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**TOPIC: Experimental investigations on the influence of microplastic particles on the erosion stability of natural and artificial cohesive sediment mixtures**

#### **Advisor**

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#### **Keywords**

Cohesive sediments, experimental work, incipient of motion, microplastic particles

#### **Introduction and background**

The behaviour of cohesive sediment mixtures is of complex nature since it is not only governed by physical but also by biological and chemical processes. Microplastic particles in such deposited cohesive sediments are another factor, which makes the prediction of the erosion behaviour of these sediment mixtures even more uncertain. For gaining knowledge on the interactions it is inevitable to obtain basic research on homogenous and reproducible samples with known amounts of microplastic particles and with knowledge regarding the sediment characteristics. This work focuses at a first step on deepening the understanding of the behaviour of microplastic spiked artificial cohesive sediments (incipient of motion and transport) by experimental research. In a second step, natural sediment samples will be investigated to obtain knowledge on the distribution and amount of microplastic particles in rivers and reservoirs.

#### **Methods to be used**

First, the PhD candidate shall review key and state-of-the-art literature on cohesive sediments to become familiar with this research area. Simultaneously, a literature review on the potential influence of microplastic on the erosion stability should be obtained. Based on the findings



from the literature reviews, artificial cohesive sediments with pre-defined characteristics regarding sediment composition and microplastic content shall be mixed and bed stability tests conducted. Hence, the PhD candidate needs to get familiar with the SETEG-flume and the associated measuring techniques (including further development of the already existing devices and methods) of the hydraulic laboratory at IWS. In addition, the candidate needs to become familiar with methods for extracting microplastic from natural sediments (chemical analysis and microscopy). Extensive post-processing of the obtained data, including the use of statistical methods, will be required to derive relationships between cohesive sediment characteristics, microplastics and possible changes in the erosion behaviour.

### **Research goals**

The main objective of this work is to obtain knowledge on the influence of microplastic particles on the erosion stability of cohesive sediment mixtures. This will happen based on experiments with artificially produced cohesive sediments, with known characteristics, and natural sediment samples. This research should give insight into: (i) the evaluation of erosion stability, (ii) the derivation of initiation of motion, and (iv) the time-dependent measurement of erosion rates by means of an optical measuring technique for erosion rate detection. The findings from this study shall improve the general understanding of cohesive sediment erosion behaviour and shall gain knowledge on the changes in erosion behaviour with respect to microplastic particles.

### **Research environment**

The PhD candidate will conduct experiments in the hydraulic laboratory at IWS as well as statistical work (including the development and coding of new algorithms). Besides, the student will become part of an interdisciplinary working group consisting of post-docs and doctoral students that conduct research on cohesive sediments from both rivers and reservoirs.

### **Prerequisites**

Good knowledge of fluid mechanics, statistics, sediment transport and programming is required. Moreover, experience in experimental as well as analytical laboratory work is recommended.

### **Contact for questions**

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