



## **Sedimentary Signature of a Storm-surge Unit in the western Netherlands coastal Dunes**

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A northwesterly storm on November 9, 2007 created a moderate storm surge that eroded about 10 m of the coastal dunes along a 1-km-long stretch near Heemskerk in the western Netherlands. The resulting dune scarp provided a unique exposure of beach and eolian sediments. In the months following the storm, we studied this exposure, with particular emphasis on a storm-surge unit that reaches an elevation of almost 6.5 m above mean sea level. The storm-surge unit consists of one or more shell-rich layers that are characterized by convolute bedding, vertical air-escape structures, large shells that are mostly oriented convex side up, and sets of parallel laminae that thin and dip in a landward direction. The shell-rich layers were deposited by storm waves that flooded a coastline fronted by undulating dunes, overtopping the lowest parts of the frontal dunes. The landward-dipping parallel laminae were deposited in washovers behind these lows. In the exposure, the storm-surge unit shows considerable relief, with local evidence of scouring. Multiple layers of convolute bedding may point to deposition during one storm surge spanning several high tides or to deposition during separate storm surges. The approximate age of the storm-surge unit, 1650 to 1850 AD, is provided by preliminary OSL ages of sand and a  $^{14}\text{C}$  age of an articulated cockle, and by the presence of coal and brick fragments. During this time span, major storm surges flooded the western Netherlands coastal area in 1717, 1741 and 1825, as known from historical records. The present study extends the 115-year-long monitoring series of storm-surge levels in the western Netherlands, providing much-needed information for coastal managers to predict 1:10,000-year flooding levels for coastal-safety purposes. The new data also shed light on wave-runup during extreme storm

surges, which is poorly understood at present.