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Reconstructing Holocene palaeoenvironmental conditions in the Baltic: Palynological and biogeochemical data from the Landsort Deep (IODP Expedition 347, Site M0063)

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Restricted basins, such as the Baltic Sea, experience particularly large impact from ongoing global climate change, including severe oxygen depletion, intensified stratification and increased water temperatures. This results in significant and lasting ecosystem alterations. IODP Expedition 347 recovered sediment cores from the Baltic Sea which allow reconstructions of such changes in an as yet unprecedented quality and resolution. We analysed Holocene sediments from the Landsort Deep (IODP Site M0063) using a combined palynological and biogeochemical approach in order to reconstruct palaeoclimate and associated terrestrial and marine ecosystem changes as well as identify anthropogenic influence in the Baltic region. Pollen are used as proxy for terrestrial vegetation changes, including agricultural activity indicated by the presence of cereals. Comparison of pollen data with organic-walled dinoflagellate cysts and other palynomorphs such as the algal taxa *Pediastrum*, *Botryococcus*, and *Radiosperma* from identical samples provides a direct land-sea comparison. These analyses are complemented with the reconstruction of sea surface temperatures (TEX_{86}^L , LDI) and mean annual air temperatures (MBT_{5Me}^*) in the Baltic Sea region. For the late to middle Holocene (~8000 to ~4000 years BP), our data imply a strong brackish-marine influence which decreases around 4000 years BP. A gradually increasing proportion of long-chain n-alkanes around this time indicates a stronger terrestrial influence. Increasing percentages of spruce (*Picea*) point to the immigration of this taxon in the central Baltic region. Warmth-loving tree taxa such as hazel (*Corylus*) imply warm conditions between ~5000 and 4000 years BP but subsequently their pollen percentages are decreasing in general. Otherwise our data indicate only minor terrestrial ecosystem changes until ca. 1000 years BP. The past ca. 1000 years witnessed increased agricultural activity, indicated by higher abundances of rye (*Secale*) pollen, and probably anthropogenically induced deforestation. This increase is paired with high percentages of the enigmatic palynomorph *Radiosperma corbiferum*. During the past 500 years sea surface temperatures increased significantly, culminating in values comparable to the Holocene Climatic Optimum. Generally, the most rapid changes in the terrestrial ecosystems seem to have happened during the past millennium under anthropogenic influence.