Stratigraphy in Palaeoceanography

Isotopic stratigraphy and biostratigraphy of a modern carbonate system: The northern Bahamas slope over the late Quaternary

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The high resolution stratigraphic framework was performed on a marine core located on the northern side of the Little Bahama Bank slope. The stratigraphical methods include faunal and floral analyses (planktonic foraminifera and coccoliths), radiometric dating, XRF analyses and isotopic stratigraphy. Low production and exportation of sediment from the bank during glacial periods and sea level lowstands result in reduced deposits, whereas deposits during interglacial periods are well developed. Any gravity flows disturbed the sedimentation, mostly during sea level rises.

Keywords: Planktonic foraminifera, Biostratigraphy, Isotopic stratigraphy, Bahamas, Late Quaternary.

High resolution biostratigraphy of Holocene on cores from the Bahamian slopes

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The leeward slopes of Bahamas are characterized by very high sedimentation rates over the Holocene and biostratigraphy based on planktonic foraminifera is a powerful tool to compare and date cores and facies. Based on four cores collected during the CARAMBAR cruise (2010) on the upper slope of the Great Bahama Bank, eleven radiocarbon dates, ^{210}Pb excess and planktonic foraminifer assemblage analyses, this work shows and discusses the main features used as detailed biostratigraphical points in this area over the mid and late Holocene.

Keywords: biostratigraphy, planktonic foraminifera, Holocene, Bahamas slopes.

Biostratigraphy of the Holocene and of the main cold events of the late Quaternary in the Gulf of Cadiz

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The Gulf of Cadiz, west of the Strait of Gibraltar, is the privileged site of water exchanges between the Atlantic Ocean and the Mediterranean where many palaeoceanographical studies have taken place over the last decades. Based on 21 cores from three cruises, oxygen isotope curves, 139 radiocarbon dates and microfaunal analyses, this work shows and discusses the main bio-events used as detailed biostratigraphical points in this area over the Late Quaternary. Those bio-events, such as well-known cold events (Younger Dryas, Heinrich events) or bio-events occurring during the Holocene, are essentially based on planktonic foraminifer species and/or coiling ratio and point occurrences of pteropod species. The large and spread data set allows to discuss ages and spatial validity of such bio-events.

Keywords: biostratigraphy, planktonic foraminifera, pteropods, Gulf of Cadiz, Late Quaternary.

Biostratigraphy in the abyssal eastern Equatorial Pacific Ocean

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Sediments through two gravity cores 14KL (11°19´N, 119°15´W, water depth 4399m) and 54KL (11°57´N, 116°59´W, water depth 4231m), which were recovered during SONNE Cruise 205 in the eastern Equatorial Pacific between the Clarion and Clipperton Fracture Zones were dated using siliceous and calcareous microfossils. The problem of dissolution of the different fossil groups during times of low sedimentation rates and times of selective production/dissolution of the different microfossil groups was overcome by using, besides the siliceous groups of diatoms, silicoflagellates and radiolarian, also calcareous nannofossils. Sedimentation rate and the position of the calcium carbonate compensation depth are crucial for one of these microfossil groups is preserved enough to be used for dating the sediment. The siliceous-shelled planktonic diatoms provide useful datums for the past ca. 1.8 Ma at sedimentation rates between 0,1 – 0,3cm/1000a. Calcareous nannofossils help dating the Miocene calcareous oozes recovered in core 14KL.

Keywords: Neogene, deep sea Pacific Ocean, siliceous and calcareous microfossils.

Climate variability recording in lagoonal environment during the Upper Hauterivian in the Lusitanian Basin

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Using the example of the Upper Hauterivian in the Lusitanian Basin, we demonstrate the climatic control on the cyclic variations of the biological, mineralogical, chemical and magnetic markers in a lagoonal environment.

In a lagoon setting, variations of detrital supply, controlled by climate changes, modify the water turbidity. During humid climatic conditions, the increase in water turbidity reduces light penetration and photosynthetic activity. The reduced precipitation of carbonates is probably due to the low concentration of cyanobacteria or unicellular green algae, and is associated with a decrease in micritization processes. Another consequence of the increase in detrital supply is the reduction in benthic foraminifera, with infaunal forms being developed in favor of epifaunal forms, and the proliferation of large agglutinated foraminifera such as *Choffatella decipiens*.

During dry climatic conditions, this tendency is reversed and there is an enhanced contribution of Miliolidae. Thus, in this lagoonal setting, climate variability, controlled by orbital parameters, modifies carbonate production, the faunal assemblages and the water chemistry.

Keywords: Benthic foraminifera, Geochemistry, Magnetic susceptibility, Paleoenvironments, Shallow-marine carbonates, Upper Hauterivian.

Isfjorden, Western Spitsbergen (Svalbard, Norway): Late Holocene stratigraphy and pollen case study

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Three bottom sediment cores (140 to 190 cm long) taken from Isfjorden, West Spitsbergen, were analyzed for pollen and spores with the main aim to elucidate local pattern of pollen and spores succession in order to understand age and define stratigraphy of marine sediments. Isfjorden bottom sediments represent greyish-green silty pelite with gruss, detritus and pebble inclusions. The upper 25 cm are water-saturated and non-plastic. In spite of extremely low concentration and predominance of reworked pre-Quaternary microfossils marine pollen spectra appeared quite similar to those known from radiocarbon-dated lake sediments and peat exposures on the coasts of neighboring Billefjorden, Van Mijenfjorden and Hornsundfjorden, provided that long-distant transported pollen of conifers, tree-birches and spores of ferns are eliminated from marine pollen spectra composition. Correlation of pollen zones (PZ), which were established in fjord sediments, with those known from peat and lake sections, enabled pollen-based stratigraphy of Isfjorden bottom sediments and further reconstruction of major stages of Late Holocene terrestrial vegetation history of Western Spitsbergen.
The oldest pollen records date back to about 2,8 to 3 ka. They characterize the lowermost silty pelite layer (intervals 180-150 cm in core 11 and 190-60 cm in core 14 from the SW part of the fjord). At this time moss-cereal-sedge fens and heather bogs at the coastal areas co-occurred with rocky tundra vegetation at higher elevations. A marked increase in the content of *Salix* sp., *Betula* sect. *Nanae*-type and Ericales pollen is recorded in the upper part of pelite layer in cores 11 and 14. Similar spectra dominate core 9 from the NE inner part of the fjord. Percentage of green mosses spores is extremely low. This type of spectra is suggestive of warmer-than present climate in Western Spitsbergen. The upper water-saturated layer of all three cores contains pollen assemblages that are very similar to those identified in the Isfjorden surface sediment samples. Therefore, they have been likely accumulated during the last 2000 years. These uppermost pollen assemblages show a sharp increase in sedge pollen. This suggests the expansion of coastal fens, which can be attributed to an increase in the amount of precipitation. Extremely low pollen concentration in Isfjorden bottom sediments possibly reflects very high accumulation rate during the time of silty pelite layer sedimentation.

Keywords: Isfjorden, Spitsbergen, pollen spectra, pollen zone (PZ), pollen-based stratigraphy, Holocene.

Pleistocene sediment sequence of the southern Lomonosov Ridge, Arctic Ocean: preliminary stratigraphic subdivision based on IRD and benthic foraminiferal records

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Two sediment cores retrieved in 2007 on the southern Lomonosov Ridge (LR) - ALR07-26C from its top, water depth 1359 m, and ALR07-15C from the base of Geophysicists' Spur, water depth 2500 m - were investigated for lithology (wt% >63 μm, terrigenous lithic grains >500 μm) and microfossils. Prominent peaks of coarse-grained material in ALR07-26C largely represented by quartz and clastic rocks are regarded as inputs of ice and, especially, iceberg-rafted debris (IRD) of Eurasian origin. In accordance with the previously obtained evidence from age-constrained cores on the central LR the highest peak 4 is correlated with MIS 6/5 boundary and disintegration of Saalian ice sheet. The three younger IRD peaks are provisionally correlated with MIS 5/4, MIS 4/3, and MIS 2/1. Small peaks of coarse-grained material in ALR07-15C dominated by various rocks rather represent local material transported by downslope slides mixed with some IRD. No calcareous microfossils occur in the cores, but only agglutinated benthic foraminifers. In ALR07-26C they correlate with the IRD-rich layers that correspond to glacial terminations with more open-sea ice conditions and, probably, higher productivity in the sea-ice marginal zone. *Cyclammina*-dominated assemblage in ALR07-26C below IRD peak 4 supports the proposed age estimation for this peak (MIS 6/5), as similar foraminiferal assemblages in other LR cores were recorded in sediments of MIS 7-9 and older. Younger assemblages show an upward transition from *Recurvoides*-

dominated assemblage in the early Late Pleistocene to the more "oligotrophic" recent one with predominance of *Reophax* and *Rhabdammina*.

Keywords: Arctic Ocean, Lomonosov Ridge, Pleistocene, IRD, agglutinated benthic foraminifers, paleoceanography.

Cenomanian shallow water bivalve accumulation on thepelagic part of the Arabian Platform, Mardin-Mazidag area, SE Turkey

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The study region lies in the Mardin-Mazıdag area in the SE Turkey. The Cenomanian shallow water platform carbonates of the Derdere Formation belonging to middle part of the Mardin Group present well exposed outcrops in the area.

Studied stratigraphic section displays a shallowing upward structure from bottom to top. Slope to outer ramp carbonates lie at the bottom, characterized by echinoidal-crinoidal bioclastic wackestone to packstone facies. This facies alternates with bivalve packstones which displays oriented accumulation of monospecific bivalves. Matrix of the bivalve packstone is composed of micrite with planktonic foraminifera and partially dolomitized.

Towards the middle part of the section, bioclastic wackestone and packstone facies with crinoids and echinoids including benthic foraminifera, ammonites and calcispheres take place. Nerinid gastropods, dasyclad algae, benthic foraminifera bearing peloidal intraclastic wackestone-packstone facies occur at the top of the section. At this level of the section, nerinid gastropods display a relative abundance and alternates with dolostones. The upper and lower parts of the section are delimited by dolostones.

The bivalve accumulation presents down dip orientation. Internal moulds of the shells include abundant fossils like "*Favreina*" and display a peloidal grainstone facies. Shells are embedded in the partially dolomitized micritic matrix. However dolomitization did not affect the infilling material of the shells.

We present here the northernmost occurrence of a Tethyan record of veneriids located close to the Turkey/Syria boundary. The shallow infaunal *Aphrodina dutrugei* heterodont bivalve species and monotaxic shell beds which are the focus of this study occurs within the Derdere Formation which form the middle part of Mardin Group. One well-exposed stratigraphic section of the Cenomanian strata was measured and sampled.

Aphrodina dutrugei, of the family Veneridae is a very common species in the early Late Cretaceous of the Egypt, Jordan and northern Syria. Our records of Cenomanian bivalves from southeast Turkey will be the first time presented by this study. So palaeogeographic approach related to the Arabian platform and margin of the Middle Eastern Tethys/Mesogea Ocean has been indicated/suggested by bivalve fauna.

According to the presence of abundant monotaxic shells infilled by "Favreina" like peloids and with a unidirectional orientation within pelagic matrix, it has been interpreted that suspension feeding bivalve shells caused an increase in bioaccumulation on the shelves and were transported by unidirectional flow on the slope of the Arabian Platform.

This study demonstrates that *Aphrodina dutrugei* monospecific bivalve accumulation (mainly articulated internal moulds) forms a marker bed in the Derdere Formation in the Mardin-Mazidag area and display a faunal connection with Middle Eastern Tethys and Arabian platform. Bivalve shells including "Favreina" like fossils as infilling materials are oriented towards SE direction with an imbricate fabric. No any different directional, upside down or vertical orientations of shells were observed. This indicates that transportation was controlled by a current. No evidence was recorded related to storm or mass flow within the succession. Transportation was from northwest to southeast. Overlying wackestones/packstones with abundant nerinid gastropods, dasyclad algae, and benthic foraminifera indicate that this part of the Arabian platform was deepened and then shallowed at this locality during the Cenomanian.

Keywords: *Aphrodina dutrugei,* Arabian Platform, Cenomanian, Bioaccumulation, transportation.