# The dissolved $N_2O$ in two small karst lakes in southwest China

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The dissolved $N_2O$ was investigated in Lake Hongfeng and Baihua, two small reservoirs constructed in carbonate area in southwest China in 1960 and 1968 respectively, in the fall of 2002. In the center and near the dam of Lake Hongfeng, the depositing organic matter produced by photosynthesis in the epilimnia was decomposed in the thermocline. Therefore pH, DO and $SO_4^{2-}$ decreased and occurred negative peaks, and $CH_4$,$CO_2$ emerged the positive peaks there. $N_2O$ had the maximum in the oxic epilimnia, gradually decreased in the thermocline, and kept stable in the hypolimnia in the center of lake. Comparatively, $N_2O$ had two peaks at the depths of 14 and 25 meters near the dam. It could be found that DO of two peaks was equal to 2.6mg/L and $SO_4^{2-}$ to 55mg/L. Obviously $N_2O$ production in surface water was relative to the growth of algae. $N_2O$ in the deep water is from the nitrification. The denitrification region could be formatted in the thermocline due to the decomposition of organic matter, and resulted in two peaks at the transitional zone of nitrification and denitrification.

In the center of lake and near dam of Lake Baihua, there were maxima of $N_2O$ at the depth of 16 meters. $\Delta N_2O$ was linear relative to the AOU over the peak, suggesting $N_2O$ was produced by the nitrification. $N_2O$ rapidly decreased and became to be under-saturated under the peak, which indicated $N_2O$ was consumed by denitrification. Therefore the peak of $N_2O$ was regarded as a boundary of nitrification and denitrification. Over the boundary $NO_3^-$,$SO_4^{2-}$ was very high, and rapidly decreased and $NO_2^-$,$CH_4$ increased under the boundary. However the large changes of DO and $CO_2$ occurred at the depth of 8 meters. The boundary of nitrification and denitrification did not recorspond to the oxic-anoxic interface. Maybe $N_2O$ was partially produced during the oxidization of $NH_4^+$ by the methanotroph microorganism. The concentration of $N_2O$ was gradually increasing from the surface to the deep water in the mouth of the inflow river of Lake Hongfeng and Baihua. In summary, the dynamic condition of water and the character of particle organic matter had great effects to the distribution of $N_2O$.

Lake Hongfeng is just 5 kilometers far on the upstream of Lake Baihua. Both belong to mesotro-eutrophic lake. However, the flux of $N_2O$ in Lake Hongfeng, $26.3\pm16.7\mu mol\ m^{-2}.day^{-1}$, was much larger than that in Lake Baihua, $1.5\pm1.4\mu mol\ m^{-2}.day^{-1}$. One of reasons was that the source of $N_2O$ in surface water in Lake Hongfeng was relative to the growth of algae, but the $N_2O$ in Lake Baihua was mainly produced by nitrification and the concentration of $N_2O$ was very low.

# Gas-chemical compositions of mantle-derived rocks and their redox characteristics

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Generally, the relationship between multivalent elements ($Fe^{2+}/Fe^{3+}$) and the oxygen fugacity of mineral assemblages of mantle-derived rocks can be used to identify the redox characteristics of the mantle, the conclusion drawn from which is that “the oxidation of the mantle is so strong that the mantle fluid is predominated by $CO_2$ and $H_2O$ in composition”. A study on the gas geochemistry of Cenozoic mantle-derived inclusions from East China has shown that there exist two different redox mantle source areas, one is a strongly reducing area with reduced gases (such as $H_2$, $CH_4$, CO and $H_2S$) amounting to 60~90% and the other is a strongly oxidizing area with some oxidized gases ($CO_2$, $SO_2$) to 60~80% because of the reaction between the crust and mantle. The stepwise-heating mass spectrometer analysis on some single minerals (olivine, enstenite and clinopyroxene) of mantle-derived rocks indicates that at low-temperature stage (30~600˚C) the gas is mainly composed of oxidized gases while at high-temperature stage (700~1100˚C) the released gas is predominated by reduced gases. When the temperature increases to 900~1140˚C, the concentration of $H_2$ is as high as 80~90%. The above study may be helpful to explore the chemical compositions and the evolution of the original undifferentiated mantle fluid.

## References

1. Blundy, J.D., Brodholf, J.P. and Wood, B.T., 1991. ***Nature,* 349,** 321-324.

2. Eggler,D.H.,1983. ***Geophys. Res. Lett.*, 10**, 365-368.