# Source rock investigations of a Middle Jurassic Posidonia marl of the Ionian Zone of Albania

NEUMEISTER S.[1], GAWLICK H.J.[1], BECHTEL, R.[1], HOXHA, L.[2], MISSONI, S.[1], GRATZER, R.[1] & DUMITRICA, P.[3]

[1] University of Leoben, Department for Applied Geosciences and Geophysics, Prospection and Applied Sedimentology, Peter-Tunner-Straße 5, 8700 Leoben, Austria;
[2] Geological Survey of Albania, Tirana, Albania;
[3] Dennigkofenweg 33, 3073 Guemligen, Switzerland

The understanding of genesis and source rock potential of sediments deposited in the course of the sedimentary history of development (trench formation, passive continental margin, active continental margin) and which build the orogenic belts today is of significant importance. Regarding the Ionian Zone of the Albanides in particular different potential source rocks in Jurassic successions should be connected with global anoxic events (OAE; e.g., Toarcian - JENKYNS 1988).

Therefore we investigated in this study a Jurassic source rock of the Ionian Zone of southern Albania, estimated to be deposited in Toarcian (e.g., MECO & ALIAJ 2000), because these rocks have not been investigated in detail until now. In Late Early Jurassic (Toarcian) a slight deepening was interpreted as cause of the general sea-level rise in the Toarcian (e.g., MECO & ALIAJ 2000) or interpreted as attributed to a local rifting event (KARAKITSIOS 1995). According to KARAKITSIOS (1995) the deposition of deep-water sediments and also the accumulation of organic matter in the Ionian Zone should be directly related to the geometry of a synrift period of the "Ionian Basin". He distinguished Lower (Toarcian) and Upper (Tithonian; resp. Callovian to Tithonian) *Posidonia* beds.

Sedimentary succession: The Ionian Zone in southern Albania is generally characterized by shallow-marine sedimentary rocks in the Late Triassic and Early Jurassic. The Toarcian succession was followed by radiolarites and later, but still in late Middle or Late Jurassic, overlain by shallow-water carbonates. Shallow-water carbonate deposition prevailed also during the Cretaceous.

Additionally the stratigraphic age of the investigated source rock was determined by radiolarian dating of a cherty limestone directly in the footwall of the organically rich sediment, to get an exact age and to correlate it exactly with the estimated Toarcian OAE or to get other paleoecological implications (compare GORICAN et al. 2003).

One characteristic organic-rich sample from the Jurassic deep-water succession was investigated by means of different methods regarding its petrographical and geochemical characteristics. In the process the typical bulk geochemical parameters of the rock as well as the molecular compositions of hydrocarbons (e.g., straight chain alkanes, isoprenoids, steroids and hopanoids and related compounds) were analyzed.

The results of the organic-geochemical analyses argue for a deposition in normal marine to lacustrine and brackish environments with freshwater supply under oxidizing conditions poor in sulphate. The organics of the sample originate from marine as well as from terrestrial sources. Higher plants may appear as source of the organic material as well. The vitrinite reflectance measurement yields a value of 0.5 $\%R_r$ characterising the low maturity of the sample, comparable with the results of BAUDIN & LACHKAR (1990) in the Ionian Zone of Greece. The sample has not reached the reflectance areas of the oil window and thus has not exhausted its potential for oil and gas generation yet. In contrast to the results of KARAKITSIOS et al. (1988) the

organic content of our sample is relatively high, comparable with the results of DANELIAN & BAUDIN (1990). The X-ray diffraction results in a mineralogical composition of quartz and calcite with some small amount of pyrite. Moreover the results of the diffraction suggest a new termination of the sediment as *Posidonia* marl and not as *Posidonia* shale as mentioned by MECO & ALIAJ (2000).
New data could be obtained regarding the stratigraphic position of the *Posidonia* marl as well. A cherty limestone directly in the footwall of the sedimentary rock rich in organics could be dated by radiolarians yielding Bajocian to Bathonian age (by the occurrence of *Japonocapsa* aff. *fusiformis* (YAO), *Parahsuum* aff. *officerense* (PESSAGNO & WHALEN) and *Paronaella* sp.). On the basis of this result the age of the overlying *Posidonia* marl has to be corrected to Middle Jurassic (Bathonian or younger) and therefore quite younger than Toarcian and also older than Callovian to Tithonian (KARAKITSIOS 1995). Also the geochemical composition and the biomarker characteristics are quite different from the known Toarcian OAE elsewhere (e.g., true *Posidonia* shale in southern Germany, Sachrang Member in the Northern Calcareous Alps). We conclude as depositional environment for the Middle Jurassic source rock of the Ionian Zone of southern Albania a small scaled but elongated basin, which was newly formed in that area as result of the onset of ophiolithe obduction onto the Adriatic margin and not as half-graben (compare GAWLICK et al. 2008). Therefore the formation of the Ionian Basin is related to contractional tectonics and not to extensional ones (“extension related to the latest opening of the Tethys Ocean” - KARAKITSIOS 1995). This model has to be proved in detail in a larger scale. Additionally more facies and stratigraphic investigations beside detailed source rock studies are needed in the whole region.


BAUDIN, F. & LACHKAR, G. (1990): Geochimie organique et palynologie de Lias superieur en zone Ionienne (Grece). Example d´une sedimentation anoxique conservee dans une paleomarge en distension. - Bulletin de la Societe de France, **8**: 123-132.

DANELIAN, T. & BAUDIN, F. (1990) : Decouverte d´un horizon carbonate, rich en matiere organique, au sommet des radiolarites d´Epire (zone Ionienne, Grece): le Membre de Paliambela. - Compte Rendu de l´Academie des Sciences, **311**, series II: 421-428.

GAWLICK, H.J., FRISCH, W., HOXHA, L., DUMITRICA, P., KRYSTYN, L., LEIN, R., MISSONI, S. & SCHLAGINTWEIT, F. (2008): Mirdita Zone ophiolites and associated sediments in Albania reveal Neotethys Ocean origin. - Int. Journ. Earth. Sci., **97**: 865-881, (Springer) Berlin.

GORICAN, S., SMUC, A. & BAUMGARTNER, P.O. (2003): Toarcian Radiolaria from Mt. Mangart (Slovenian-Italian border) and their paleoecological implications. - Marine Micropaleontology, **49**: 275-301, Amsterdam.

JENKYNS, H.C. (1988): The Early Toarcian (Jurassic) anoxic event: stratigraphic, sedimentary, and geochemical evidence. - Am. Journ. Sci., **288**: 101-151.

KARAKITSIOS, V. (1995): The influence of Preexisting Structure and Halokinesis on Organic matter Preservation and Thrust System Evolution in the Ionian Basin, Northwest Greece. - AAPG Bulletin, **79**: 960-980.

KARAKITSIOS, V., DANELIAN, T. & DE WEVER, P. (1988): Datation par les radiolaires des Calcaires a Filaments, Schistes a Posidonies superieurs et Calcaires de Vigla (zone Ionienne, Grece) du Callovian au Tithonique terminal. - Compte Rendu de l´Academie des Sciences, **306**, series II : 367-372.

MECO, S. & ALIAJ, S. (2000): Geology of Albania. - Beiträge zur regionalen Geologie der Erde, **28**: 1-246, (Schweizerbart) Stuttgart.