

# Diel Fluctuation of Carbon Dioxide Emission Affected by Eutrophication and Dissolved Organic Matter in China's Largest Urban Lake

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The large variability of carbon dioxide (CO<sub>2</sub>) emissions from urban lakes remains a challenge for partitioning these sources at meaningful spatial and temporal scales. Dissolved organic matter (DOM) governs spatial and temporal variations in CO<sub>2</sub>. Yet, relationships of CO<sub>2</sub> concentration (cCO<sub>2</sub>) and emission flux (FCO<sub>2</sub>) with DOM in urban lakes have rarely been reported. In this study, we monitored cCO<sub>2</sub>, FCO<sub>2</sub> and DOM composition over a 24-hour period at three sites in dry and wet seasons in China's largest urban lake, the Tangxun Lake. Our study found the ratio of day/night FCO<sub>2</sub> (mmol m<sup>-2</sup> d<sup>-1</sup>) decreased from the dry season (0.79; 7.68/9.68) to the wet season (0.25; 6.05/24.16), averaging 0.42 (6.77/15.97), implying that accounting for nighttime CO<sub>2</sub> emissions can elevate regional estimates by 70%. This study revealed that eutrophication affected diurnal CO<sub>2</sub> emissions with an increased algal growth enhancing daytime CO<sub>2</sub> uptake and subsequently increasing nighttime CO<sub>2</sub> emissions via DOM degradation (higher protein-like DOM fraction). We anticipate that the relative magnitude of FCO<sub>2</sub> between day and night from lakes is likely to increase due to urbanization and climate change, underscoring the importance of treating urban lakes as a distinct group, and integrating DOM dynamics into carbon cycling in future research.