

UNCERTAINTY QUANTIFICATION IN LITTORAL EROSION

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ABSTRACT. We aim at quantifying the impact of flow state uncertainties in littoral erosion to provide confidence bounds on deterministic predictions of bottom morphodynamics. Two constructions of the bathymetry standard deviation are discussed. The first construction involves directional quantile-based extreme scenarios using what is known on the flow state Probability Density Function (PDF) from on site observations. We compare this construction to a second cumulative one using the gradient by adjoint of a functional involving the energy of the system. These ingredients are illustrated for two models for the interaction between a soft bed and a flow in a shallow domain. We also consider the application of the ensemble to quantify the amount of buried oil in the intertidal beach zone. Our aim is to keep the computational complexity comparable to the deterministic simulations taking advantage of what already available in our simulation toolbox.

Key words and phrases. Backward propagation, quantile, uncertainty, littoral morphodynamics, Shallow water equations, sensitivity analysis, worst-case analysis.