Geophysical Research Abstracts
Vol. 16, EGU2014-2345-1, 2014
EGU General Assembly 2014

After melt down of the Scandinavian icecap sea-level change rates of the Kattegat Sea shifted many times between -3.1 and +3.7 mm a-1

Jens Morten Hansen
Geological Survey of Denmark and Greenland, Copenhagen, Denmark (jmh@geus.dk)

Short-term sea-level change rates of the late Holocene are generally underestimated because SL-proxies of lowstands normally have a much lower preservation potential than SL-proxies of highstands. However, continuous series of numerous sea-level proxies from both highstands and lowstands are preserved on an island in the middle of the Kattegat Sea between Denmark and Sweden. The island (Læsø, 118 km2) emerged c. 4900 years BP and thereafter the island evolved around 4000 km of still visible, successive shorelines. Due to constantly retreating shores and – not least - a constantly high supply of sediment from a 90 km2 shallow abrasion platform around most of the island, the isostatically raised beaches provide a unique setting for preservation of both highstand and lowstand proxies, while lowstand proxies in most other Scandinavian settings have been eroded by subsequent highstands, thus forming plains of laterally stacked highstand berms. Consequently, the island supplies with many lowstand proxies not previously reported from Scandinavia, and which are essential for understanding magnitudes of relatively short-term (200 - 300 years) sea-level oscillations during the late Holocene.
By means of a high resolution LiDAR model of the island, levels and formation chronology of the island's previous shorelines have been identified with high confidence, and by means of 108 absolute datings (14C, OSL and tree-ring datings) the shorelines' absolute ages have been modelled, presently based on 551 RSL/age index points. By means of ground penetrating radar (GPR) the swash heights of any type of paleo-beach have been identified with good precision. By compensation for regional isostatic rates (GIA) and other types of more local terrain-level changes, which can be depicted from the LiDAR-mapping, the RSL-levels have been transformed to a detailed absolute sea-level (ASL) curve.
Calculated as a 200 year running mean of the level/age index points the 'eustatic' ASL-curve shows change rates between +3.0 to +4.7 mm a-1 (RSL: -1.0 to +0.1) during the period 4900 to 4000 years BP, i.e. until the Scandinavian icecap ultimately had melted back to isolated glaciers. In the following Subboreal period (4000 - 2700 years BP) ASL oscillated four times between 0 and 80 cm below MSL with ASL-change rates between -4.0 and +3.0 mm a-1 (RSL: -6.2 to +0.3). During the subsequent Subatlantic highstand (2700-1300 years BP) ASL oscillated twice between 0 and 70 cm above MSL with ASL-change rates between -2.2 and +3.7 mm a-1 (RSL: -4.5 to +1.0). During the following Subatlantic lowstand (1300 BP to present) ASL oscillated 0 to 80 cm below MSL (Little Ice Age) with SL-change rates between -2.1 and +2.8 mm a-1 (RSL: -3.4 to +0.8). After culmination of the Little Ice Age lowstand (at 0.8 m below MSL c. 700 years BP) ASL has been oscillating with change rates between +0.9 and +2.7 mm a-1 (RSL: -1.1 to +0.8) and rising with a mean rate of +1.18 mm a-1.