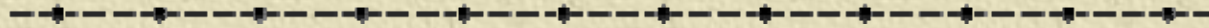


The evolution of intertidal mudflats in the Venice lagoon



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Objectives



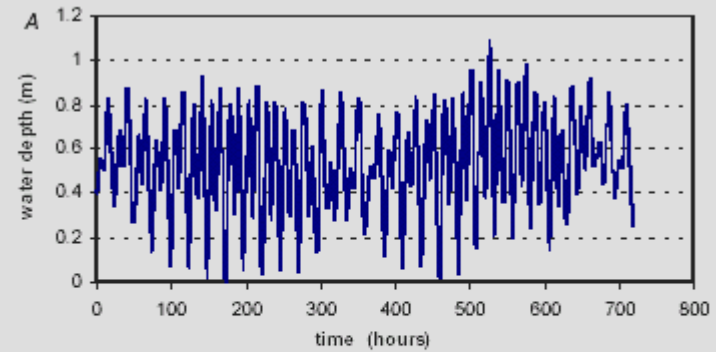
Figure 1. Sketch of cohesive supratidal areas (in dotted grey) and channels (in white) surrounding *Palude della Centrega* and site V40. Locations of *Burano* and *Torcello* villages (in dark grey) are also reported.

- ✦ Identify factors that govern the evolution of tidal flats in the Venice Lagoon
- ✦ Study the reasons for the accretion of the Scanello Area

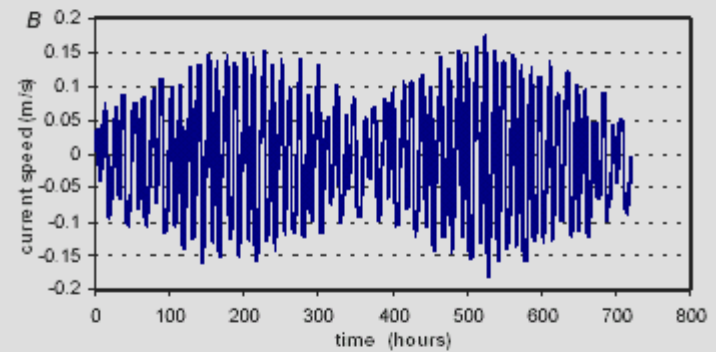
Forcings



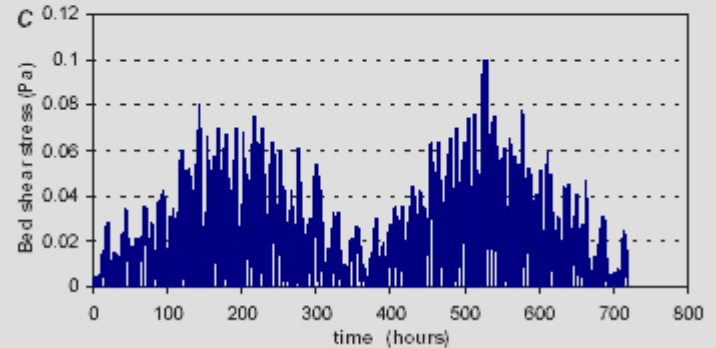
Total water depth



Current speed



Bed shear stress



Tidal currents



Deposition,
erosion and
accretion under
the action of the
tidal currents

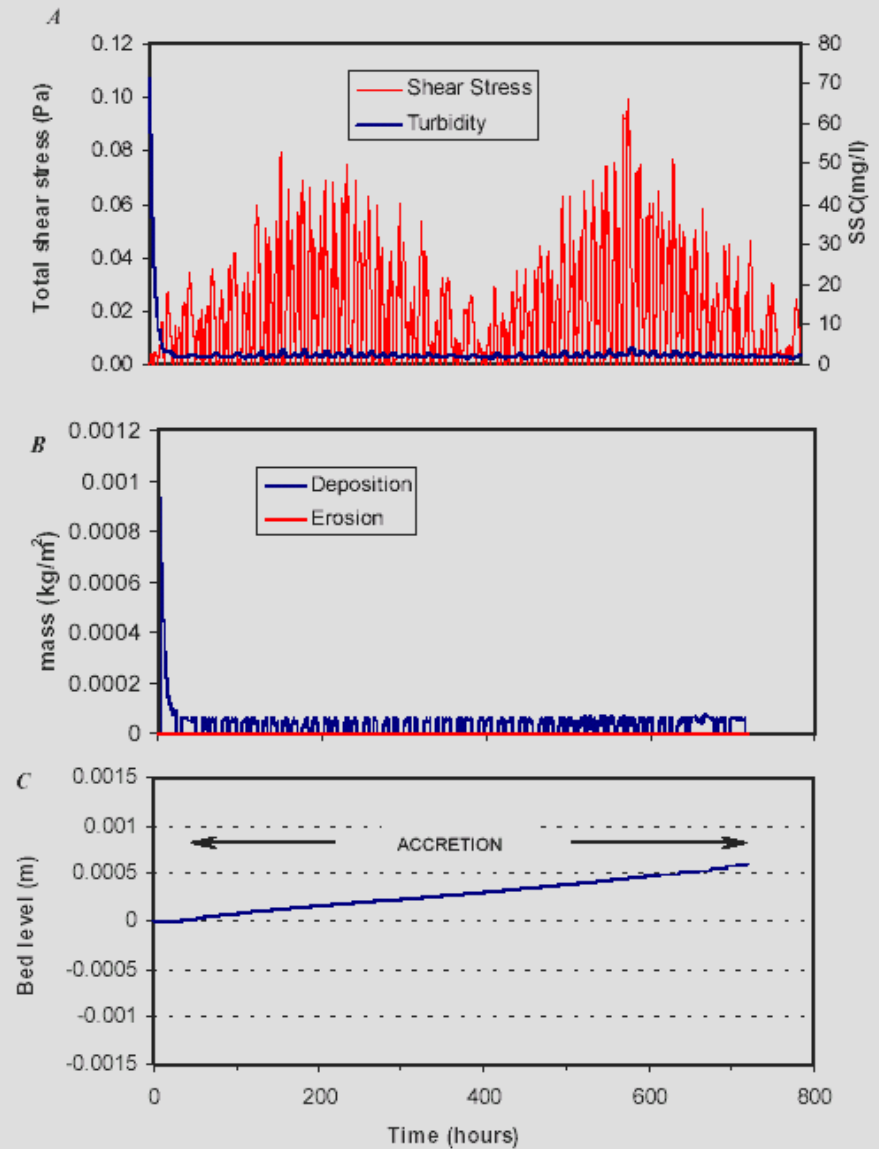


Figure 8. Bed shear stress and SSC time series (top), eroded and deposited mass (middle) bed level elevation (bottom) simulated under the effect of tidal currents and a sediment input of 3.3×10^4 t/a. Note the deposited mass going to zero during the exposure of the tidal flat.

Sediment input and Storms

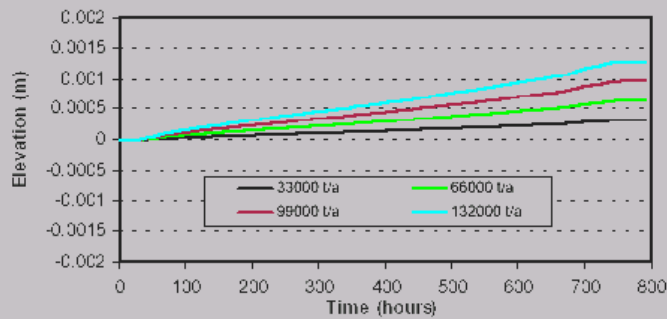
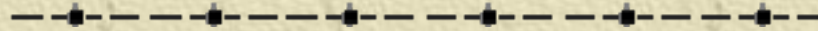


Figure 9. Results of bed level changes under the effect of local currents and different sediment inputs. Note that the accretion rate increases with increases in sediment input.

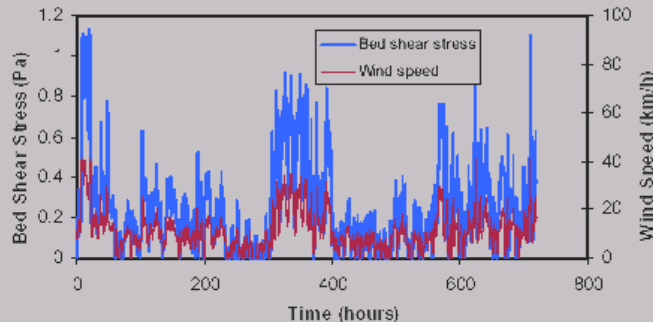


Figure 10. A time series of wind speeds measured in *Treporti* station and the bed shear stress computed by the model using the equation 3.iii.

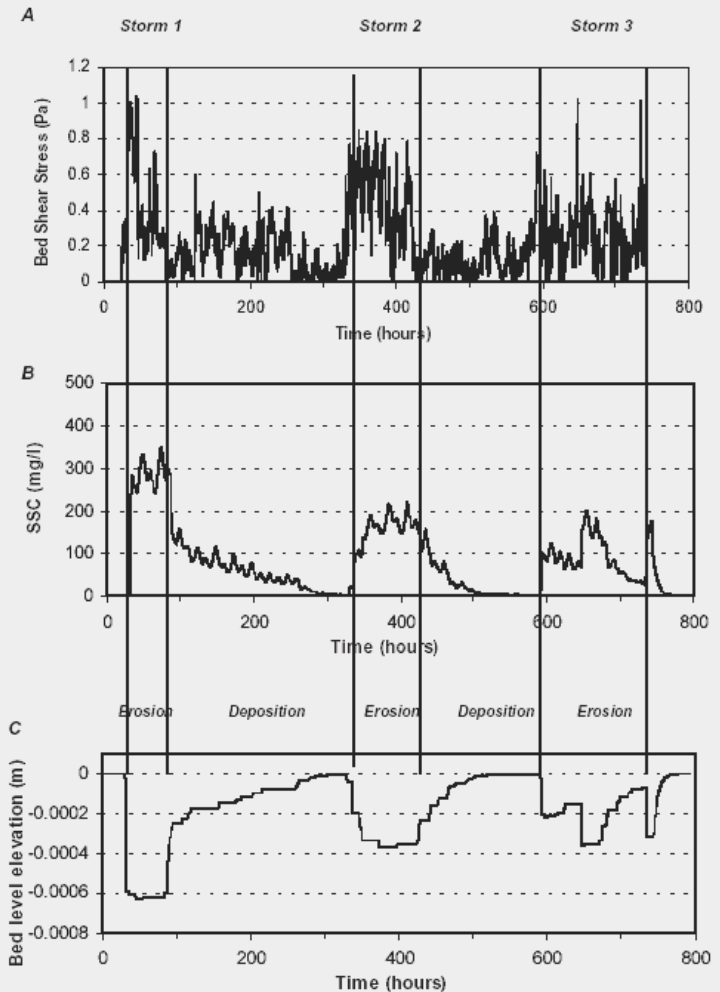
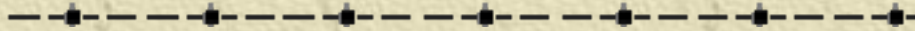


Figure 12. A time series of bed shear stress (A), SSC (B) and bed elevation (C) computed by the model on a 30-day simulation using real wind speed data measured at *Treporti* on August 1998.

Results



- ✦ Only sediment input can explain the fact of accretion in the Scanello area
- ✦ We still need to seek for a mechanism to fully explain observed accretion rate

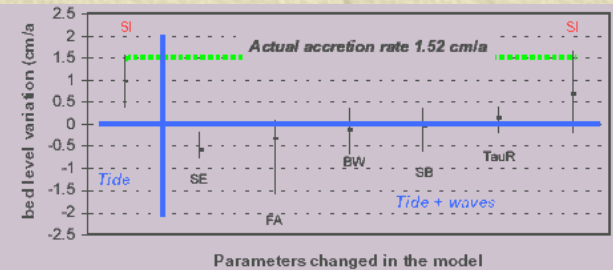


Figure 14. A summary of results of bed level changes obtained from the sensitivity analysis of SLIM. The vertical blue line separates the results obtained under the effect of currents only and tidal currents and waves. The horizontal blue line separates the simulations of accretion and erosion. SB = sediment stability; SE = sediment export; FA = friction coefficient ($0^\circ < \phi < 30^\circ$); SI = sediment input; BW = Bora wind, TauR = bed shear stress reduction. Note that maximum erosion is obtained by modifying the friction coefficient. Deposition can occur under the effect of tidal currents or, in the presence of waves, under a decreased elevation of the mudflat, an increase in the erosion threshold and a reduction of the bed shear stress by sea grasses. The actual accretion rate (1.52 cm/a) is represented by the green dotted line and is simulated using a sediment input of 363000 t/a.

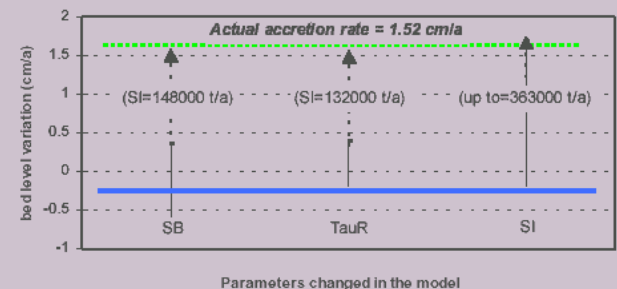


Figure 15. A summary of the calibration results of bed level changes obtained from the sensitivity analysis under the combined effect of high τ_c , reduction of the shear stress by plants and increase in the river sediment input. The model can be obtained using a SI of ~363000 t/a, increasing the τ_c up to 1.16 Pa (SB) and using a SI=148000 t/a, or reducing τ_c (TauR) by 50% in combination with a SI=132000 t/a. The dotted arrows represent the contribution of sediment input to the accretion rate.

Next ideas

