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Fourier transform infrared spectroscopy on long sediment cores from Lakes El´gygytgyn, NE Siberia, and Ohrid, Albania/Macedonia: A fast and cost efficient tool for the quantitative analysis of biogeochemical properties.

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Here we present fourier transform infrared spectroscopy (FTIRS) in the mid-infrared (MIR) region as a fast and cost efficient analytical tool for long sedimentary records from the lakes El´gygytgyn, NE Siberia, and Ohrid, Albania/Macedonia. Both lakes likely formed in the late Tertiary. The sediment records recently recovered from these lakes reach back c. 340 and 40 ka respectively.

IR-spectra in the MIR-region contain information on organogenic as well as minerogenic constituents in lake sediments. Our aim was to extract this specific information in a qualitative and quantitative way. To obtain direct information on variations in sediment composition, using complex FTIR-spectral data, principal component analysis (PCA) was applied. PCA not only gives a simplified impression on important variations in sediment composition, it also sheds light on the specific spectral region affected by these variations and thus on varying concentrations of several minerogenic and organogenic constituents. For example, the region around 1100 cm^{-1} shows strong variations in the sequence from Lake El´gygytgyn mostly connected to varying

opal concentrations. In the sequence from Lake Ohrid, strongest variation appears in the region around 1400 cm^{-1}, which is indicative for carbonate minerals. The results of a PCA of FTIR-spectral data from Lake El´gygytgyn show a very good correlation with other paleoclimate records during the past 340 ka. A PCA of IR-spectral data from Lake Ohrid indicates strong differences in sedimentation patterns during glacial and interglacial stages.

For simultaneous, quantitative analysis of geochemical properties, such as TOC, TN, TS, TIC, and biogenic silica using FTIR spectral information, calibration models relating their concentrations and FTIR spectra were successfully established by partial least squares regression (PLSR). This, in combination with the small amount of sample material needed, negligible sample pre-treatments, and low costs of analysis, indicates that FTIRS is a promising tool for high-resolution paleolimnological studies.