

Accumulation of Terrestrial Dissolved Organic Matter Potentially Enhances Dissolved Methane Levels in Eutrophic Lake Taihu, China

Zhou, Y.Q., Xiao, Q.T., Yao, X.L., Zhang, M., Shi, K., Lee, X.H., (Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences); Podgorski, D.C. (U. of New Orleans), Qin, B.Q. (Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences); Spencer, R.G.M. (Florida State U.) and Jeppesen, E. (Aarhus U.)

Introduction

Inland waters play an important role for the storage of chromophoric dissolved organic matter (CDOM) and outgassing of methane (CH₄). However, to date, linkages between the optical dynamics of CDOM and dissolved CH₄ levels remain largely unknown.

Experimental

We used multi-year seasonal data series (2012–2014) collected from Lake Taihu and 51 connecting channels to investigate how CDOM optical dynamics may impact dissolved CH₄ levels in the lake.

Results and Discussion

High dissolved CH₄ in the northwestern inflowing river mouths coincided with high underwater UV-Vis light availability, dissolved organic carbon (DOC), chemical oxygen demand (COD), DOM aromaticity, terrestrial humic-rich fluorescence, in situ measured terrestrial CDOM, and depleted dissolved oxygen (DO), stable isotopic δ²H and δ¹⁸O compared with other lake regions. Our results further revealed positive relationships between dissolved CH₄ and CDOM absorption at 350 nm, i.e. a(350), COD, DOC, terrestrial humic-rich fluorophores, and DOM aromaticity, and negative relationships between dissolved CH₄ and DO, δ²H, and δ¹⁸O. The central lake samples showed a major contribution of terrestrial-sourced molecular formulas to the ultrahigh resolution mass spectrometry data, suggesting presence of allochthonous DOM sources even here. We conclude that an elevated terrestrial CDOM input likely enhances dissolved CH₄ levels in Lake Taihu (Figure 1).

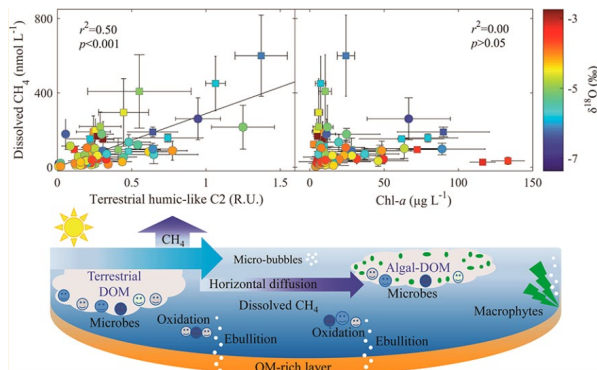


Figure 1 Relationships between dissolved CH₄ and terrestrial humic-like C2 and chlorophyll-a. Conceptual diagram illustrating the multiple controls of dissolved CH₄ in

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References

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