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Continuous *in situ* characterization of particulate sizes in urban stormwater: Method testing and refinement

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ABSTRACT

Understanding the size distribution of stormwater particulates and the pollutants associated with each size fraction is becoming an increasingly important aspect of stormwater management. This paper evaluates the accuracy of the Laser In Situ Scattering and Transmissometry (LISST 100x) particle analyzer and describes the adaptation of the instrument for use in urban stormwater assessment. The accuracy of the instrument was evaluated with known particle size standards of 5, 20, and 100 μm . While the mode of the size distribution corresponded with the average particle size indicated by the manufacturer, the weighted mean was 131 to 141% of the average particle size of the standards. Measured concentrations of screened natural sediment ($<63 \mu\text{m}$) ranged from 71 to 120% of the nominal value, with a variation in replicate measurements of 3% (coefficient of variation). The pumping regime used to transport stream water to the instrument gave results that compared well with those obtained using a depth-integrated grab sampler. Bubbles in the pumped samples, which could be interpreted by the instrument as particles, were reduced using a modified filter device. Transmission of the laser through the samples was greatly improved using a reduced-volume flow-through cell. Field results using the adapted technique compared well with those obtained with a laboratory Coulter Counter, with a median relative percent difference between the two techniques of 8% for the silt and clay fraction and 20% for very fine and fine sands. With application of protocols outlined in this study, the LISST provides a new tool for continuous in situ analysis of stormwater particulates.

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