Response of Dissolved Organic Matter Optical Properties to Net Inflow Runoff in a Large Fluvial Plain Lake and the Connecting Channels

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Results and Discussion

Fluvial plain lake watersheds are usually highly urbanized and have high concentrations of chromophoric dissolved organic matter (CDOM). CDOM derived from the connecting urban channels usually share strong terrestrial and anthropogenic signals and net inflow runoff (Qnet) to the lake serves as a proxy of residential household sewage input. We investigate how Qnet controls the optical characteristics of CDOM in fluvial plain Lake Taihu and the connecting channels. CDOM absorption coefficient *a*(350), dissolved organic carbon (DOC), the fluorescence intensity (Fmax) of seven PARAFAC components C1-C7, and δ15N-TDN were higher in the northwestern relative to the other lake regions, and a(250)/a(365), spectral slope S275–295, andδ13C-DOMrelative low in the northwestern lake, all indicating strong terrestrial and anthropogenic effects. Conversely, the urban land cover (%Cities), gross domestic product (GDP), and population density were relatively low in the western sub-watersheds and high in the eastern sub-watersheds. This apparent paradox reflects variations in Qnet from different sub-watersheds. Thus, significant positive relationships were found between Qnet and *a*(350), DOC, chemical oxygen demand (COD), chlorophyll-a (Chl-a), Fmax of C1-C3 and C6-C7, and %C2-%C3 in the five hydraulic sub-watersheds. We revealed significant positive relationships between mean *a(*350), DOC, COD, Chl-a, C1-C3 and C6, %C2-%C3, and the products of Qnet×%Cities, Qnet×GDP, and Qnet ×population density. We further found dominant contribution of lignin to the total number of assigned formulas for the samples collected from the channels in the Huxi watershed and the central lake using high resolution mass spectroscopy. We conclude that Qnet is of key importance for the optical properties of CDOM molecules in the various regions of Lake Taihu and the connecting channels.

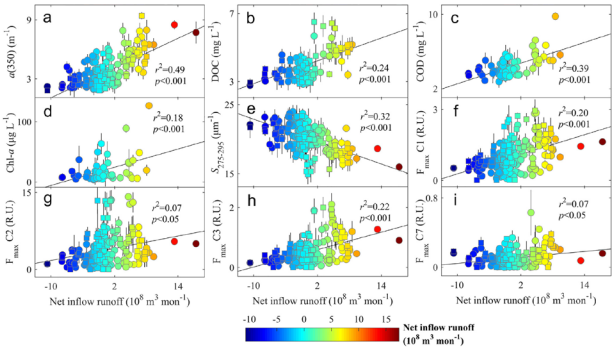

Fig 1. Relationships between monthly net inflow runoff (Qnet) and CDOM absorption coefficient a(350) (a), DOC (b), chemical oxygen demand (COD, c), chlorophyll-a (Chl-a, d), CDOM absorption spectral slope S275–295 (e), and Fmax of PARAFAC-derived C1–C3, and C7 (f–i) collected from five lake regions and the connecting channels delineated by dashed lines as shown in Fig. 1. Circles represent the samples collected from the lake and quadrates stand for the samples collected from the connecting channels. Error bars in all panels represent ±1 S.D. of samples collected from the five lake regions.

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References

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