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Spectral analysis of selected sediment core samples from the Chew Bahir Basin, Ethiopian Rift in the spectral range from 0.3 to 17 μm: support for climate proxy information

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Investigations on short ($\leq$18.8 m) sediment cores retrieved along a NW-SE transect across the Chew Bahir (CB) basin, Southern Ethiopian Rift, have shown that they can provide valuable climate information (Förster et al., 2012). The relationship between mineralogical and geochemical properties of the core samples is closely linked to the hydroclimate history of the region. During dry climate episodes both the illitization of the smectites and the octahedral Al-to-Mg substitution in the phyllosilicate materials has been documented. An enhanced potassium fixation during dry intervals is also linked to the increase in layer charge caused by the authigenic changes in octahedral composition (Förster et al., 2018).

The ongoing work, a non-destructive spectral analysis of reflectance in a wide spectral range from 0.3 to 17 μm on selected core samples from both wet and dry intervals from the long ($\sim$280 m) cores from Chew Bahir basin supports this interpretation . The spectral range from 0.3 to 6 μm is suitable for investigating the absorption bands of OH, H_2O, M-OH lattice vibrations as well as the crystal field transitions of transition metal ions. This allows a detailed examination and differentiation of various clay minerals as well as indications of single primary minerals (olivine and pyroxene). The wavelength range longward 7 μm provides further mineralogical data such as on the presence of feldspars and the results of the short-wave channel to be substantiated. First results show that the main mineralogical structure is characterized by montmorillonite (rare illite and kaolinite are also present). Strongly variable parts of calcite are also spectrally detectable. Characteristic reflectance minima (Christiansen features) close to 8 μm indicate the presence of Ca-rich plagioclase. The high variability of a band close to 1 μm is used together with the spectral information above 7 μm to identify the diverse individual minerals within the olivine, pyroxene and feldspar group minerals. The results are compared with μXRF scan data and will be further verified by petrographic data of the rocks in the catchment. Overall, the presented spectral study (0.3 to 17 μm) is a suitable and non-destructive method to examine the main mineralogical components of the samples. The results can be directly compared with hyperspectral remote sensing data that are available for the Chew Bahir basin.

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