Geophysical Research Abstracts
Vol. 15, EGU2013-10143, 2013
EGU General Assembly 2013

# Using in-situ spectrophotometric sensors to monitoring dissolved organic carbon concentration: our S::CAN experience

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Dissolved organic carbon, (DOC), is the component of the organic carbon that can pass through a membrane filter, with the accepted maximum pore size of 0.7 $\mu$m. There is growing interest in high resolution time series of such data e.g. heterotrophic respiration of DOC in freshwater systems can fuel atmospheric $CO_2$ efflux so observing variation in DOC concentration, [DOC], is meaningful. Field deployable sensors, capable of measuring [DOC] on a continuous basis, have the potential to provide us with a far higher resolution time series data than we can obtain through manual sampling.

At a catchment area draining Europe's largest windfarm, Whitelee, we have deployed an S::CAN Spectrolyser. This device scans wavelengths from 200 to 735nm, generating a spectral fingerprint and then, using an inbuilt algorithm, returns a value for the DOC concentration, termed DOC-equivalent, [DOC-eq]. The Spectrolyser also estimates other parameters such as total organic carbon and the true colour of the water. Unfortunately, our field Spectrolyser [DOC] are different from lab based measurement of [DOC] of the same field filtered samples (measured using a Thermalox high temperature catalytic oxidation system). Comparing 28 lab measured [DOC] with Spectrolyser [DOC-eq] shows an average difference of 7.6 mg/l C. Here we discuss our interpretation of why this disparity exists and how to accommodate this offset such that accuracy is improved.

We have tried various methods of keeping the lens and path length clean through brushing, acid cleaning and the recent installation of a high pressure air hose (recommended by S::CAN). We will compare output before and after this installation.

Further complexity is added because light may be absorbed by other components of the field sample, such as particulate material, and this could compromise the estimated [DOC-eq]. [DOC] may be estimated using absorption measurements made at 254nm and 340nm (Tipping et al, 2009). We have implemented this formula using 255 and 340nm (the closest wavelengths) to compare the results with the automatically generated [DOC-eq], and also our laboratory measurements. As a field-deployed sensor measuring unfiltered samples, to compensate for turbidity we have incorporated the asborption measurement at 735nm in the calculation. With this approach, the average difference between lab measured and calculated decreases to 4.5mg/l.

Tipping, E., et al. (2009), Quantification of natural DOM from UV absorption at two wavelengths. Environmental Chemistry, 6,6, 472-476.