The undatables: Quantifying uncertainty in a highly expanded Late Glacial - Holocene sediment sequence recovered from the deepest Baltic Sea basin –IODP Site M0063

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Laminated, organic-rich silts and clays with high dissolved gas content characterize sediments at IODP Site M0063 in the Landsort Deep, which at 459 m is the deepest basin in the Baltic Sea. Cores recovered from Hole M0063A experienced significant expansion as gas was released during the recovery process, resulting in high sediment loss. Therefore during operations at subsequent holes, penetration was reduced to 2 m per 3.3 m core, permitting expansion into 1.3 m of initially empty liner. Fully filled liners were recovered from Holes B through E, indicating that the length of recovered intervals exceeded the penetrated distance by a factor of >1.5. A typical down-core logarithmic trend in gamma density profiles, with anomalously low density values within the upper ~1 m of each core, suggests that expansion primarily occurred in this upper interval. Thus, we suggest that a simple linear correction is inappropriate. This interpretation is supported by anisotropy of magnetic susceptibility data that indicate vertical stretching in the upper ~1.5 m of expanded cores. Based on the mean gamma density profiles of cores from Holes M0063C and D, we obtain an expansion function that is used to adjust the depth of each core to conform to its known penetration. The variance in these profiles allows for quantification of uncertainty in the adjusted depth scale. Using a number of bulk ^{14}C dates, we explore how the presence of multiple carbon source pathways leads to poorly constrained radiocarbon reservoir age variability that significantly affects age and sedimentation rate calculations.

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