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Drill core samples from the Kupferschiefer of Poland were collected throughout the Zechstein basin. According to base metal content, metal facies, and distance to areas with oxidized Kupferschiefer (Rote Fäule) close to the mining districts in SW Poland, the samples are classified as Rote Fäule, mineralized or barren Kupferschiefer, respectively. The organic matter of these samples is characterized by Rock-Eval and GC-MS analysis.

Rock-Eval pyrolysis yields hydrogen and oxygen indices consistent with the classification of organic matter as type-II kerogen. Organic matter from highly mineralized samples adjacent to Rote Fäule and especially from Rote Fäule samples show low HI and high OI values, characteristic for type-III kerogen. The obtained relationship between Tmax and the present depth of the Kupferschiefer indicates that most of the barren samples from central and northern Poland fall close to the trendline that would be expected from type-II kerogen due to increasing thermal maturation, assuming common geothermal gradients (Teichmüller & Durand 1983). Kupferschiefer samples from the mineralized and the Rote Fäule zones yield higher Tmax values despite its low present depths of burial. The depletion of organic matter in hydrogen together with the increase of Tmax data from the Kupferschiefer towards Rote Fäule is explained as the result of organic matter degradation by oxidizing brines in, and adjacent to, areas of Rote Fäule (Püttmann et al. 1990).

With decreasing distance to Rote Fäule, the normalized yields of soluble organic matter (SOM) decrease, accompanied by an overall increase of the relative proportions of aromatic hydrocarbons in the SOM. The dominance of aromatics in the organic matter of Rote Fäule affected Kupferschiefer is consistent with the depletion of hydrogen, as indicated by low HI values.

Gas chromatography of the saturated hydrocarbon fractions from mineralized Kupferschiefer confirms the degradation of n-alkanes, preferably those of intermediate to high-molecular weight, during oxidative alteration, as already been recognized in previous studies (Püttmann et al. 1989, 1990). Compositional changes of the aromatics towards Rote Fäule are characterized by the occurrence of polycyclic aromatic hydrocarbons and elevated ratios of phenanthrene to methylphenanthrenes that are attributed to demethylation reactions and resulted in a decrease of the methylphenanthrene index (MPI 1; Radke et al. 1982). The greater difference in vitrinite reflectance between values calculated from MPI 1 and measured data (Sun et al. 1995) within the Rote Fäule zone is caused by the depletion of methylphenanthrenes in the aromatics. Kupferschiefer samples from the barren zone of the Polish basin do not show these alteration pattern. The observed variations in organic matter composition with burial depth are consistent with changes due to increasing thermal maturation. Maturity assessment is achieved from MPI 1 and the methyldibenzothiophene ratio (MDR; Radke et al. 1986). From the maturity versus depth relationship of the Kupferschiefer strata throughout the Polish basin, a continuous increase in vitrinite reflectance is obtained.

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Organic geochemistry of upper Triassic (Rhaetian) marls (Kössen Formation) within the Gailtal Alps (Eastern Alps, Austria)

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Bituminous marls of the upper Triassic (Rhaetian) Kössen Formation from the Gailtal Alps (Kärnten, Austria) are investigated by Leco-carbon analyser, Rock-Eval pyrolysis, and GC/MS in order to reconstruct their depositional environment and the thermal history of the sedimentary basin. The negative correlation of organic carbon with carbonate carbon contents obtained from most of the samples indicates that the organic matter input is diluted by variable extent of carbonate precipitation, as typically produced by planktonic productivity cycles within pelagic environments (Ricken 1993). The samples plot close to the regression line for normal marine sediments (Berner 1984) in the correlation diagram of the total sulfur content versus Corg.

Kerogen typing based on Rock-Eval pyrolysis data imply a major contribution of land plant detritus to the organic matter. However, the high maturity of the source rocks and high amounts of generated or migrated hydrocarbons may affect organic matter classification based on the results of pyrolysis. High normalized yields of soluble organic matter (SOM) and the general tendency of increasing relative proportions of saturated hydrocarbons in the SOM with the increase in SOM yields provide further evidence for the high extent of hydrocarbon generation within the sediments.

The n-alkane distribution profiles of most samples suggest a major contribution of algea to the biomass. In several of the samples, a dominance of mid- to long-chain n-alkanes within the saturated hydrocarbon fractions is observed. This shift in the position of maximum peak intensities towards the n-C_{20} to n-C_{25} range correlates with high normalized yields of the SOM. All samples are characterized by high n-C_{17} / pristane and n-C_{18} / phytane ratios, indicating the high maturation stage of organic matter. Samples characterized by n-alkane maxima in the mid-chain range show lower n-C_{17} / pristane ratios and lower relative abundances of alkylated naphthalenes in the aromatics compared with the rest of the sample set. These results most probably indicate the expulsion of low-molecular weight hydrocarbons from samples which have generated high amounts of n-alkanes.

Paleoenvironmental implications can be drawn by applying parameters for the characterization of n-alkane distribution (n-C_{21+22} / n-C_{28+29} ratio; carbon preference index), as well as from the pristane / phytane ratios. According to these, a marine origin of organic matter deposited within carbonate source rocks under anoxic, evaporitic conditions could be proposed. However, all these parameters are known to be affected by maturation and by differences in the precursors for acyclic isoprenoids. Carbon preference indices close to 1.0 are consistent with the high maturity of organic matter from the samples.

The GC traces of the aromatic hydrocarbon fractions from several of the samples show high concentrations of alkylated dibenzothiophenes relative to the alkylated phenanthrenes of comparable boiling point. The occurrence of these sulfur-bearing aromatics argues for an early diagenetic incorporation of sulfur, produced through bacterial sulfate reduction, into the biomass. High contents of organic sulfur require insufficient amounts of reactable iron in the sediment, as observed in carbonate-rich marine sediments.

The sample locality within the Rhaetian Kössen Formation implies an organic maturity in terms of vitrinite reflectance between 0.9 to 1.0 % Ro. Maximum temperatures of organic matter maturation characteristic for the middle of the oil window are further corroborated by the methylphenanthrene index (MPI 1; RADKE et al. 1982).

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Sequence stratigraphy of Zechstein Cycle-1 carbonates and evaporites in the Hessian Basin, Germany

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A sequence stratigraphic model for the Hessian Basin (Germany) including the rocksalt bearing Werra Subbasin is based on detailed lithofacies and facies descriptions of Zechstein Cycle-1 carbonates and evaporites in the cores of more than thirty wells. The Hessian Basin is located at the southern margin of the Southern Permian Zechstein Basin. Two complete third order depositional sequences are recognized within the succession.

Zechstein sequence 1 (ZS1)

Reworked sandstones of the Weissliegend and/or the Zechstein-Conglomerate overly Zechstein-sequence-boundary-1 and are interpreted as transgressive systems tract deposits of ZS1 (STROHMENGER et al. 1996). Laminated shales of the Copper Shale are regarded as a condensed section. The overlying Zechstein Cycle-1 carbonates (Zechstein-Limestone) represent predominantly highstand systems tract deposits. The carbonates show a great variety of depositional environments ranging from high-energy beaches and oolite shoals at the western margin to algal reef mounds and associated back-reef facies in the southern parts. In the centre of the Hessian Basin (i.e. in the Werra Subbasin) low energy shallow water carbonates (mudstones, oncoid and pisoid wackestones) dominate. Within the carbonates two shallowing upward cycles (fourth order) are developed nearly throughout the whole Hessian Basin. They are interpreted as parasequences.

Zechstein sequence 2 (ZS2)

At the southern and western margins of the basin a type-1 sequence boundary is developed. In the more central parts of the Hessian Basin Zechstein-sequence-boundary-2 is characterized by a facies shift to peritidal deposits. In the Werra Subbasin this peritidal facies (Werra-Anhydrite) consists of subtidal laminated carbonates with displacive gypsum crystals. To its west intertidal cryptalgal laminites and supratidal sabkha (chicken-wire) anhydrites occur. The peritidal facies association formed under relative lowstand conditions. It represents an aggradation of peritidal wedges and is regarded as a shelf margin systems tract. Two shallowing upward cycles (fourth order) are recognized and interpreted as parasequences. During the subsequent transgressive systems tract a salina and sabkha facies association is developed. In the Werra Subbasin only a thickness of 10 m is found whereas to the west a thickness increase (> 50 m) indicates more favourable physico-chemical conditions for sulfate precipitation. Within subaqueously formed salina-type (selenite) anhydrites thin intercalations of supratidal sabkha-type (chicken-wire) anhydrites occur. Each succession from salina to sabkha sediments represents a shallowing upward cycle. Three of those cycles are recognized and interpreted as parasequences. Furthermore, in the Werra Subbasin laminated, bituminous sulfates and carbonates occur. The laminites were deposited in slightly deeper water and mark the maximum flooding in the area. During the following highstand systems tract a simultaneous deposition of sulfates and chlorides (Werra-Halite) took place. Thick wedges of shallow water sulfates developed around the Werra Subbasin. Rocksalt deposition (up to 300 m) was restricted more or less to the Werra Subbasin.

In the Hessian Basin sulfate precipitation started under shallow water conditions and evolved into deeper water, whereas rocksalt deposition took place in a deep water environment. The deep water/deep basin setting of halite precipitation in the Werra Subbasin was caused by continuing subsidence/sea level rise and differential evaporite precipitation.

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Contribution to the geology-sedimentology of the Breccia Member, Topolia Formation, NW Crete, Greece

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Crete island is considered part of the Hellenic Arc System, the latter developing to the north of the active subduction, where the African plate underthrusts Eurasia. The Neogene Topolia Formation, is mainly consisted of various limestone breccia, their genesis being long controversially discussed. It is subdivided into the component poor "Lissos-Schichten" (SW Crete) and the rich in components "Topolia-Breccie" (NW Crete) respectively (KOPP & RICHTER 1983). According to the International Stratigraphical Guide (SALVADOR 1994), we introduce here the term Member for these two subdivisions of the previous authors. Our study concerns the strongly cemented Breccia Member (former "Topolia-Breccie"), being well-developed along the southern and eastern margin of the Late Miocene Kastelli-Kissamou Basin. Two opinions are mainly concerning on the formation of this Member; a) transported together with the Tripolitza and Pindos nappes and placed on its present location (KOPP & RICHTER 1983) or b) deposited under brittle tectonical control in situ *s.l.* (co. POSTMA et al. 1993, JOLIVET et al. 1996, BELLAS & KEUPP 1999). After detailed mapping (scale 1:10.000), we support the second thesis, firstly, because there had to incorporate at least equal components from the Pindos nappe, while it is almost consisted of Tripolitza derived limestone breccia and secondly, it should be diversified at various geographical and geologically stratigraphical positions, following shear-weakness zones of the Pindos nappe, a fact not recognisable from the distribution on previous and our geological/facies map (BELLAS & KEUPP in prep.).

Normal Optical and SEM techniques used for the study of the Breccia Member, revealed seven different types of carbonate components according to which they are classified below (after DUNHAM's scheme): 1) Grainstone with Oncoids and very rare Miliolidae, 2) Wackestone, rich in benthic foraminifera, 3) Mudstone with rare benthic foraminifera (possibly of protected lagoonal, origin), 4) microbial Bindstone, 5) pure Dolomite components