Sediment Model Manuscript

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Keyword 1 | Keyword 2 | Keyword 3 |

Introduction

Methods

Field observations and model parameters. We observed tidal height, grain size, suspended sediment concentration (SSC), and dry bulk density over multiple field seasons (both dry and monsoon) from 2011-2016. The tidal height, measured above the platform, was inferred from a pressure sensor deployed at Polder 32 [INCLUDE LOC]. The median grain size was measured in multiple locations around Polder 32 and within the natural mangrove forest. Grain sizes ranged from 14-27 µm, which is consistent with medium to coarse silt. SSCs were obtained using an optical backscatter point sensor (OBS) affixed to the side of small boat. SSC varied within a tidal cycle (0-3 g/L) and seasonally (0.15-0.77 g/L). Dry bulk density (900-1500 kg/m^3) was determined from sediment samples at depths of 50-100 cm (**?**). These field observations were used to define distributions for each model parameter

Numerical model. We modeled tidal platform elevation (ζ) at a point through time as

$$\frac{d\zeta}{dt} = \frac{dS_M}{dt} + \frac{dS_O}{dt} + \frac{dP}{dt} + \frac{dM}{dt}, \qquad [1]$$

where (§$_M$ is mineral sedimentation, (§$_O$ is organic matter sedimentation, P is compaction, and M is tectonic subsidence (**? ? ?**).

We approximate S_M as

$$S_M(t) = \int \frac{w_s C(t)}{\rho} dt, \qquad [2]$$

where w_s is the characteristic settling velocity of a grain given by Stokes' law, C is the depth-averaged suspended sediment concentration in the water column, and ρ is the dry bulk density of the sediment. Equation **??** assumes there is no resuspension of mineral sediment (**?**).

We capture the temporal variation of suspended sediment concentrations during one tidal cycle through the mass balance given as

$$\frac{d[h(t) - \zeta]C(t)}{dt} = -w_s C(t) + C_{in}\frac{dh}{dt}, \qquad [3]$$

where h is the height of the water column and C_{in} is the incoming suspended sediment concentration of the adjacent water column (**? ? ? ?**).

The incoming suspended sediment concentration also varies with time and can be written as

$$C_{in}(t) = C_{max}[h(t) - \zeta], \qquad [4]$$

where C_{max} is the maximum suspended sediment concentration of the adjacent water column.

Monte Carlo simulations.

Results

Discussion

Conclusion

Acknowledgments

References

Significance Statement

Authors must submit a 120-word maximum statement about the significance of their research paper written at a level understandable to an undergraduate educated scientist outside their field of speciality. The primary goal of the Significance Statement is to explain the relevance of the work in broad context to a broad readership. The Significance Statement appears in the paper itself and is required for all research papers.

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