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Mapping the architecture of Danish Wadden Sea barrier islands using GPR

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The relative sea level is rising fast in many regions of the world because of global warming. Sea level changes have large implications especially at low gradient barrier coasts. Understanding the response of coastal barrier island systems to sea level rise is important both from a scientific and a practical point of view. To obtain this understanding, barrier islands are studied using geophysical, sedimentological and geomorphological field methods. The study site is the Danish part of the Wadden Sea with focus on the barrier island Rømø. Ground Penetrating Radar, GPR, investigations are used to map sedimentary architecture and structures of the barrier island. Eight core wells are drilled to approx. 25 m depth. Five corings are located along GPR profiles on Rømø, two are carried out in the intertidal lagoon, and one at a high intertidal flat adjacent to the mainland coast. The cores are described both with respect to grain size, sedimentary structures and fossils to reveal depositional environments. The GPR data sections are collected with 100 MHz antennae in a coarse grid covering the island of Rømø. The antennae were mounted on a cart with a spacing of 1 m. The maximum penetration depth is up to 15 m in the interior parts of the island, whereas it decreases to about 1 m near the coasts because of the intrusion of salty water and fine-grained marsh sediments. The GPR data sections are depth-converted to facilitate direct comparison with the cores. The depth-converted GPR reflection sections are correlated to the sedimentological logs from the cores as well as geophysical logs collected in the boreholes and on the cores in the laboratory. We observe two to three continuous, almost horizontal reflections in the bulk part of Rømø. The continuous reflections can be followed over large distances providing good conditions for correlation between the core wells. The GPR reflection sections display internal structures that indicate the existence of both eolean and marine deposits in the upper approx. 10 m.