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# Real time monitoring of urban surface water quality using a submersible, tryptophan-like fluorescence sensor

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Due to the recent development of field-deployable optical sensor technology, continuous quantification and characterization of surface water dissolved organic matter (DOM) is possible now. Tryptophan-like (T1) fluorescence has the potential to be a particularly useful indicator of human influence on water quality as T1 peaks are associated with the input of labial organic carbon (e.g. sewage or farm waste) and its microbial breakdown. Hence, real-time recording of T1 fluorescence could be particular useful for monitoring waste water infrastructure, treatment efficiency and the identification of contamination events at higher temporal resolution than available hitherto. However, an understanding of sensor measurement repeatability/transferability and interaction with environmental parameters (e.g. turbidity) is required. Here, to address this practical knowledge gap, we present results from a rigorous test of a commercially available submersible tryptophan fluorometer ($\lambda$ex 285, $\lambda$em 350). Sensor performance was first examined in the laboratory by incrementally increasing turbidity under controlled conditions. Further to this the sensor was integrated into a multi-parameter sonde and field tests were undertaken involving: (i) a spatial sampling campaign across a range of surface water sites in the West Midlands, UK; and (ii) collection of high resolution (sub-hourly) samples from an urban stream (Bournbrook, Birmingham, U.K). To determine the ability of the sensor to capture spatiotemporal dynamics of urban waters DOM was characterized for each site or discrete time step using Excitation Emission Matrix spectroscopy and PARAFAC. In both field and laboratory settings fluorescence intensity was attenuated at high turbidity due to suspended particles increasing absorption and light scattering. For the spatial survey, instrument readings were compared to those obtained by a laboratory grade fluorometer (Varian Cary Eclipse) and a strong, linear relationship was apparent (R2 > 0.7). Parallel water sampling and laboratory analysis identified the potential for correction of T1 fluorescence intensity based on turbidity readings. These findings highlight the potential utility of real time monitoring of T1 fluorescence for a range of environmental applications (e.g. monitoring sewage treatment processes and tracing polluting DOM sources). However, if high/variable suspended sediment loads are anticipated concurrent monitoring of turbidity is required for accurate readings.