Geophysical Research Abstracts
Vol. 16, EGU2014-14261, 2014
EGU General Assembly 2014

Process thresholds in plant-wave interactions on saltmarsh surfaces: implications for wave dissipation and marsh stability

Iris Moeller (1), Tom Spencer (2), Franziska Rupprecht (3), Matthias Kudella (4), Maike Paul (4), Bregje Van Wesenbeeck (5), Guido Wolters (5), Kai Jensen (3), and Tjeerd Bouma (6)

(1) Fitzwilliam College, Storey's Way, Cambridge CB3 0DG, UK (im10003@cam.ac.uk), (2) Cambridge Coastal Research Unit, Department of Geography, University of Cambridge, Downing Place, Cambridge, CB2 3EN, UK (ts111@cam.ac.uk), (4) Forschungszentrum Küste, Leibniz University Hannover, Hannover, Germany (kudella@fzk-nth.de), (3) Applied Plant Ecology, Biocenter Klein Flottbek, University of Hamburg, Hamburg, Germany (franziska.rupprecht@uni.hamburg.de, (5) Deltares, Delft, NL (bregje.vanWesenbeeck@deltares.nl), (6) Yerseke Spatial Ecology, Netherlands Institute for Sea Research (NIOZ), Yerseke, NL (tjeerd.bouma@nioz.nl)

Saltmarshes provide a range of important ecosystem services, amongst others protection from waves during storms. Plant-wave interactions are critical in determining wave energy reduction by the marsh surface, as this is achieved through hydraulic friction at the bed, vegetation and/or soil movement, and wave breaking. While these energy dissipating processes are understood in theory, crucial understanding is lacking as to just how effective marshes are when it really matters, under extreme water levels and waves, when the interaction between the marsh canopy and waves may differ from lower energy conditions. Experiments undertaken in one of the world's largest wave flumes, with a transplanted section of natural salt marsh typical of NW European coasts, provide first evidence of wave dissipation under storm surge conditions. The experiments showed how energy reduction is affected by individual dissipating processes, and also identified the wave energy threshold above which salt marsh vegetation ceases to make an effective contribution to wave attenuation. Beyond this wave height threshold, plant-wave interactions altered, and so did energy dissipation. Furthermore, for wave heights exceeding a height threshold, damage resulted to marsh vegetation in the form of plant stem breakage and removal. The marsh substrate itself remained remarkably stable and resistant to surface erosion, however, under even the highest wave energy conditions. These findings now allow, for the first time, the quantitative assessment of flood risk reduction by salt marshes under extreme conditions and thus provide input into the future engineering of such biophysical buffers in the face of global environmental change.