

Temporal and spatial pattern of methane flux and its control mechanism in Lake Taihu

太湖甲烷通量的时空特征及其控制机制

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Impacted by climate change, eutrophication, and algal blooms, the temporal and spatial pattern of methane emission from the big shallow and its environmental and biological control mechanisms is a key scientific question in the researches of greenhouse gases cycling in lake. In this research, we will choose Lake Taihu, the big shallow eutrophic lake influenced by algal bloom in China. Based on the Taihu Mesoscale Eddy Flux Network, methane flux between lake surface and the atmosphere will be measured by floating flux chamber method, flux-gradient method, eddy covariance method, and bulk diffusion model. We will evaluate the applicability of the four measurement methods in shallow lake. The diurnal, seasonal, and interannual dynamic and spatial pattern of methane flux in Lake Taihu will be clarified based on the measurements. According to the spatial pattern of methane flux, we will calculate the amount of methane emission from the whole lake. Moreover, an empirical model will be derived by combining the methane flux measurement with routine meteorological measurements, water quality measurements, and biomass measurements. The model will be applied to explore the environmental and biological control mechanisms of the temporal and spatial variation of the methane flux in Lake Taihu. The research will provide important scientific data and basis for accurately evaluating the contribution of Lake Taihu to regional greenhouse emission and climate change. And, the research will contribute to making the policy for the greenhouse gases emission reduction in Lake Taihu basin.

在气候变化、富营养化尤其是蓝藻水华爆发条件下，大型浅水湖泊甲烷排放量的时空变化特征及其环境生物控制机制研究成为湖泊温室气体循环研究的热点问题。本项目以我国富营养化及受蓝藻爆发影响的大型浅水湖泊太湖为研究对象，依托太湖中尺度通量观测网络，利用箱式法、通量梯度方法、涡度相关观测方法以及水气界面扩散模型对甲烷通量开展观测。从而对不同甲烷通量观测方法在浅水湖泊的适用性进行评价；基于观测明确太湖甲烷通量日、季节以及年际变化特征及空间格局，并根据太湖甲烷的空间格局估算太湖全湖甲烷的排放量；结合小气候观测、水质观测、生物量观测构建经验模型以揭示太湖甲烷通量时空变化的环境生物控制机制。该研究结果可为准确评价太湖对区域温室气体排放及其对气候变化的贡献以及该区域温室气体减排政策的制定提供重要的基础数据与科学依据。