Geophysical Research Abstracts
Vol. 17, EGU2015-1952-1, 2015
EGU General Assembly 2015

Continuous monitoring bed-level dynamics on an intertidal flat: introducing novel stand-alone high-resolution SED-sensors

Zhan Hu (1,2), Walther Lenting (3), Daphne van der Wal (1), and Tjeerd Bouma (1)

(1) Spatial Ecology Department, Royal Netherlands Institute for Sea Research, P.O. Box 140, 4400 AC Yerseke, Netherlands (zhan.hu@nioz.nl), (2) Hydraulic engineering Department, Delft University of Technology, P.O. Box 5048, 2600 GA Delft, The Netherlands, (3) Marine Technology Electronics Department, Royal Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands

Tidal flat morphology is continuously shaped by hydrodynamic force, resulting in highly dynamic bed elevations. The knowledge of short-term bed-level changes is important both for understanding sediment transport processes as well as for assessing critical ecological processes such as e.g. vegetation recruitment chances on tidal flats. Due to the labour involved, manual discontinuous measurements lack the ability to continuously monitor bed-elevation changes. Existing methods for automated continuous monitoring of bed-level changes lack vertical accuracy (e.g., Photo-Electronic Erosion Pin sensor and resistive rod) or limited in spatial application by using expensive technology (e.g., acoustic bed level sensors). A method provides sufficient accuracy with a reasonable cost is needed. In light of this, a high-accuracy sensor (2 mm) for continuously measuring short-term Surface-Elevation Dynamics (SED-sensor) was developed. This SED-sensor makes use of photovoltaic cells and operates stand-alone using internal power supply and data logging system. The unit cost and the labour in deployments is therefore reduced, which facilitates monitoring with a number of units. In this study, the performance of a group of SED-sensors is tested against data obtained with precise manual measurements using traditional Sediment Erosion Bars (SEB). An excellent agreement between the two methods was obtained, indicating the accuracy and precision of the SED-sensors. Furthermore, to demonstrate how the SED-sensors can be used for measuring short-term bed-level dynamics, two SED-sensors were deployed for 1 month at two sites with contrasting wave exposure conditions. Daily bed-level changes were obtained including a severe storm erosion event. The difference in observed bed-level dynamics at both sites was statistically explained by their different hydrodynamic conditions. Thus, the stand-alone SED-sensor can be applied to monitor sediment surface dynamics with high vertical and temporal resolutions, which provides opportunities to pinpoint morphological responses to various forces in a number of environments (e.g. tidal flats, beaches, rivers and dunes).