Paleoenvironmental evolution of the Lower Miocene organic clays (the Sokolov Basin, Eger Graben, Czech Republic): Inorganic proxies

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Lacustrine sediments of the Cypris Formation cover in the Sokolov Basin approximately 20 km^2 of its area being represented chiefly by offshore organic matter and pyrite-rich clays of a thickness ranging from 130 m to 180 m, whereas near-shore facies are missing or preserved only rarely. Variations in Fe, Ca, K, Rb, S, Sr, Ti and Zr contents in lacustrine clays were studied in drill core (Dp 333-2009) using a portable XRF spectrometer Innov-X Alpha. The results of XRF measurements were verified by ICP-MS method after total digest of samples. The constant Ti/Zr ratio in the entire clay sequence indicates a uniform source of terrigeneous material brought into depositional area during the whole sedimentation period. Similarly, the Fe/Zr and Fe/Ti ratios are invariable thus indicating that most of the iron is confined to terrigenous material. Therefore, the correlation between Fe and S in clay is insignificant. The K/Zr and Rb/Zr ratios gradually increase from the bottom to the top of the studied sequence documenting an increase in the content of clay minerals in the sediments studied. Increase in Ca/Zr and Sr/Zr ratios upward in the section is attributed to the rising content of carbonates. The progressive increase in the content of clay minerals and carbonates towards the top of the sequence studied has been interpreted as indicating a gradual transition from the hydrologically open, relatively deep, freshwater lake environment, to the hydrologically closed, shallow water alkaline lake environment. This interpretation corresponds with the increasing content of anhydrite, montmorillonite and analcime upward in the clay sequence. Lacustrine clays of the Cypris Formation are usually laminated. The K/Zr and Rb/Zr ratios in organic matter-rich (10-18%TOC) and organic matter-poor (2-10% TOC) laminas are basically the same, but the Ca/Zr and Sr/Zr ratios are significantly higher in organic matter-poor laminas. Therefore, it is believed that the lamination reflects most likely seasonal variations in the organic matter and carbonate deposition.

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Modelling global trace gas emissions from biomass burning: Importance of emissions models vs. observed burned area

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Biomass burning is one of the largest sources of atmospheric traces gases and aerosols globally. Emissions from biomass burning can be quantified by a combination of observed burned area, terrestrial ecosystem models to simulate fuel loads and the effect of fire on ecosystem dynamics, and emission factors that relate combusted biomass to the emission of various trace gases. However, different versions of global burned area data derived from satellite observations and emissions models still show major discrepancies. Studies on burned area products have so far focused on product inter-comparison, while the consequences of those discrepancies for fuel simulations and emissions modelling with ecosystem models are still unknown.

Here, we perform a sensitivity analysis of the influence of burned area products and emissions models using the ecosystem model LPJ-GUESS and modified version of the global fire model Spitfire. The emissions model follows two different strategies: a conventional one where fixed emission factors are multiplied by biomass combusted, and an alternative one where combustion efficiency depends on the ratio of grass to total combusted litter. Aerosol particle mass is also computed, following two different approaches derived.