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Submerged beach ridges in Mecklenburg Bay (SW Baltic Sea) indicate Late-Pleistocene and Holocene shore lines

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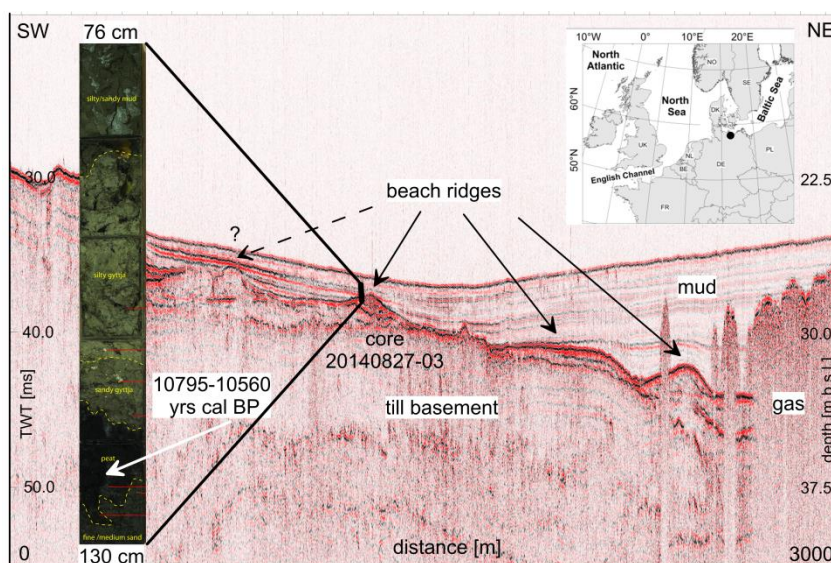
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Beach ridges are geomorphologic landforms that represent coastlines of marine and freshwater bodies. They are variable in form, ranging from sandy fair weather deposits to storm-related boulder ridges. The depositional environment associated with those ridges is generally related to moving shore lines. In case of relative water-level rise, exposed ridges are seldom preserved because reworking of the ridge material during a transgressive situation is very likely.

The Baltic Sea is a semi-enclosed marginal Sea connected to the Atlantic Ocean via the North Sea. Due to the complex glacio-isostatic rebound and threshold situation of its basin, it featured a development through different transgressional and regressional stages since the late Pleistocene. The most prominent stages are: Baltic Ice Lake (limnic), Yoldia Sea (partly brackish), Ancylus Lake (limnic), Mastogloia Sea (brackish) and Littorina Sea (brackish/marine). We suggest that the regressional and transgressional phases within these stages both supported the generation of beach ridges and that these ridges can survive transgressions and therefore can be used to delineate ancient coastlines.

Within the last decade more than 5800 kilometres of shallow marine seismic profiles (mainly Boomer and parametric Sediment-Echosounder) were obtained from Mecklenburg Bay (further named MB). Based on these data submerged shore line deposits were observed. Identified beach ridge features were analysed in terms of geometry, spatial relation (location, depth below sea level), extension and stratigraphic classification. The ridges contain internal, seaward dipping reflectors or a diffuse chaotic seismic signature. Their base and top are mostly represented by unconformities. Spatial analysis of the observed ridges reveal an elongated nature, orientated parallel to depth contour lines. In some locations sets of beach ridges are preserved featuring an altitude gradient. To elaborate an age-model for the observed ridges, material from slightly above and below ridge features was obtained by gravity and vibro-coring. The ridges are covered by younger Holocene deposits up to > 6 m in thickness. A Gravity core (see figure) penetrates the sequences covering a submerged ridge. A peat layer directly above the ridge and below younger Holocene lake deposits at -28m HNH is dated to 10.795 - 10.560 yrs cal BP.



Beneath the peat layer a sandy beach facies was found. Verified by the age of the peat layer the beach ridge was formed during or prior the Yoldia stage and was preserved even during subsequent transgressive conditions. Differences in the altitude of various beach ridges suggest that water level stagnation or

slowly changing water levels during the Baltic Sea history are preserved. By assembling ridge features of similar altitude paleo-coastlines within the whole MB are delineated.

Figure: Boomer profile showing submerged beach ridges covered by Holocene deposits. Inset: core 20140827-03.

