

# Temporal and spatial distributions of dissolved organic carbon and nitrogen in two small lakes on the Southwestern China Plateau

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**Abstract** Temporal and spatial distributions of dissolved organic carbon (DOC), dissolved organic nitrogen (DON), chlorophyll-*a* and inorganic nitrogen were investigated in two small mountainous lakes (Lake Hongfeng and Baihua), on the Southwestern China Plateau, based on almost 2 years' field observation. DOC concentrations ranged from 163  $\mu\text{M}$  to 248  $\mu\text{M}$  in Lake Hongfeng and from 143  $\mu\text{M}$  to 308  $\mu\text{M}$  in Lake Baihua, respectively, during the study period. DON concentrations ranged from 7  $\mu\text{M}$  to 26  $\mu\text{M}$  in Lake Hongfeng and from 14  $\mu\text{M}$  to 47  $\mu\text{M}$  in Lake Baihua. DOC showed vertical heterogeneity with higher concentrations in the epilimnion than in the hypolimnion during the stratification period. The DON concentration profiles appeared to be more variable than the DOC profiles. Apparent DON maxima occurred in the upper layer of water. In Lake Hongfeng, DOC concentration in the surface water was highest at the end of spring and early summer. DON concentration was 2–5  $\mu\text{M}$  higher in May 2003 and in June 2004 than in adjacent months. DOC and chlorophyll-*a* concentrations were significantly correlated ( $r = 0.79$ ,  $P < 0.05$ ). The period of highest concentrations of DOC in Lake Hongfeng was also the season of concentrated rainfall. Algae activity and allochthonous input might result in an increase of DOC and DON concentrations together. In Lake Baihua, the

maximum concentrations of DOC and DON in the surface water occurred simultaneously in May 2003 and February 2004. DOC concentrations were significantly correlated with DON ( $r = 0.90$ ,  $P < 0.01$ ), indicating the common sources. Allochthonous input, biological processes, stratification and mixing were the most important factors controlling the distributions and cycling of dissolved organic matter (DOM) and inorganic nitrogen in these two lakes. Inference from the corresponding vertical distributions of DOM and inorganic nitrogen indicated that DOM played potential roles in the internal loading of nitrogen and metabolism in the water body in these small lakes. The carbon/nitrogen (C/N) ratio showed a potential significance for tracing the source and biogeochemical processes of DOM in the lakes. These results are of significance in the further understanding of biogeochemical cycling and environmental effects of DOM and nitrogen in lake ecosystems.

**Keywords** Dissolved organic nitrogen · Dissolved organic matter · Lake · Southwestern China Plateau · Nitrogen

## Introduction

Naturally occurring dissolved organic matter (DOM) is one of the important constituents in natural water ecosystems. Previous studies have demonstrated that DOM shows strong reaction activity and significant eco-environmental effects in natural environments (e.g., Tanoue and Midorikawa 1995; Barber et al. 2001; Wu and Tanoue 2001; Doig and Liber 2006). DOM may control the transport, toxicity and fate of trace metals and organic contaminants in aquatic environments (e.g., Tanoue and Midorikawa

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