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Contribution and preservation of allochthonous and autochthonous organic carbon in large and shallow Lake Wuliangsu, China

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Understanding contribution and preservation of allochthonous and autochthonous organic carbon (OC) in shallow lake system is crucial for knowledge of OC burial and recycling behaviors, as well as sustainable management practices. As the largest lake ecosystem in the reaches of the Yellow River, Lake Wuliangsu is a very typically shallow lake located in semi-arid region. In this study, we developed end-member mixing models of *n*-alkanes' distribution patterns and 13C value to quantitative calculate the original contributions of submerged macrophytes, emergent plants, and riverine input to lake sediments. The model results show a predominant contribution of the autochthonous OC to sediments in Lake Wuliangsu, with open-water areas dominated by submerged macrophyte-sourced OC and the other areas by emergent plant-sourced OC. We further evaluated the preservation behavior of these different types of OC by comparing the relative contributions of them before and after depositional process, based on end-member mixing models from *n*-alkanes and bulk OC, respectively. The results suggest that, compared with the emergent plant-sourced OC and the allochthonous OC, the submerged macrophyte-sourced OC was strongly decomposed during depositional process. In this sense, caution should be taken into consideration when applying the *n*-alkane-based proxies into tracking the source-sink behavior of different sourced OC in the geological perspectives. The preservation of the submerged macrophyte-sourced OC is much lower (<30%) in lake central areas than in the lake shore areas (>60%). Strong decomposition of submerged macrophytes in lake central areas intensively consumed dissolved oxygen of the water body, creating ideal conditions for heterotrophic anaerobic bacteria and methanogenic *Euryarchaeota* to prosper. Therefore, source of OC could conduct important but complex effects on OC cycling mode in shallow lakes, demonstrating the importance of evaluating the individual OC burial efficiency for OC of different sources.