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Integrated GPR and sedimentological studies of the Rømø barrier island, Danish Wadden Sea

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The sea level is rising fast in many regions, probably because of global warming, with large implications at low gradient barrier coasts. We jointly interpret GPR and sedimentological data from five boreholes in order to obtain a new understanding of the composition, sedimentary structures and changing depositional environments of the Rømø barrier island, Danish Wadden Sea. The GPR data are from a survey of W-E and N-S trending 100 MHz reflection profiles with a total length of 30 km. These data, which offer a vertical resolution of 0.2-0.3 m, are supplemented with high-resolution 250 MHz data collected over key structures. The high-resolution data offer a vertical resolution of 0.1 m. The depth-converted GPR reflections are correlated with the sedimentological facies logs in order to constrain the origin of the reflections. Different generations of 20-40 m wide and up to 1-2 m high beach ridges are observed in the GPR data. Aeolian dunes are observed above the beach ridges. We identify two relatively strong reflections with good continuity: one at 0-2 m above present mean sea level (pmsl) and one at 1-3 m below pmsl. The upper reflection appears to represent swales between beach ridges/sand dunes and beach ridge flanks. The lower reflection probably represents the top of a clay layer in many areas. In other areas, the lower reflection is weaker and probably represents the transition between two marine sandy deposits. The nature of the two prominent reflections is constrained by detailed amplitude analysis. Our study provides substantial new information about the marine and aeolian sedimentary processes that have formed the Rømø barrier island system from the Holocene to recent times. Such knowledge is essential for assessing how the future

evolution of barrier islands will be influenced by sea level changes.