

A new device to measure the settling properties of suspended particles : instrumental development and first applications during runoff events in small watersheds

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Most equations describing suspended particle transport balances the settling flux of particles against the turbulent flux of the flow. Although in-situ techniques have been developed to measure settling velocities of suspended particles in coastal areas, floodplain rivers and estuaries, they are not easily transferable to small and meso-scale watersheds. The main limitation lies in the range of concentrations frequently reaching several tens of grams per liter during runoff events. To overcome this instrumental limitation we developed an original System for the Characterization of Aggregates and Floccs (SCAF). An optical settling column, equipped with a vertical array of 16 optical sensors, was used to provide light transmission through a suspension during quiescent settling. It was specifically designed to be inserted in plastic bottles contained in classical sequential samplers, in order to obtain automatic measurements of the suspension immediately after its collection in the river. From the SCAF measurements, we calculate both the particle settling velocity distributions and the propensity of particles to flocculate. The prototypes were tested in laboratory conditions for a wide range of concentrations and material types, leading to consistent measurements with flocculation indices comprised between 0 and 80, respectively for non-cohesive and cohesive materials. First measurements in the field were achieved during runoff events at the outlet of small nested catchments in Lao PDR (MSEC network of environmental observatories) in order to explore the non-conservative behavior of the settling properties of eroded soil aggregates during their transfer.