



Geochemical and palynological investigations on early Permian lake sediments – Saar-Nahe Basin, western Germany

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During late Carboniferous and Permian times, a thick sequence of fluvial and lacustrine sediments were deposited in the Saar-Nahe Basin, western Germany. In order to reconstruct paleoenvironmental conditions in western Europe in the late Paleozoic, we focus our study on the finely laminated early Permian lake sediments of the Meisenheim Formation, which range in age from approximately 295 to 300 Ma (Königer et al., 2002). Because of its relative low thermal maturity (0.4 to 0.7 % Rm) and its sedimentological variety the Odernheim Lake System, with a minimum surface area of 760 km², was chosen to reconstruct the lake internal carbon cycle, lake history and vegetation as well as the paleoclimate of the Saar-Nahe-Basin. Lake evolutionary can be reconstructed based on variable carbonate carbon ($\delta^{13}\text{C}_{\text{carb}} = -5$ to $+2$ permil) and oxygen ($\delta^{18}\text{O}_{\text{carb}} = -7$ to $+5$ permil) isotopic compositions of dolomite. Sedimentary organic matter represents primarily a mixture of detrital vascular plant material ($\delta^{13}\text{C}_{\text{org}}$ around -21 permil) and lake derived photosynthetic algal matter ($\delta^{13}\text{C}_{\text{org}}$ around -27 permil). This distinction based on organic carbon isotopes is further supported by palynofacies analyses and Rock-Eval data. An additional contribution from bacterial biomass is likely. Bacterial sulphate reduction, and thus anaerobic remineralization of sedimentary organic matter, is indicated by the presence of sedimentary pyrite ($\delta^{34}\text{S}_{\text{CRS}} = -20$ to $+10$ permil; CRS: chromium reducible sulphur). Together with organically bound sulphur isotopes ($\delta^{34}\text{S}_{\text{OBS}} = -15$ to $+9$ permil) additional information about the lake internal sulphur cycle and the bottom water conditions are

given. Observed geochemical changes are attributed to temporal variations in the water balance of Lake Odernheim, including times of stronger evaporation as well as times showing substantial input of freshwater.

References:

Königer, S., Lorenz, V., Stollhofen, H. & Armstrong, R.A. (2002): Origin, age and stratigraphic significance of distal fallout ash tuffs from the Carboniferous-Permian continental Saar-Nahe Basin (SW Germany). *Int. J. Earth Sci.*, 91: 341-356.