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Calibration of biological lake sediment records: Tracing diatom assemblages through the water column into the sediment

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Paleolimnological studies rely on sediment cores taken from the deepest point of a lake. The deposited sediment and its embedded biological record are expected to be chronological and to display the lakes ecological past. Therefore many studies use micropalaeontological approaches, since, e. g., unicellular organisms like diatoms are directly dependent on habitat changes and thus mirror the prevailing weather conditions.
In this study we combine a set of diatom samples from freeze cores of a varved sediment, a sediment trap and bi-weekly plankton survey data with environmental data to calibrate the biological sediment record of a lake. The annually laminated sediment of the boreal forest lake Nylandssjön in northern Sweden provides a very high temporal resolution, which allows us, even on a seasonal scale, a gapless comparison between in situ production and the sediment deposition. Analysis of the diatom assemblages through the water column into the sediment is expected to reveal quantitative and qualitative miss match in deposition, resuspension, seasonal and interannual delays caused by physical events or autochtonous interactions such as grazing in the water column.
The overall comparison of the ten year plankton net record and the corresponding sediment trap samples reveals large shifts from season to season but also from year to year. The sediment trap diatom record indicates comparable abundance patterns for the main taxa (Asterionella formosa and Tabellaria flocculosa). Peaks and seasonal shifts are less pronounced in the sediment trap compared to the plankton data. An overall difficulty lies in the comparison of volumes of water and sediment, concentrations and fluxes, which needs to be solved. However, subsequent comparison with the sediment diatom assemblage is expected to lead us to understand interannual taphonomic processes affecting diatom records within ten years in the naturally formed sediment layers. More importantly we will be able to discover the missing link between Limnology and Paleolimnology, which is an important step towards a reliable interpretation of environmental signals imprinted in sediment records.