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Contrasting UV-Vis Spectra of Terrestrial and Algal Derived Dissolved Organic Matter.

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Dissolved organic matter (DOM) is an important freshwater component. It controls aquatic ecological and biochemical cycling, and can be problematic in industrial water treatment. Thus, the demand for effective and reliable monitoring is growing. The heterogeneity of the spectroscopic properties of DOM are such that measurements of absorbance at a single wavelength cannot provide accurate predictions of [DOC]. Previous construction of a two-component model, based on the combination of absorbance at two wavelengths and a constant accountable for non-absorbing DOM, resulted in good predictions of [DOC] across approximately 1800 different freshwater systems (R2=0.99). However, there were isolated cases where the model appreciably underestimated [DOC], including shallow lakes and reservoirs in the Yangtze basin, China where waters were deemed to be highly eutrophic. Here, we used a revised series of samples, from small scale algal dominated microcosms, mesocosms and catchment scale field samples to explore the capability of the two component model in situations where algae may be the dominant producer of aquatic DOC. Absorbances were measured using a laboratory based UV-Vis spectrometer and subsamples were also analysed through combustion and infra-red detection. In both the microcosms and mesocosms, the model failed to provide a reliable fit, and [DOC] was considerably underestimated. At the field scale, analysis of 55 samples from a combination of reservoirs, arable ponds, streams and rivers produced mostly reliable predictions of [DOC] (R2=0.96), which can be attributed to the dominant input of terrestrial DOM. Samples of shallow, enclosed meres from the North-West of the UK showed hints of similar behaviour to that of the Chinese lakes, suggesting some influences from algal DOM. Our results therefore provide evidence that algae may produce complex forms of DOM that harbour different spectroscopic properties to terrestrially derived material, in the UV spectral range.