Geophysical Research Abstracts,
Vol. 11, EGU2009-11923, 2009
EGU General Assembly 2009

Critical shear stress for erosion evaluation by use of wind and turbidity observations and a simplified 0D wave model

C. Venier (1), A. D'Alpaos (2), and M. Marani (3)

(1) IMAGE, University of Padova, Padova, Italy (venier@idra.unipd.it, 0039 049 8275446), (2) University of Padova, Geoscience Dept., Padova, Italy (adalpaos@idra.unipd.it, 0039 049 8272010), (3) International Center for Hydrology "D. Tonini" and Department IMAGE, University of Padova, Padova, Italy (marani@idra.unipd.it, 0039 049 8275446)

One of the key processes governing the dynamics of intertidal geomorphology is sediment re-suspension induced by wind-waves, which tends to erode shallow mudflats and make suspended sediment available for deposition processes occurring preferentially in vegetated marshes. It is thus important, both from a conceptual and a modelling point of view, to devise methods to estimate sediment resuspension and the critical shear stress for erosion.
The present work concerns the evaluation of the critical shear stress in shallow tidal areas with specific application to the Venice lagoon, where a network of wind, water level and turbidity sensors has been concurrently operating for several years (2004-2007). Different point wave models forced by wind are implemented and evaluated in order to compute the bottom shear stress due to wind-wave action, expressed as a function of wave height and period. Wave height and period are then computed as a function of depth and wind velocity (Breugem et al., 2007; Carniello et al., 2008). We then use a 0D sediment mass conservation equation to relate the simulated bottom shear stresses and the turbidity observations concurrently performed in the proximity of the anemometers. Critical shear stresses for sediment erosion can then be evaluated without recourse to invasive techniques which may disturb the sediment itself. Estimates in the range 0.32-0.35 Pa are obtained, in line with what is expected for sandy silt.
The method improves a previous similar formulation, by introducing a more realistic wave model and appears to have distinct advantages over more traditional in situ procedures (e.g. the Sea Carousel or the Cohesive Strength Meter) because it does not interfere with the surface biofilm and provides a direct and quantitative physical estimate of the critical-shear stress.