

## 4.3.31

### Organic geochemistry of Lower Liassic sediments in the northern Tethys margin (Frick, Swiss Jura)

V. SCHWAB AND J.E. SPANGENBERG

Institute of Mineralogy and Geochemistry, University of Lausanne, BFSH-2, 1015 Lausanne, Switzerland (Valerie.Schwab@img.unil.ch; Jorge.Spangenberg@img.unil.ch)

Carbon isotopic and molecular composition of organic matter (OM) of a siliciclastic stratigraphic sequence has been used to reconstruct the Middle Hettangian to Upper Sinemurian depositional environments in the northern Tethys margin and surrounding land. The facies changes record a major regressive-transgressive cycle with a minimum flooding surface marked by Upper Hettangian concretionary oolitic limestones.

$\beta\alpha$ (H)-Hopanes in the  $C_{29}$  to  $C_{31}$  range,  $17\beta$ (H)-trisorhopane,  $aaa$ - $C_{27}$  and  $C_{29}$  steranes point to relatively immature OM. The dominance of short-chain  $n$ -alkanes maximizing at  $n$ - $C_{16-17}$  is presumed to have a cyanobacterial and algal origin. Significant prokaryotic contribution in the Upper Hettangian microbial concretionary limestones and in the Upper Sinemurian clay-rich marls is evidenced by high hopane/sterane ratios of 11.4 and 14.8, respectively.  $\delta^{13}C$  values of  $n$ -alkanes (mean  $-31.3\text{‰} \pm 1.5$ ) suggest predominantly heterotrophic organism precursors. The  $^{13}C$ -enrichment (up to  $2.5\text{‰}$ ) of pristane and phytane relative to  $n$ -alkanes is consistent with common photosynthetic precursors of these isoprenoids. Higher relative abundance of short-chain ( $C_{15}$ - $C_{20}$ ) monomethylalkanes (2-me-heptadecane, 7-me-heptadecane and 2-me-octadecane), presumably derived from cyanobacteria [1], is observed in Middle Hettangian shallow water and Uppermost Sinemurian sediments. This points to OM production in a low oxygenated photic zone. In Sinemurian samples, the 2<sup>nd</sup> order regressive-transgressive cycles are correlated with  $n$ - $C_{29}/n$ - $C_{17}$  (up to 0.6),  $C_{27}/C_{29}$  sterane (up to 1.2), hopane/sterane (up to 13.9) and dibenzothiophene/phenanthrene (up to 0.8) ratios, indicating higher plant inputs and marine OM preservation during maximum water depth. The occurrence of isorenieratane derivatives originated from Chlorobiaceae assesses periods of euxinic conditions extending into the photic zone [e.g. 2] during Middle Hettangian sedimentation.

This first organic geochemical study has identified the major primary producers during the Lower Liassic sedimentation on the northern Tethys margin, providing new insights for the palaeoenvironmental models.

#### References

- [1] Kenig F. (2000) *Organic Geochemistry* **31**, 237-241.  
 [2] Guthrie J.M., Clayton J.L., and Sinninghe Damsté J.S. (1998) *Organic Geochemistry* **29**, 1253-1267.

## 4.3.32

### Does the lake morphology influence vertical ion distribution in lake water?

H. SCHROEDER AND M. ISENBECK-SCHROETER

Institut for Environmental Geochemistry, University of Heidelberg, D-69120 Heidelberg, Germany (hartwig.schroeder@ugc.uni-heidelberg.de)

The seasonally stratified lake Willersinn (Germany) is a former gravel pit in the Rhine Valley. The lake has two main basins and a maximum depth of 20 m. The groundwater from upstream, which enters the lake, is enriched in sulphate with concentrations up to  $2500 \mu\text{mol/l}$ . This and the bioproduction in summer lead to high sulphide concentrations in the anoxic hypolimnion.

Seasonal variations of the redox cline were observed by concentration measurements of dissolved iron, manganese, phosphorous, sulphate and sulphide in lake and pore water. Due to a high temporal and spatial resolution we observed unexpected concentration profiles for these species. We found a low concentration region, where we expected high concentrations in iron manganese and sulphide according to the redox conditions. The minima zones were stable over the whole summer. No valid geochemical approach explained these unusual lake water profiles (see Figure).

Using a simple analytical model, that includes the lake morphology, it turned out that the concentration of sulphide in lake water could be modelled as a function of time and the lake geometry. For this calculation we assumed that sulphide is released at the water sediment interface with a constant flux and no vertical mixing is taking place within the water column. For the other species we chose individual flux conditions for each substance and got good agreements with the measured data. This encouraged us to implement some simple chemical processes.

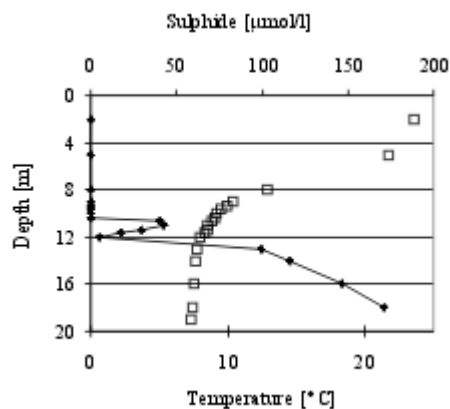


Figure: Sulphide distribution in summer. The open squares show the temperature.