Temporal variations in CH4 and CO2 mixing ratios and fluxes at Lake Taihu

Reported by Li Hanchao
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Introduction

1. The CH$_4$ and CO$_2$ fluxes of the lake–atmosphere exchanging process act an important role in atmospheric dynamical process.

2. The CH$_4$ and CO$_2$ fluxes and mixing ratios can reflect the anthropogenic influence and the biological function of the atmosphere.

3. We may find new scientific problems by flux observation on lake since there are very few people did this work before.
Material and Methods

Fig.1 Gradient observation device

Fig.2 CH$_4$ CO$_2$ and H$_2$O gas analyser
Sampling system

Fig. 3
Flux calculation

\[ \text{Flux} = -\rho_\text{a} \cdot K \cdot \frac{r_2 - r_1}{z_2 - z_1} \]

- \( \rho_{\text{a}} \): air density.
- \( r_1 \): dry air mixing ratio at \( z_1 \).
- \( r_2 \): dry air mixing ratio at \( z_2 \).
- \( K = ku \cdot z_g / \varphi_h \)
- \( z_g = \sqrt{z_1 z_2} \)

- \( u_* \): friction velocity.
- \( k \): Von Karman constant.
- \( \varphi_h \): stability function for sensible heat.
Result and Analysis

Fig. 4 CH4 mixing ratio
Fig.5 CH4 mixing ratio of 4 days
Fig. 6 CO2 mixing ratio
Fig. 7  CO2 mixing ratio of 4 days
Fig. 8 CO2 flux
Fig. 9 CO2 flux of 4 days
Fig. 10 CH4 flux
Fig. 11 CH4 flux of 4 days
Results

1. The diurnal variation of CO$_2$ concentration shows good consistency with bio-physiological processes. The fluctuations of CO2 vary greatly when in summer.

2. CH$_4$ concentration reaches the peak in the forenoon and achieves low values in the afternoon. The fluctuations of CH4 vary greatly when in summer.

3. The trends of CH4 and CO2 variation are similar. The fluctuations vary greatly with the elapsing of the time.
Discussion

1. From the current CO$_2$ and CH$_4$ fluxes observation, we have not find some obvious laws.
2. The diurnal variation of CO$_2$ mixing ratio may be related to bio-physiological processes.
Following work

1. All testing equipment must be suitable for the precision of observation.
2. Sum up the maintenance experience and improve the maintenance method.
3. Gather some useful information about greenhouse gases influenced by human activity.
4. Try to find out some important factors which influence greenhouse gas fluxes.
Thank you!