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Spatial and temporal variations of dissolved organic matter dynamics in a disturbed *Sphagnum* peatland after hydrological restoration

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Peatlands contain a third of the world soil C in spite of their relatively low global area (3% of land area). They can become sources of C because of human disturbances such as drainage. The aim of this work is to assess the effect of an hydrological restoration on a disturbed *Sphagnum* peatland. It concerns spatial and temporal variations of dissolved organic matter (DOM) dynamics.

The investigated site was La Guette peatland (France, N 47°19'44", E 2°17'04", alt. 154m), whose hydrological conditions are influenced by a road passing through its former area. The road drain accelerates drying mechanisms, favouring thus vascular plants settlement to the detriment of specific flora of peatlands (i.e. *Sphagnum*). Hydrological restoration was undertaken in February 2014. It consisted in building thresholds to slow down drain runoff and to promote the soil rewetting. Two transects of piezometers were settled in independent two hydrological sub-systems: Trans-up and Trans-down. Trans-down is supposed to be influenced by the hydrological restoration, while Trans-up is not. These transects cross the peatland and follow water flow direction until the outlet. Six sampling campaigns were performed before, during and after the vegetation period. Water conductivity and pH were measured on site. Water samples were collected in the piezometers. Samples were filtered in the field at 0.45 μm. Concentrations of dissolved organic carbon (DOC), cations (Na^+, K^+, Ca^{2+}, Mg^{2+}, NH^{4+}) and anions (Cl^-, ${SO_4}^{2-}$, ${PO_4}^{3-}$, ${NO_2}^-$, ${NO_3}^-$) were measured. Absorbance was measured by UV-VIS spectrophotometer to assess $SUVA_{254}$ and aromaticity of DOM. Three-dimensional excitation–emission matrices (EEM) were undertaken to characterise fluorescent DOM (FDOM). Humification (HIX) and biological (BIX) fluorescence indices were calculated. PARAFAC algorithm was used to treat EEMs. Precipitations and water levels were measured automatically by a weather station and automatic probes, respectively. Rain water was also analysed to assess precipitation contribution in each analysis.

Mean DOC concentrations are higher in Trans-up than in Trans-down (45 $mg.L^{-1}$ *vs* 30 $mg.L^{-1}$). Water table fluctuations are more important in Trans-up than in Trans-down (6 cm *vs* 15 cm). In both sub-systems, DOC concentrations decrease from the upstream forest border to the middle of the peatland and then increase until the outlet. DOM aromaticity shows seasonal variability with a peak in summer. Maximum aromaticity is always reached in the middle of transects. Measured emission/excitation couples are similar to those found in peat standards and references (International Humic Substances Society). Fluorescence indices show that DOM humification degree increases while crossing peatland following water flow direction. Seasonal variations of fluorescent intensity ratios are wider in Trans-up than in Trans-down due to higher water drawdown during summer in Trans-up. DOM in the middle of the transects is mainly autochthonous, whereas DOM near the limit of the peatland shows strong allochthonous influence from neighbour systems. Ionic concentrations are correlated to DOC, showing charging and discharging gradients in peat water. Results from characterisation of DOM and peat water geochemistry show spatial and temporal variations in nature and origins of DOM. This study emphasizes contrasts between control and hydrologically reworked sub-systems.