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## Inferring suspended sediment carbon content and particle size at high frequency from the optical response of a submerged spectrometer

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Manual and unattended sampling in the field and laboratory analysis are common practices to measure suspended sediment (SS) carbon content and particle size. However, one of the major drawbacks of these ex-situ methods is that they make high frequency measurements challenging. This includes restricted data collection due to limited access to the sampling locations during turbulent conditions or high flows, when the largest amount of sediments is transported downstream, introducing uncertainty in quantification of SS properties (particle size and carbon content) and sediment loads. Knowledge on SS carbon content and particle size is also important to better understand the multi-component form of suspended sediments (i.e. flocs) that directly affect sediment transport and other sediment properties (e.g. settling velocity and density). Moreover, SS carbon content and particle size exert an impact on the optical sensor readings that are traditionally used to measure turbidity. In that respect, high frequency measurements of SS carbon content and particle size could eventually help us to move from 'local' calibrations towards 'global' dependencies based on in-situ SS characterization.

In this study, we propose to use a submerged UV-VIS spectrometer to infer SS carbon content and particle size. The sensor measures the entire light absorption spectrum of water between 200 nm and 750 nm at sampling intervals as short as 2-minutes. To this end, we first test our approach under controlled conditions with an experimental laboratory setup consisting of a cylindrical tank (40-L) with an open top. An UV-VIS spectrometer and a LISST-200X sensor (to measure particle size distribution) are installed horizontally. A stirrer facilitates the homogeneous mixing of SS and prevents the settling of heavy particles at the bottom. We use the sediments sampled from 6 sites in Luxembourg with contrasting composition and representing different land use types and geological settings. The sampled sediments were wet sieved into 3 size classes to clearly recognize the effect of particle size on absorption. In our investigation, we use specific wavelengths, chemometric techniques and carbon content specific absorbance indices to infer SS composition and particle size from the absorption spectrum. Results are then validated using in-situ field data from two instrumented field sites in Luxembourg. Amid the challenge of associating laboratory and field results, the preliminary results indicate that the absorption spectrum measured with a

submerged UV-VIS spectrometer can be used to estimate SS particle size and carbon content.