Hydrological management induced spatial-temporal variations in optical and molecular composition of dissolved organic matter in Three Gorges Reservoir

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Introduction (Use of sections is optional)

Rivers transport dissolved organic matter (DOM) to coastal oceans, consist a critical component of the global carbon cycle. However, anthropogenic activities disturbed the connection between rivers and coastal oceans, among which dam reservoir construction is one of the most far-reaching human modifications and perturb organic matter transport. Three Gorges Reservoir (TGR), the largest reservoir in the world, was chosen as a typical case assessing how dam construction and hydrological management affecting DOM cycling in inland waters. As such, we investigate the distribution and composition variations of DOM in TGR, particularly at the molecular level for the first time, in a tributary named Xiangxi Bay and mainstream of TGR. Considering the complexity of DOM, a series of techniques was conducted including ion chromatography, stable carbon isotopes, UV absorbance spectroscopy, excitation and emission matrix fluorescence spectroscopy and parallel factor analysis (EEM-PARAFAC), and Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS) (Coble et al., 1996; Stenson et al., 2003).

Results (Use of sections is optional)

The linkage between optical properties and molecular characteristics of DOM in TGR was established and spatial-temporal variations of DOM in TGR were consequently elucidated (Kellerman et al., 2015). Higher terrestrial and algal inputs but lower anthropogenic inputs in Xiangxi Bay than those in mainstream were observed in the dry period. On the contrary, no apparent spatial variability of DOM was observed in the wet period. The spatial variation of DOM in the dry period was mainly attributed to the water intrusion from mainstream to Xiangxi Bay. With respect to temporal variations, lower anthropogenic input, higher algal inputs and agricultural inputs were observed in the dry period than those in the wet period. DOM in the wet period showed relatively higher terrestrial characteristics with higher aromaticity than that in the dry period.

Conclusions (Use of sections is optional)

Although wastewater input and seasonal algal bloom resulted in seasonal changes in DOM partly, the more important factor influencing the seasonal dynamics of DOM is likely the submerging of water-level fluctuation zone caused by the anti-seasonal hydrological management of TGR. Thus, the substantial effects of hydrological management of TGR on DOM were revealed spatially and temporally. This investigation illustrated the influence of dam operation on the sources of DOM and set up a subtle insight into its further effect on

regional and even global carbon cycle considering the blooming of damming reservoirs all over the world (Maavara et al., 2017).

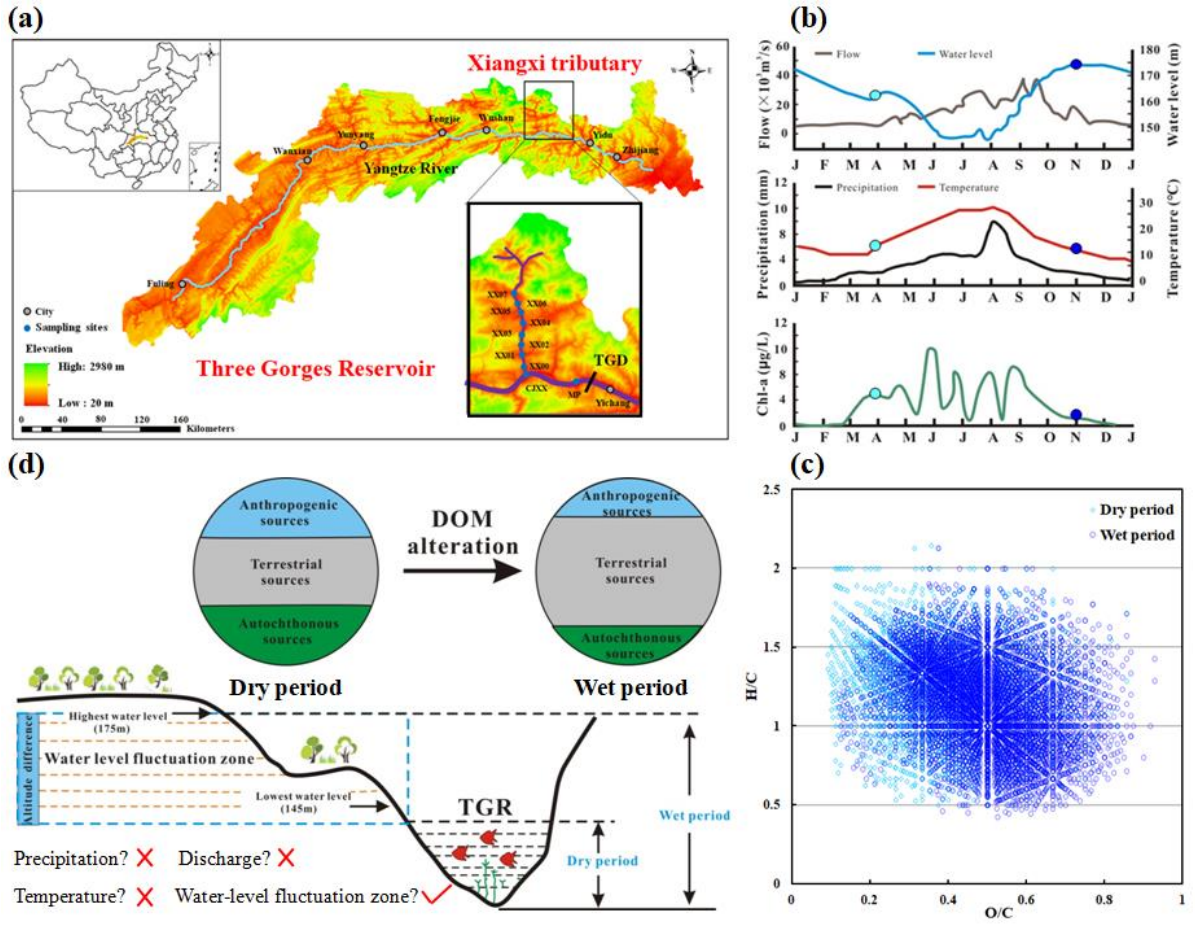

Figure 1 *(a) Study area and sampling sites in TGR; (b) Monthly variation of water level, flow speed, air temperature, and precipitation of TGR: dots represent two sampling events; (c) The van Krevelen diagram of molecular characteristics of DOM in dry and wet periods based on FT-ICR MS; (d) a sketch showing DOM composition alteration from the dry to wet period.*

References (Use of sections is optional)

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