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Influence of riverine suspended sediment carbon content and particle size on turbidity

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In recent decades, optical backscatter techniques have increasingly become used to measure turbidity for the quantification of suspended sediment (SS) concentrations. One of the limitations of this method is that site-specific calibrations between SS concentration and turbidity (NTU) are needed. This is because turbidity (NTU) readings respond to factors other than SS concentrations, such as organic and mineral fractions, SS density, particle size distributions, and particle shape. Organic matter introduces irregularity in the shape of suspended particles that may aggregate to form flocs, which are not spherical, and different SS particle fractions (clay, silt, and sand) show different optical responses. Even though organic content is known to influence particle size and density and, as a result, turbidity, an explicit formulation of turbidity accounting for organic content is still missing. We conjecture that a better understanding of the relations between turbidity, SS carbon content (proxy for SS organic content under specific conditions) and particle size can help us to move from local calibrations towards 'global' dependencies. In this study, we investigate this by means of (i) a laboratory experiment, and (ii) *in-situ* high frequency SS characterization of carbon content and particle size. We collected sediments from 6 sites in Luxembourg representing different land use types and geological settings. The sampled sediments were wet sieved into 3 size classes and one part of the sieved samples were oxidized with hydrogen peroxide to investigate the effect of carbon content on turbidity and particle size. To this end, we first conducted laboratory experiments using a tailor-made setup consisting of a cylindrical tank (40-L) with an open top. A stirrer facilitated the homogeneous mixing of SS and prevented settling of heavy particles. Here, a submerged UV-VIS spectrolyser was used to estimate SS carbon content, a LISST-200X sensor to measure particle size distribution and a YSI EXO2 multi-parameter sensor to measure turbidity (NTU). Carbon content was measured in the laboratory with a CHNS Elemental analyser to calibrate the spectrometer readings, and a Mastersizer 3000 to measure particle size distribution. Laboratory results were then validated using field data from two instrumented sites in Luxembourg (Alzette River at Huncherange and Attert River at Useldange). Ongoing analysis will be discussed, and a global calibration equation between turbidity and SSC based on particle size, density and carbon content will be presented.