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Changes in relative sea-level and coastal morphology during the last 5000 years – a case study from the island of Samsø, Denmark

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Changes in relative sea-level (RSL) during the mid- to late Holocene are reconstructed based on internal beach ridge geometry imaged by ground-penetrating radar. Data were collected across a raised beach-ridge system on the island of Samsø, Denmark. The internal architecture of the beach-ridge system is divided into characteristic radar facies. We identify downlap points interpreted to mark the transition from the beachface to the upper shoreface, which we assume to represent actual sea-level at the time of deposition.

The absolute vertical level of the identified downlap points are combined with an age-distance model based on optically stimulated luminescence dated samples to construct a RSL curve for the past c. 5000 years. To our knowledge, this is the longest RSL reconstruction based on this proxy.

The dataset shows that the period between c. 4800–3800 yr BP was characterized by relatively high RSL values of c. 2.3 m above mean sea level. A marked decrease in RSL of c. 1.3 m occurred between c. 3800–3600 yr BP at a rate of c. 5 mm/yr. After c. 3500 yr BP the RSL curve shows a gradually decrease at a rate of c. 0.6 mm/yr.

This new data set further revealed reflections interpreted as beach steps. In combination with estimated changes in dip values of interpreted beachface reflectors, these observations may provide information about changes in the morphodynamic conditions of beach-ridge construction and progradation through time.