

**Chemostratigraphy, Magnetostratigraphy, Chronology,
Palaeoenvironments and correlations**

The elemental stratigraphy of the South Caspian Lower Pliocene Productive Series

Akif Alizada, Elmira Aliyeva, Dadash Huseynov, Ibrahim Guliyev

Geology Institute of Azerbaijan National Academy of Sciences. 29A H.Javid avenue, Baku, AZ1143, Azerbaijan,
Phone +994125100141; Fax +994125372285. E-mail: e_aliyeva@gia.ab.az

The first attempt of the chemical stratigraphy of the Productive Series sediments has been made based on their macro- and microelemental composition. The results show a good correlation between the content of some of the elements and the lithology of studied sediments, which allows distinguishing the chemostratigraphic units within the Productive Series, and their subsequent correlation to the main stratigraphic complexes.

Keywords: South Caspian basin, Lower Pliocene, macro-, microelements, chemostratigraphy, lithostratigraphy.

Integrated stratigraphy and paleoenvironmental reconstruction for the Late Cretaceous Danish chalk based on the Stevns-2 core

Myriam Boussaha^{1*}, Nicolas Thibault², Lars Stemmerik³

^{1,2} University of Copenhagen, Department of Geosciences and Natural Resource Management,
Øster Voldgade 10, Copenhagen 1350 Denmark

³ Natural History Museum of Denmark, Øster Voldgade 5-7, Copenhagen 1350 Denmark

¹ myriam.boussaha@geo.ku.dk, phone number: +45 30 28 67 66

² nt@geo.ku.dk, phone number: +45 353-23350

³ lars.stemmerik@snm.ku.dk, phone number: +45 353-22371, Fax: 3532 2501

* Corresponding author: myriam.boussaha@geo.ku.dk

An integrated stratigraphy of the Stevns-2 core located in eastern Denmark is hereby presented based on calcareous nannofossil biostratigraphy and carbon isotope stratigraphy.

Carbon and oxygen isotope have been performed on 419 bulk samples. Calcareous nannofossil biostratigraphy has been applied, based on the analysis of 57 samples. Original gamma-ray data from the well-log analysis are also presented.

The calcareous nannofossil data span the upper Campanian (UC16^a) to the lower Danian (NNT1). These new stratigraphic data are compared and correlated to other Boreal, Tethyan and Tropical sites in order to provide an age-model for Stevns-2. While using this age-model, differences in the sedimentation rates of Stevns-1 and Stevns-2 borehole are nicely expressed, although the two sites are only 8 km apart from each other.

The mechanisms responsible for these changes are under investigation, but are probably related to a combination of variations in paleoproductivity, paleocurrents, geodynamics and paleotopography.

Keywords: Carbon isotope, Chalk sediment, Danish Basin, Calcareous Nannofossils, Late Cretaceous, Paleoenvironments.

Isotopic events preceding Badenian Salinity Crisis in Central Paratethys, Middle Miocene, Poland

Krzysztof Bukowski¹, Arjan de Leeuw², Malgorzata Gonera³

¹ AGH University of Science and Technology, Faculty of Geology, Geophysics and Environment Protection,
al. Mickiewicza 30, 30-059 Krakow, Poland; buk@agh.edu.pl

² CASP, West Building, 181A Huntingdon Road, Cambridge, CB3 0DH, United Kingdom,
e-mail: arjan.deleeuw@casp.cam.ac.uk

³ Polish Academy of Sciences, Institute of Nature Conservation, al. Mickiewicza 33, 31-120 Krakow, Poland;
gonera@iop.krakow.pl

Middle Miocene foraminifera from Upper Silesian Basin (Poland) have been analysed. The stable oxygen and carbon isotope signatures in *Uvigerina*, *Globigerina bulloides* and *Globigerinoides quadrilobatus* show a consistently the tendency of directional changes. The sharp and strong increase in the proportion of heavy isotopes $\delta^{18}\text{O}$ recorded about 10 metres below Badenian evaporites.

Keywords: Middle Miocene, Paratethys, foraminifera, stable isotopes.

New advances in the stratigraphy and geochemistry of the organic-rich Lower Jurassic series of the Lusitanian Basin (Portugal)

Luís V. Duarte¹, Ricardo L. Silva¹, João G. Mendonça Filho², Ana C. Azerêdo³, Maria Cristina Cabral³, María J. Comas-Rengifo⁴, Gil Correia¹, Rui Ferreira¹, Isabel M. Loureiro³, Ricardo Paredes^{1,4}, Alcides Pereira¹, Nadi Poças Ribeiro¹

¹ Universidade de Coimbra, Departamento de Ciências da Terra and IMAR-CMA, Coimbra, Portugal. lduarte@dct.uc.pt; ricardo.silva@student.dct.uc.pt; gil.correia@gmail.com; rfr.ferreira@yahoo.com; rparedes@dct.uc.pt; apereira@dct.uc.pt; ribeironadi@gmail.com

² Universidade Federal do Rio de Janeiro, Laboratório de Palinofácies e Fácies Orgânicas, Rio de Janeiro, Brasil. graciano@geologia.ufjf.br

³ Universidade de Lisboa, Faculdade de Ciências, Departamento e Centro de Geologia, Lisboa, Portugal. acazeredo@fc.ul.pt; mccabral@fc.ul.pt; imloureiro@fc.ul.pt

⁴ Departamento de Paleontología, Facultad de Ciencias Geológicas, Univ. Complutense de Madrid. Madrid, Espanha. mjcomas@geo.ucm.es

In this work are presented the main results of the Project “High resolution stratigraphy of the Lower Jurassic organic-rich marine series in the Lusitanian Basin (Portugal)”. In the Lusitanian Basin the Lower Jurassic is mainly composed of an alternating marl–limestone succession (Upper Sinemurian-Toarcian), at some intervals enriched in organic matter (Upper Sinemurian and Pliensbachian). These Lower Jurassic carbonate units correspond to the Coimbra, Água de Madeiros, Vale das Fontes, Lemede and S. Gião/Cabo Carvoeiro formations. Over the last years, these series were the subject of a multidisciplinary and integrated stratigraphic analysis, based on the study of a range of biotic and abiotic parameters. The high-resolution analysis undertaken on these units in the main reference sections of the basin allowed seven main themes to be developed in this project, involving sedimentological and sequential analysis, ammonite biostratigraphy, macroinvertebrate palaeontology and palaeoecology, ostracod analysis, chemostratigraphy, organic and petrographic geochemistry and gamma ray analysis. Besides the novel and innovative results obtained in each scientific domain, the integration of all the collected data allowed the achievement of two main transverse goals: the improvement of the stratigraphy and sedimentary knowledge of the Lower Jurassic carbonates and the hydrocarbon generative potential of the different Sinemurian and Pliensbachian units.

Keywords: Integrated stratigraphy, palaeoenvironment, hydrocarbon source rock, Jurassic, Portugal.

Magnetic parameters of a Toarcian marl-limestone succession, Maria Pares, Portugal: a preliminary study

Celeste Gomes¹, Armando Rocha², Luís V. Duarte³, Helena Sant’Ovaia⁴

¹ Earth Sciences Department GCUC, University of Coimbra.

² Lousã School Group.

³ Earth Sciences Department GCUC, IMAR-CMA, University of Coimbra.

⁴ Geosciences Department, Environment and Spatial Planning, Geology Centre, University of Porto

The magnetic parameters (magnetic susceptibility, isothermal remanent Magnetization at 1 tesla (IRM_{1T} and IRM_{-300 mT}), of 77 samples were analysed across the Toarcian marly limestone succession in the Rabaçal area (northern Lusitanian Basin), involving around 170 m of thickness. The S₃₀₀ ratios were also calculated. The series include the top of the Lemedo, S Gião (subdivided into five members) and the Póvoa da Lomba formations, well controlled by ammonite biostratigraphy. The main objectives of this study are: 1) to present a stratigraphic record of the magnetic parameters of the studied marl-limestone succession, emphasizing the relations with lithostratigraphic units; 2) to characterise the magnetic record; and 3) to highlight the importance of this data in the palaeoenvironmental interpretations. The sampling was carried out in order to obtain a sample of 1 kg of the selected strata using diamagnetic material. In the Lab, the mass of the samples was determined by an electronic scale with an accuracy of 0.0001 g. The samples were measured on a magnetic susceptibility meter, Agico, Kappabridge KLY-4S model (Czech Republic), in the Petrophysics Laboratory, Department of Geosciences, Environment and Spatial Planning/Geology Centre, University of Porto. A magnetic field of 300 Am⁻¹ was applied in the measurements. The samples were measured 3 times and an average value was then calculated. The IRM measurements were carried out using a high sensitivity Molspin Minispin magnetometer and the magnetic fields were imparted using a Molspin pulse magnetizer in the Department of Earth Sciences, University of Coimbra. This was done in order to obtain IRM values at 1 T, and -300 mT. The susceptibility values range between 1.38 and 12.43 E-08 m³kg⁻¹ and the IRM_{1T} values range between 9.50 E-05 Am² kg⁻¹ and 6.88 E-01 Am² kg⁻¹. The obtained value reveal the following conclusions: 1) some of the lower values are obtained in micritic limestones of the different formations and at different biostratigraphic positions; 2) the higher values are measured and calculated on marl samples, interpreted due to the terrigenous component; 3) some limestone beds show high values of magnetic susceptibility (between 5.69 and 12.43 E-08 m³kg⁻¹) and IRM_{1T} (76.10 E-05 and 6.88 E-01) clearly related to the presence of magnetite (S-300 between 0.82 and 0.84).

Keywords: Magnetic susceptibility, IRM_{1T}, S₃₀₀, marl–limestone succession, Toarcian, Lusitanian Basin, Portugal.

Integrated magnetic susceptibility and geochemical record of $\delta^{13}\text{C}$ anomalies in the Berriasian and Valanginian sections from the Tethyan domain (Western Carpathians, Poland)

Jacek Grabowski¹, Leszek Krzemiński¹, Johann Schnyder², Katarzyna Sobieñ¹, Jan Hejnar³, Leona Koptiková⁴, Andrzej Pszczółkowski⁵, Petr Schnabl⁴

¹ Polish Geological Institute – National Research Institute, Rakowiecka 4, 00-975 Warszawa Poland, jacek.grabowski@pgi.gov.pl; katarzyna.sobien@pgi.gov.pl

² University Paris VI, case 117, 4, pl. Jussieu, 75252 Paris Cedex 05, France, johann.schnyder@upmc.fr

³ Institute of Geological Sciences, Cracow Research Centre, Polish Academy of Sciences, Senacka 1/3, 31-002 Krakow, Poland, ndhejnar@cyfronet.pl

⁴ Institute of Geology of the Academy of Sciences of the Czech Republic, v. v. i., Rozvojová 269, 165 00 Praha 6, Czech Republic, koptikova@gli.cas.cz; schnabl@gli.cas.cz

⁵ Institute of Geological Sciences, Polish Academy of Sciences, Warsaw Research Centre, Twarda 51/55, 00-818 Warszawa, Poland, pszczolkowski@yahoo.com

New magnetic susceptibility (MS), stable isotopes and geochemical (major and trace elements) data are presented from the three Berriasian – Valanginian pelagic sections from the Western Carpathians of Poland. MS correlates well with lithogenic influx and reflects exactly short-term transgressive – regressive cycles in the interval below the $\delta^{13}\text{C}$ event in the Late Valanginian (Weissert event). The pattern of MS changes during the Weissert event is more complicated, reflecting most probably also significant climatic changes. Redox sensitive indicators (Th/U, Ce/Ce*) account for significantly oxygen depleted conditions combined with relatively low content of productivity indicators (Al normalized P, Ba and Cu).

Keywords: Berriasian, Valanginian, magnetic susceptibility, $\delta^{13}\text{C}$, major and trace elements.

The Upper Cenomanian–Lower Turonian anoxic event in the carbonate platform of the Preafrican Trough, Morocco

V. Lebedel^{1*}, C. Lézin¹, B. Andreu¹, M.-J. Wallez¹, El M Ettachfani², L. Riquier³

¹ Université de Toulouse, UPS, OMP, GET (Géosciences Environnement Toulouse), CNRS, IRD, 14 Av. E. Belin, F-31400 Toulouse, France.

² Université Chouaïb Doukkali, Faculté des Sciences, Géologie, Laboratoire Géosciences & Techniques de l'Environnement, B.P. 20, 24 000, El Jadida, Morocco.

³ Institut des Sciences de la Terre de Paris (UMR CNRS 7193), Université Pierre et Marie Curie, Paris 6, 4 place Jussieu, 75252 Paris cedex 05, France.

*Corresponding author: vanessa.lebedel@get.obs-mip.fr

In the carbonate platform of the Preafrican Trough, Morocco, during the Upper Cenomanian–Lower Turonian, the environments range from a peritidal zone/inner ramp to a deep open platform. Four depositional sequences are recognized, and the major drowning phase appeared after the Cenomanian–Turonian boundary. The OAE2 (Oceanic anoxic Event 2) is well identified by the $\delta^{13}\text{C}$ excursion even in shallow water. Chemical and biological disturbances are recorded during the Cenomanian-Turonian Anoxic Event on the carbonate platform, with dysoxic conditions in the outer-ramp environment (west of the platform). The displacement of this dysoxic waters is controlled by the sea level variations. After OAE2, dysoxic conditions linked to a high productivity, following a climate humidification increasing chemical weathering, appear all over the platform, and are the source of a biological crisis.

Keywords: Upper Cenomanian–Lower Turonian, Preafrican Through, Morocco, Palaeoenvironments, Sequence stratigraphy, Inorganic geochemistry, Dysoxia.

Geochemical marked of recent Quaternary record from estuarine sediments of Jaboatão River, Pernambuco, Brazil

**Marta M. do Rego Barros Fernandes de Lima¹, Virgínio Henrique Neumann²,
Maria Teresa Taboada Castro³, Enjôlras de A. Medeiros Lima⁴,
Edmilson Santos de Lima², Ricardo Ferreira da Silva⁵**

¹ MFG Transportes. Av. Rosa e silva, 955/701, Aflitos. PE/Brazil; martamfg@yahoo.com.br; Fone: 55 81 86120636

² Federal University of Pernambuco, UFPE, CTG, Departament of Geology, Av. Acad. Hélio Ramos, s/n, Recife, Pernambuco, Brazil, neumann@ufpe.br; delima@ufpe.br;

³ Universidad A Coruña, C / Maestranza, sn, 15001, A Coruña, Spain, teresat@udc.es

⁴ Geological Survey of Brazil, CPRM, Av. Sul, 2291, Recife, Pernambuco, Brazil, enjolas.lima@cprm.gov.br

⁵ Geosciences Postgraduate, Federal University of Pernambuco, UFPE, CTG, Departament of Geology, Av. Acad. Hélio Ramos, s/n, Recife, Pernambuco, Brazil, ricardo.fsilva2@ufpe.br

Heavy metal (HM) concentrations in estuarine sediments of the Jaboatão river, North-eastern Brazil have been measured in order to assess possible historical sources of pollution. The trace metals were investigated on basis of samples from a bottom core drill performed 4km from the mouth of the river. The total sediments (TS) of the sliced 50 cm, were submitted to chemical analysis, particle size analysis and organic matter (OM). The chemical species analyzed (As, Cr, Pb, Hg, Ni and Zn) were generally increased in their concentrations at 30 to 35 cm interval. This scenario indicates that the accumulation of HM has been constant since the last decades and confirms the existence of two well differentiated compartments, separated by the horizon (30-35 cm). Thus, the partitioning of sedimentary and geochemical profile highlights different environmental conditions in the estuary. These differences are possible related to consecutive depositional systems, stratigraphic marker. This behavior is marked by a conspicuous dichotomy in the C/N ratio, specifying signatures depending upon geochemistry of the sedimentological granulometry and of hydrodynamic differences, in an essentially organo-siliciclastic

depositional context. It stays indefinite if those different signatures would be stratigraphical (regional), or just conditioned to sedimentological facies of the estuarine environment. The organic matter present in the sediments indicates a progressive evolution of continental environment conditions at the bottom, to more estuarine conditions at the top, which could indicate a small and progressive drowning of the Jaboaão river mouth, probably related to sea level rise base in the range considered. Effectively, the Jaboaão's Basin is characterized by urban and industrial occupations although it includes extensive sugarcane plantations with great devastation of the native forests.

Keywords: organic matter, environmental geochemistry.

Late Jurassic Bio- and Chemostratigraphy of the Lower Saxony Basin, Northern Germany

Friedrich Wilhelm Luppold¹, Carmen Heunisch^{1*}, Jochen Erbacher¹, Matthias Heldt¹, Sebastian Caesar²

¹ State Authority for Mining, Energy and Geology, Stilleweg 2, 30655 Hannover, Germany

² University of Hamburg, Bundesstraße 55, 20146 Hamburg, Germany

*Corresponding author: Tel. +49-511-6432529; Fax: +49-511-643532529; e-mail: carmen.heunisch@lbeg.niedersachsen.de

To get a stratigraphic standard section for the Upper Jurassic of the Lower Saxony Basin priorily a 325 m core was investigated by biostratigraphical (benthic foraminifers, ostracods and palynology) and chemostratigraphical (stable carbon isotope data) means. The result was a rather detailed biozonation of the investigated section.

Keywords: biostratigraphy, chemostratigraphy, microfossils, palynomorphs, Late Jurassic.

Carbon and oxygen isotopic signals from the Callovian- Oxfordian in French sedimentary basins

Pierre Pellenard^{1*}, Romain Tramoy², Marine Cornuault¹, Emmanuelle Pucéat¹, Annachiara Bartolini², Emilia Huret³, Mathieu Martinez¹, Dominique Fortwengler¹, Didier Marchand⁴, Jacques Thierry⁵

¹ UMR CNRS 6282 Biogéosciences, Université de Bourgogne, 6 Bd Gabriel, 21000 Dijon, France

² UMR/CNRS 7207 MNHN-UPMC 8 rue Buffon CP 38, 75005 Paris, France

³ ANDRA, Parc de la Croix-Blanche, 1-7 rue Jean Monnet, 92298 Châtenay-Malabry, France

⁴ 8a, avenue Ste Claire, 06100 Nice, France

⁵ 15 rue du Point du Jour, 21000, Dijon, France

*Corresponding author: pierre.pellenard@u-bourgogne.fr

High-resolution carbon and oxygen isotope data from the Paris Basin and the Subalpine Basin (France) are available in a precise biostratigraphical framework for the Callovian-Oxfordian stages. A biostratigraphically well-constrained $\delta^{13}\text{C}$ curve, derived from bulk-carbonates in the Paris Basin and the Subalpine Basin, is provided in order to document carbon-cycle evolution and to serve as a chemostratigraphical reference for the Callovian-Oxfordian in the Tethyan domain. Sea-temperature reconstructions, using diagenetically screened belemnite and oyster data, reveal major climate perturbations at the Middle-Late Jurassic transition.

Keywords: Callovian, Oxfordian, carbon cycle, palaeotemperatures, belemnite, bivalve.

The Holocene climatic recovery in SW Iberia preserved in limestone tuff deposits

Carlos Ribeiro¹, Pedro Terrinha², Antje Voelker³, António Candeias⁴, Lúcia Rosado⁵, Paulo Guerreiro⁶

¹ Dep. Geociências-Univ. Évora/Centro de Geofísica de Évora – Apt. 94 7002-554 Évora, (+351)266745301, cribeiro@uevora.pt

² Instituto Português do Mar e da Atmosfera/Instituto D. Luiz - Rua C do Aeroporto 1749-077 Lisboa, (+351) 218 447 000, pedro.terrinha@ipma.pt

³ Instituto Português do Mar e da Atmosfera - Rua C do Aeroporto 1749-077 Lisboa, (+351) 218 447 000, antje.voelker@ipma.pt

⁴ Dep. Química-Univ. Évora/Laboratório Hércules / Centro de Química de Évora - Palácio do Vimioso, Largo Marquês de Marialva, 8, 700-809 Évora, (+351266706581), candeias@uevora.pt

⁵ Laboratório Hércules - Universidade de Évora/ Centro de Química de Évora – Palácio do Vimioso, Largo Marquês de Marialva, 8, 700-809 Évora, (+351266706581), lcrosado@hotmail.com

⁶ Centro de Estudos de Geografia e Ordenamento do Território – Departamento de Geografia, Faculdade de Letras, 3004-530 Coimbra, (+351)239859900, pauloguerreiro@gmail.com

Data on continental limestone shows that following the cold climate of the Younger Dryas stadial, conditions for carbonate sedimentation settled in SW Iberia, leading to the development of the Asseca river (Tavira) limestone tuffs. This formation, deposited during a period of approximately 7.5 ka, preserves a detailed record of the climatic conditions as well as the vegetation cover of the area.

Keywords: Holocene, Climate, SW Iberia

Preliminary magnetostratigraphy for Jurassic/Cretaceous transition in Porto da Calada, Portugal

Johanna Salminen¹, Jorge Dinis², Octávio Mateus³

¹ Department of Geosciences and Geology & Department of Physics, University of Helsinki, Finland, Phone: +358 9 19151019, email: johanna.m.salminen@helsinki.fi

² Earth Science Dep., University of Coimbra, Largo Marquês de Pombal, 3000-272 Coimbra, Portugal & IMAR-CMA, Marine and Environmental Research Centre, 3004-517 Coimbra, Portugal, jodinis@dct.uc.pt

³ CICEGe, Departamento Ciências Terra, FCT-Universidade Nova Lisboa, Quinta da Torre, 2829-516 Caparica, Portugal; Museu da Lourinhã, 2530-157 Lourinhã, Portugal, omateus@fct.unl.pt

We will present a stratigraphic log supporting a preliminary magnetostratigraphy of Tithonian-Berriasian section in the Porto da Calada (Portugal). Based on biostratigraphy and reversed and normal magnetostartigraphy the location of Tithonian-Berriasian boundary is tentatively located at ca. 52 m, not in conflict with former proposals. Due to later remagnetizations (diagenesis) an unsuccessful study for magnetostratigraphy of Tithonian-Berriasian section at the Cabo Espichel (Portugal) location is reported here.

Keywords: lithostratigraphy, magnetostratigraphy, Tithonian-Berriasian, Lusitanian basin, Portugal.

Stratigraphic significance of water geochemistry

Irén Varsányi¹, Lajos Ó. Kovács²

¹ Department of Mineralogy, Geochemistry and Petrology, University of Szeged, H-6701 Szeged, P.O. Box 651, Hungary, Tel.: +36-62-544681, Fax: +36-62-544641, varsanyi@geo.u-szeged.hu

² Hungarian Office for Mining and Geology, H-1590 Budapest, P.O. Box 95, Hungary, Tel.: +36-1-3731841

Separation of water bodies and correlation of water quality with stratigraphy in the central part of the Pannonian Basin are discussed. High Cl^- , and a Cl^- to Br^- ratio similar to that of seawater indicate the Pannonian sediments. More positive $\delta^{18}\text{O}$ and $\delta^2\text{H}$ values together with high K^+ and Li^+ concentrations delineate location of the Pontian, while more negative δ values with low K^+ and Li^+ show the Pliocene. Increasing Na^+ and decreasing Ca^{2+} and Mg^{2+} along the flow path are characteristic of the aquifers in the Pleistocene layers.

Keywords: hydrogeochemistry, meteoric water, sea water, infiltration, water stable isotopes.

Geochemistry and chemostratigraphy of Meso-Neoproterozoic sedimentary rocks of Yenisei ridge (Siberia, Russia)

Irina Vishnevskaya¹, Natalia Pisareva¹, Artem Proshenkin¹, Nadejda Kanygina²

¹ Sobolev Institute of geology and mineralogy SB RAS, Novosibirsk, Russia; tel. +79232452297; fax +73833332792; e-mail: vishia@igm.nsc.ru

² Novosibirsk State University, Novosibirsk, Russia

The outputs of the sedimentary cover of the Siberian platform presented at the Yenisei Ridge. We investigated the geochemical data of Meso-Neoproterozoic terrigenous rocks and isotopic (Sr, C, O) characteristics of carbonate rocks (the Sukhoi Pit, Tungusik, Shirokin groups). These data showed that Sukhoi Pit, Tungusik and Shirokin groups deposited more than 850 million years ago. The absence of tillite deposits and the occurrence of a positive $\delta^{13}\text{C}$ value indicate that this took place before the appearance of the Cryogenian global glaciation. The study of the distribution of rare and trace elements in these rocks allowed us to establish that they were formed by the erosion of the very mature (high stage of differentiated) rocks of the Siberian platform.

Keywords: carbonate, Cryogenian, chemostratigraphy, strontium, rare and trace elements.