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Assessment of uncertainty in suspended sediment load at constructed wetland inlet and outlet

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The use of constructed wetlands (CWs) for reducing pollution from different industries and land uses is common practice globally. Different countries have approached monitoring of CWs performance in several ways. For example, authorities can have different requirements in the flow measurement and sampling frequencies depending of the nature of the pollutant load. Typically, the load remaining after CW purification is estimated through concentration and flow measurements. As taking water samples comes with a cost, samples are taken with long intervals which can increase the uncertainty in the estimated loads. In 2012, a large water quality dataset was collected from CW inlet and outlet containing daily or twice a day water quality samples spanning from March until October. By sub-sampling the collected data with 1, 2, 3, or 4 weeks intervals we estimated the uncertainty range related to the sparse sampling. The results show large uncertainty remaining even with weekly sampling which suggests that increasing the sampling density from once in two weeks to once a week is not probably worth as the costs related to sampling would double. A method based on the flow duration curve (FDC) of the CW for reducing the uncertainty was also tested. The method divides the observed FDC to four equal parts and finds the mean or median concentration for each flow category. The load is then calculated by multiplying the observed flow with the mean or median concentration with the appropriate flow category. The FDC method was able to decrease the uncertainty, but much still remained, especially when concentrations of the measured variable showed large variation as it is typical case if annual nutrient and sediment loads from different land uses are monitored. Generally, continuous sensor technology might be a feasible option for further reducing the uncertainty in load estimation.