A micromechanical modelling approach for predicting particle dislodgement

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Abstract In recent years, the impulse and energy concepts have been proposed as a means of improving the prediction of sediment particle entrainment. Because they account for temporal aspects of the applied hydrodynamic forces, impulse-based or energy-based approaches provide a better representation of a highly fluctuating phenomenon compared to the more traditional time-averaged Shields parameter or constant force magnitude-based model. In the present paper, we elaborate further on the simulation of particle migration by applying a theoretical model based on hydrodynamic pressure data. Three common movement scenarios and the dynamic critical drag force, allowed to vary during particle motion, are qualitatively discussed here. Also, the possible inaccuracy in entrainment prediction of three different models is addressed with reference to our simulation results. It is demonstrated that the multi-parcel impulse model has the best performance when compared to the single-parcel impulse and force magnitude-based models.

Key words impulse; hydrodynamic forces; particle dislodgement; multi-parcel approach; dynamic resistance