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Development and testing of a sampling device for the analyses of suspended sediment concentrations

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Suspended sediment concentrations are not equal in time as well as within a cross section. For calibration, sampling is needed within a cross profile (using e.g. sampler US P-61-A1) or nearby of a SSC sensor. However, due to insufficient hydraulic efficiency, uncontrolled handling under water as well as lack in accuracy in starting and closing the suspended sediment sampling, the well-established extracting of water samples by hand (dip or grab sample) lacks reproducibility. Due to these shortcomings a novel measuring device has been developed for suspended sediment sampling in rivers. For the design of the presented sampler the experiences of previous technical concepts of direct suspended sediment sampling in rivers have been considered.
The sampling device consists of 2 tubes: a filling pipe (8x1 mm = 6 mm inner diameter) and an exhaust pipe (6x1 mm = 4 mm inner diameter). The filling pipe is equipped thread (M8x1 mm) to attach the “measuring nozzle” made of brass. We compared three different nozzles (D4, D5, D6) in order to investigate possible effects of different filling times. Both tubes are connected (TIG -Tungsten Inert-Gaswelding) by a flat steel. All parts (despite the nozzles) are made from stainless steel. On the tubes a plastic screw cap is mounted which allows to attach (and quickly change) standard sampling bottles. A mount enables that the device can be attached to a commercially available “GARDENA aluminium handle”, thus using this rod samples can be taken at certain localities.
The measurement device has been designed to improve the accuracy of suspended sediment sampling in rivers. The target was to achieve an optimum in hydraulic efficiency without disturbing the natural transport dynamics. Thus, the water sample gained from this sampling device supports the calibration and validation of indirect suspended sediment sampling devices (e.g. SSC sensor). We present the design of the sampler as well as field data in comparison with conventional dip samples.