement, l'appartenance structural-génétique des gisements, les milieux de dépôt, les systèmes et les paléoenvironnements où se sont développés les marécages qui ont généré les charbons, les associations végétales, les facies charbonneux, le climat,etc.

LA DISTRIBUTION TEMPORELLE ET SPATIALLE DES GYPSES NEOGENES DE LA ROUMANIE

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Dans les dépôts néogènes de la Roumanie, se développent le plus grand des roches gypsiphéres à l'importance economique est lié des formations miocénnes qui se trouvent dans les grandes unités structurales: les Carpats Orientals, la Dépression de la Transsylvanie, la Dépression Gétique et la Plate-forme de la Moldavie.

Dans les Carpats Orientals les gypses se trouvent dans les formations aquitaniennes de Drajna et Maneciu, burdigaliennes de Pucioasa, Cornu, Stefesti, Bozioru, Soveja, Barsesti, Naruja, Andreiasu, Perchiu, Nistoroaia, Dragugesti, Pietricica, Marginea et dans le Badenien a accumulations des gypses de Slanic.

La Dépression de Transsylvanie a des importantes accumulations liées des dépôts badeniens de Turda, Calan et Orastie (possible le Bassin du Strei).

Dans la Depression Getique les gisements de gypses sont en liaison avec les depots aquitaniens et burdigaliens de Boteni, Nucsoara et Corbeni.

La Plate-forme de la Moldavie a des accumulations des gypses dans les formations badeninnes de Darabani.

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