



## **Characterisation of dissolved organic matter (DOM) in the Seine River catchment (France) by excitation-emission matrix (EEM) fluorescence spectroscopy combined with PARAFAC and PCA analyses**

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Dissolved organic matter (DOM) is a heterogeneous, complex mixture of compounds with wide ranging chemical properties and diverse origins. It is well known to interact with pollutants and to affect their transport and their fate in aquatic environment, and plays a vital role in the global cycling of carbon. In this study, UV/visible absorbance and excitation emission matrix (EEM) fluorescence spectroscopy combined with PARAFAC and PCA analyses have been used to characterize colloidal DOM in the Seine River watershed.

Surface water samples were collected in November 2011, September 2012 (low-water) and February 2013 (flood) from 23, 39 and 45 sites respectively from different areas including the Oise basin, the Marne basin, the Grand Morin basin and the downstream of the Seine River. A Jasco V-560 spectrophotometer was used for UV/visible absorbance measurement. Fluorescence spectra were recorded using a Fluorolog FL3-22 SPEX – JOBIN YVON fluorometer. The samples, at natural pH, were placed in 1 cm quartz cuvette, thermostated at 20°C. All sample spectra were obtained by subtracting a blank spectrum (ultrapure water Milli-Q, Millipore) and were instrumentally corrected. When necessary, samples were diluted to avoid inner filter effects. The fluorescence data set was analyzed using PARAFAC DOMFluor toolbox in Matlab which decomposes the complex data matrix into its main components.

The application of UV/visible absorbance and EEM fluorescence spectroscopy in combination with PARAFAC and PCA analyses allowed us to identify different sources of dissolved organic matter in the catchment of the Seine River and highlighted spatial and temporal variations of DOM properties. We observed significant different and specific typologies of organic matter for the four studied zones. The Seine basin is characterized by the strongest biological activity (in connection with the presence of the “Seine-Aval” WWTP). DOM from the Oise basin seems to have more “humic” characteristics (a forest sample presenting the strongest “humic-type” material). Samples collected from the Marne basin are characterized by a third specific type of organic matter. For samples collected in November 2011 and September 2012 the distributions observed for the 7 components determined by PARAFAC treatment were different for each studied basins, highlighting different organic materials in each zone. A homogeneous distribution of the components was obtained for the samples collected during the flood in February 2013.