



## **Amino acid racemization analysis (AAR) as a successful tool for dating Holocene coastal sediments: Stratigraphy of a barrier island spit (Southern Sylt/North Sea)**

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Dating of Holocene sediments in shallow coastal areas of the German North Sea by conventional techniques is commonly problematic. In particular the marine reservoir effect of radiocarbon means that radiocarbon dating cannot be applied to sediments younger than about 400 years. Amino acid racemization dating (AAR) is a viable alternative for dating young sediments. The method is based on the determination of ratios of D and L amino acid enantiomers in organic matrices of biogenic carbonates.

In this study we use AAR as a tool for dating Holocene barrier islands sediments. Based on an AAR derived chronological framework we develop a model of barrier spit accretion which describes the interaction between extreme events, fair weather coastal processes and sedimentary development that constrains the major episodes of barrier island evolution. The stratigraphy was defined using ground-penetrating radar (GPR) surveys complemented by sedimentological coring data. The stratigraphy is then conceptualised in a AAR chronostratigraphic framework to define a chronological order and allow the development of a stratigraphic model of the evolution of Southern Sylt. The AAR data provide high temporal resolution and have been used for dating stages of barrier spit accretion. The time lines are marked as storm surge generated erosion unconformities in the stratigraphic profile. Individual shells and shell fragments of *Cerastoderma edule*, *Mya arenaria*, *Mytilus edulis* and *Scrobicularia plana* have been accumulated by short-term storm events as shell layers associated with the erosion unconformities and have been dated by AAR.

Time lines reveal that the barrier spit accretion occurred episodically, and is dependant on the provided rate of sand delivery. The general trend is that sequences young to the South. The AAR derived time lines have been verified and correlated by historic maps and sea charts. It is apparent that spit enlargement at this site increased significantly during the Middle Ages (1593 – 1794) and was coupled with several intensive storm surges in this period. The findings indicate that when combined with GRR stratigraphy AAR provides useful results of high accuracy for dating stages of barrier spit progradation.