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Spatial variations of CH_4 in surface air over Lake Taihu

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Outline

- Introduction
- Objective
- Measurements
- Results
- Work plan

1. Introduction

- About 4% global land surface was Lakes and reservoir (*Downing et al., 2006; Lee et al., 2014*).
- Many researches found lakes are an important source of green house gases in the atmosphere, including CO_2, CH_4, and N_2O (*Cole et al. 1994; Huttunen et al. 2003; Bastviken et al. 2011*).
- The contribution of CH_4 emission of lake to global CH_4 emission is more than 16% (*Palma-Silva et al., 2013*).

1. Introduction

- Some research found, the relationship between CH_4 emission and NPP and temperature is positive, but the relationship between CO_2 flux and NPP and temperature was negative.
- And the relationship between CH_4 and CO_2 and dissolved organic carbon is not significant (*Xing et al., 2005*).
- How to accurately quantify the CH_4 emission from Lake to the atmosphere?
- What are the mechanisms that control the Lake CH_4 emission?

2. Objective

- Lake Taihu is located Yangzi river Delta, and its an shallow lake.
- In this study, the spatial pattern of CH_4 in surface air over Lake Taihu was primarily explored.

3. Measurements

3.1 Sites descriptions

- Lake Taihu is located between 30°5’40’’– 31°32’58’’ N and 119°52’32’’– 120°36’10’’ E,112, and its total area is about 2400 km^2. The mean depth of the lake is about 1.9m.
- The lake includes seven different zone, according to different types of vegetation (*Liu et al. 2007*), spatial pattern of pollution (*Zhao et al., 2011*), and wind wave situation (*Qin et al., 2007*) (*Lee et al., 2014*).

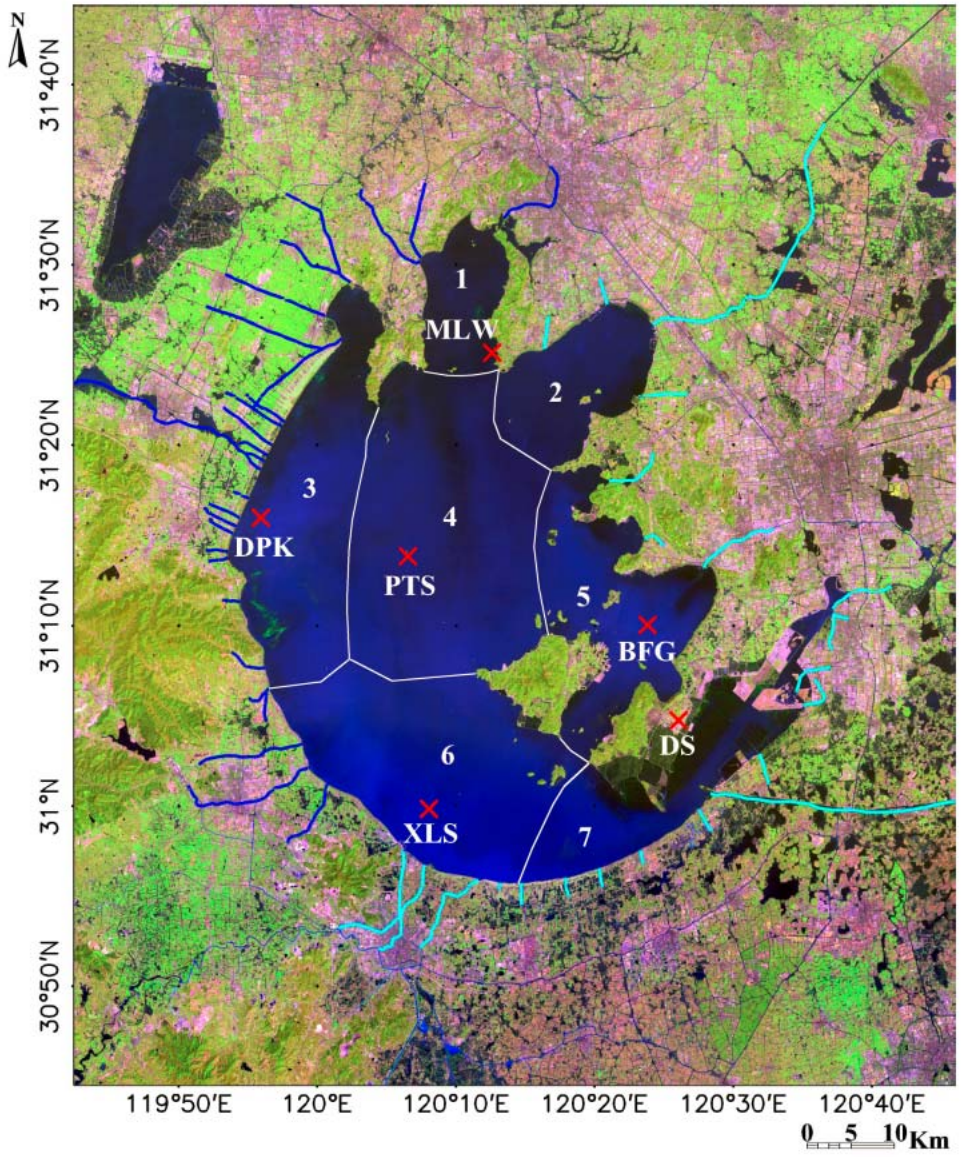

Figure 1 The seven biophysically zone of Lake Taihu (Lee et al., 2014)

1 Semi-enclosed bay;

2 Floating plants and emergent macrophytes zone;

3 Hyper-eutropica zone;

4 The center of lake;

5 Submerged macrophytes;

6 Transition zone between phytoplankton and macrophyte;

7 Submerged macrophytes and pen fish farming zone.

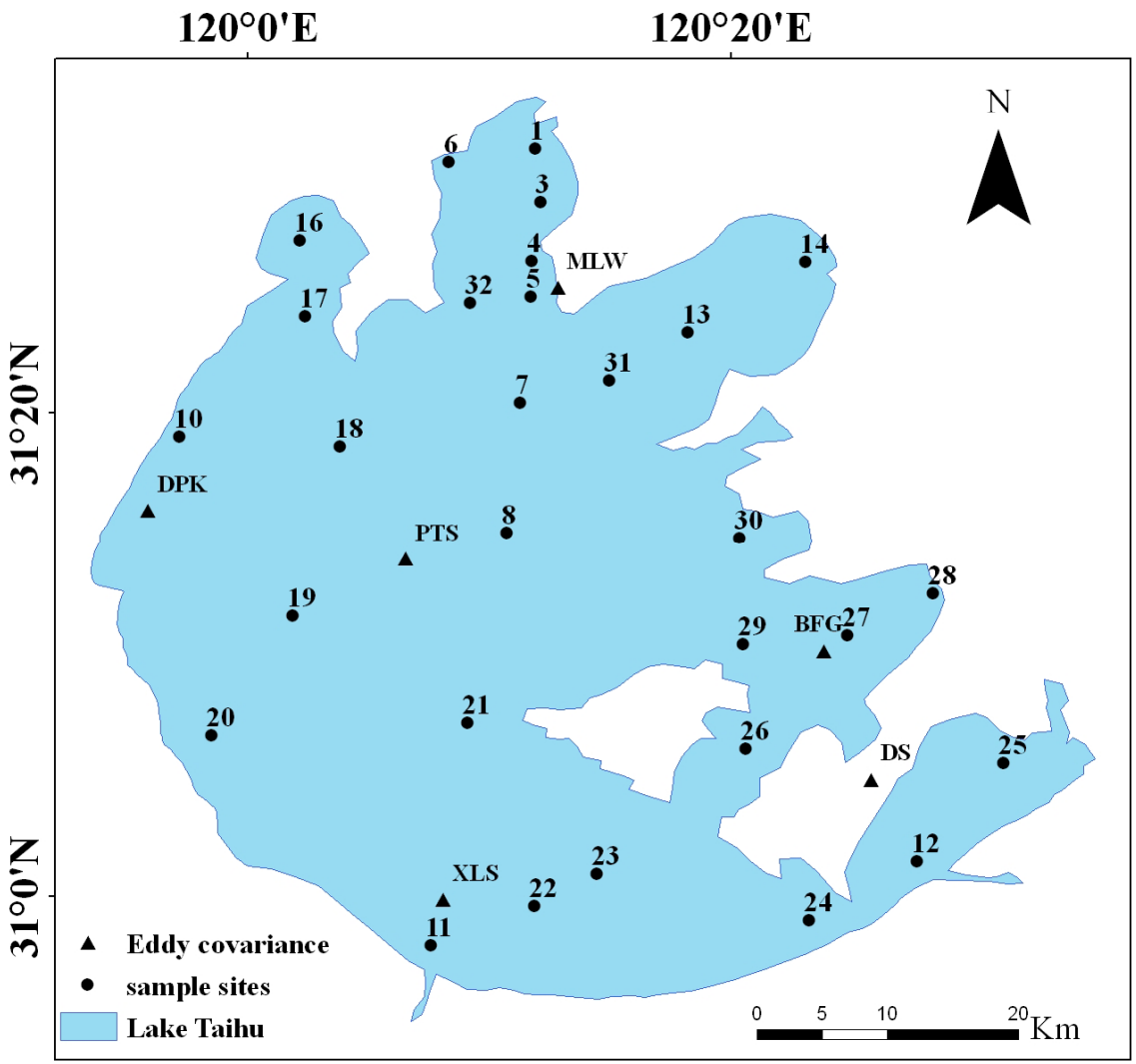

Figure 2 The distribution of sample sites in Lake Taihu.

3.2 Measurements

- Los Gatos Research Ultra-portable Gas analyzer was used to measured CH_4, CO_2, and water vapor in surface air over Lake Taihu during 12-13 June 2014.
- The instrument signal was recorded at 1Hz.
- Garmin 621SC GPS was recorded latitude and longitude every 100m.
- Garmin 60CSX GPS was recorded latitude and longitude at 1Hz.

3.2 Measurements

12 June:
07:20 – 16:10

13 June:

06:40 – 15:50

Eddy covariance

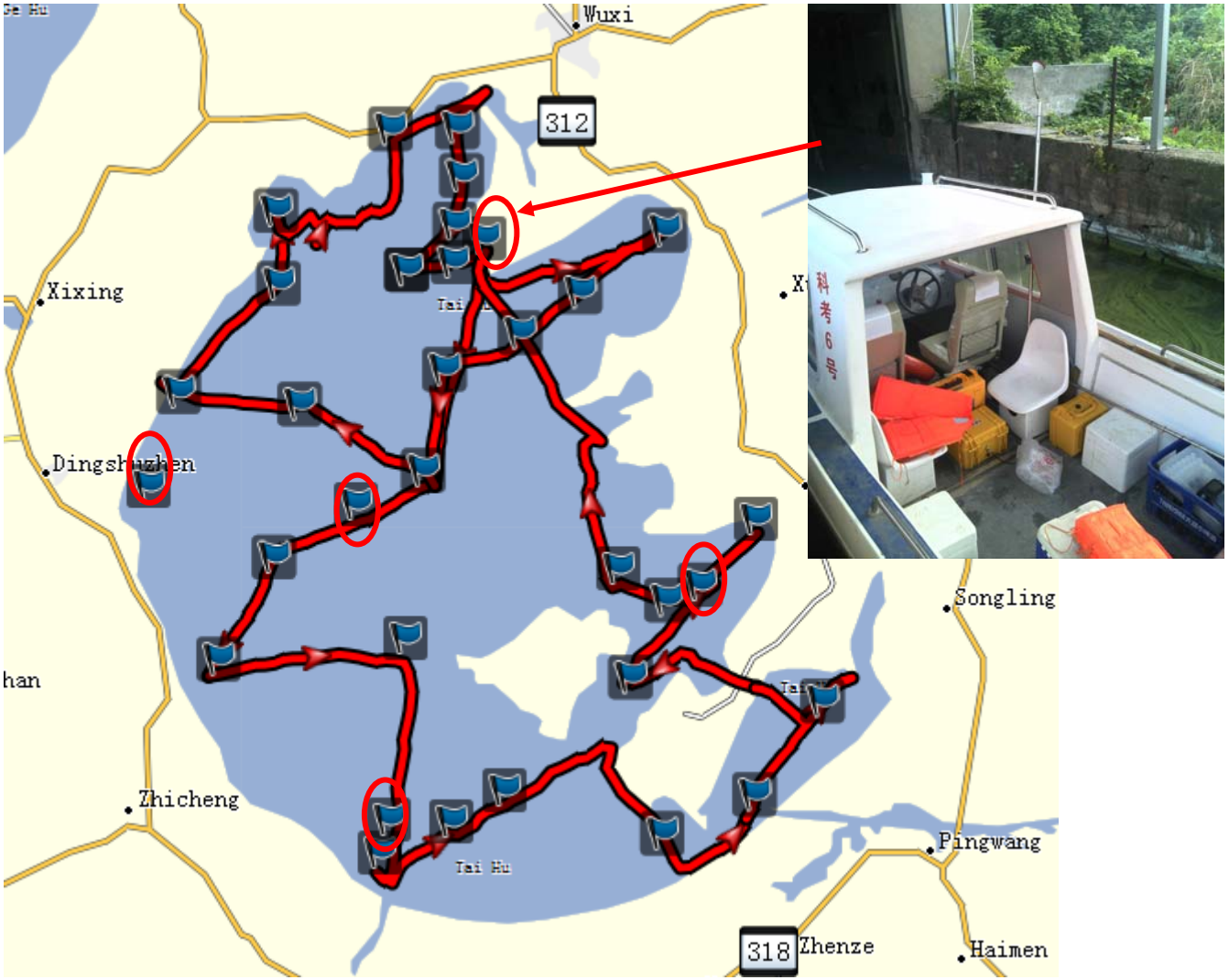

Figure 3 The drive route

3.2 Measurements

- The boat was driven at about 50kmph.
- The location information was selected every 1km, and then the CH4 and CO2 was chose at this location.

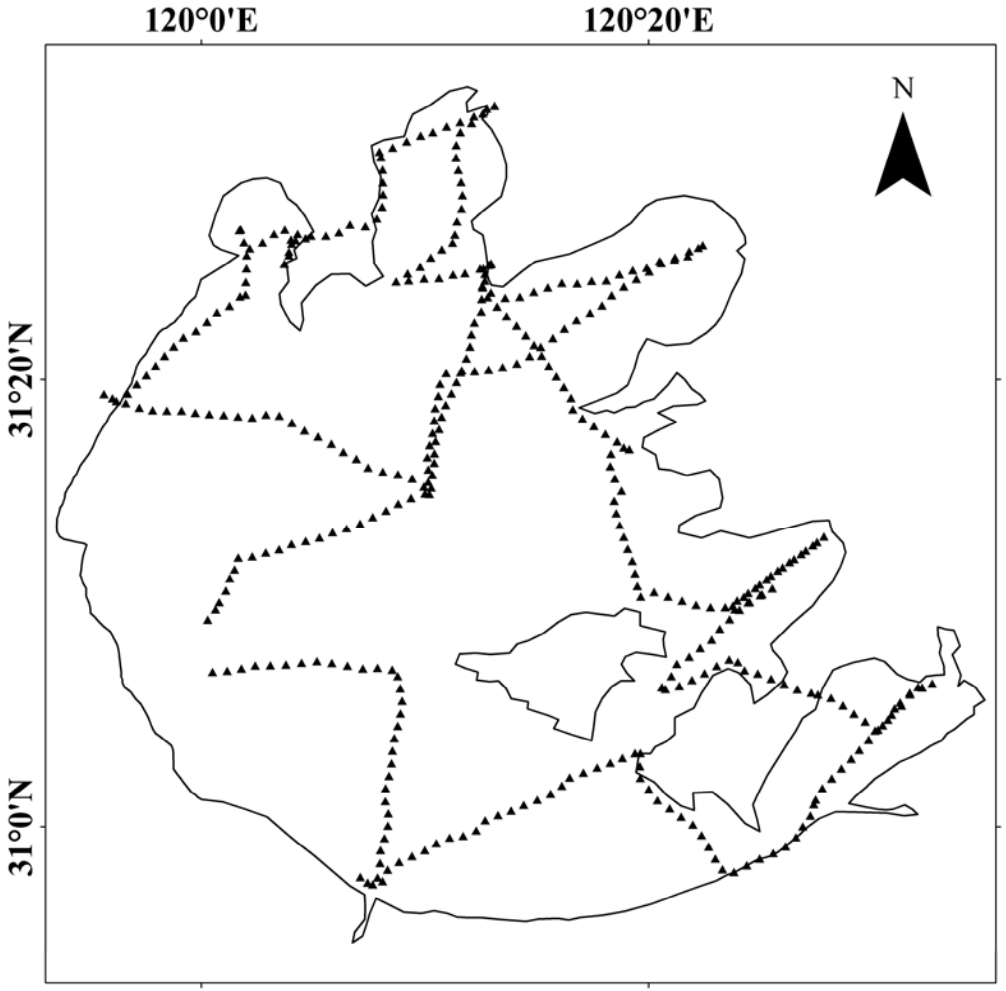

Figure 4 The sampling point along drive route

3.3 Data processes

- The time delay, about 8 seconds, of LGR analyzer was corrected, because of 2m intake tube.
- The time difference, about 30 seconds, between LGR and GPS was corrected.

4. Results

4.1 Daily dynamic of meteorological factors

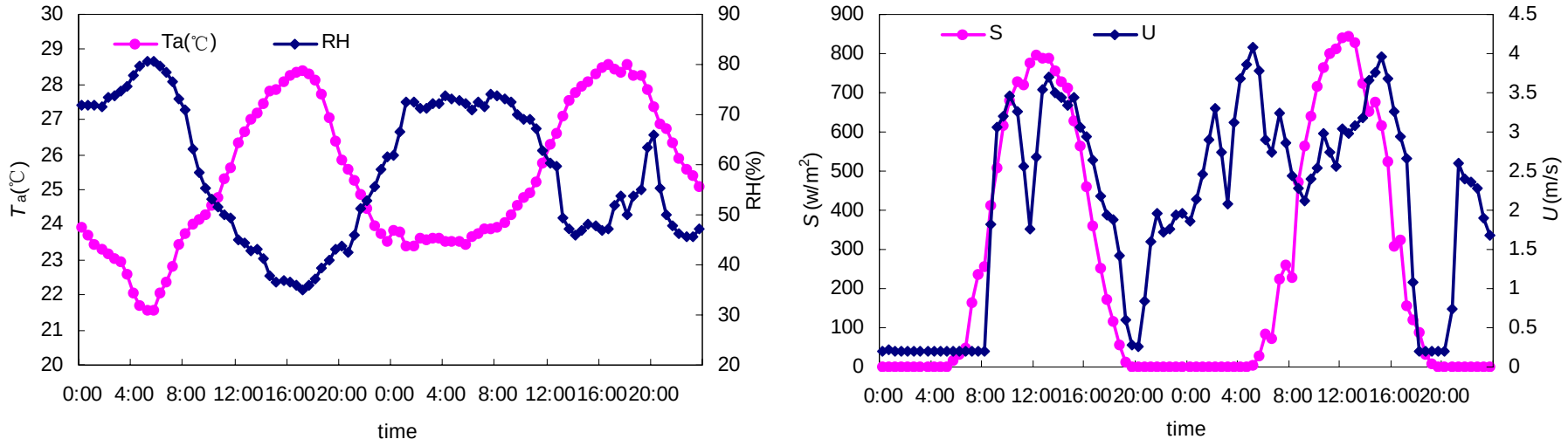

Figure 5 Daily variation of air temperature (T_a), relative humidity (RH), global solar radiation (S), wind speed (U) from 12 Jun 2014 to 13 Jun 2014

4.2 Daily dynamic of CH_4 and CO_2 in surface air over lake

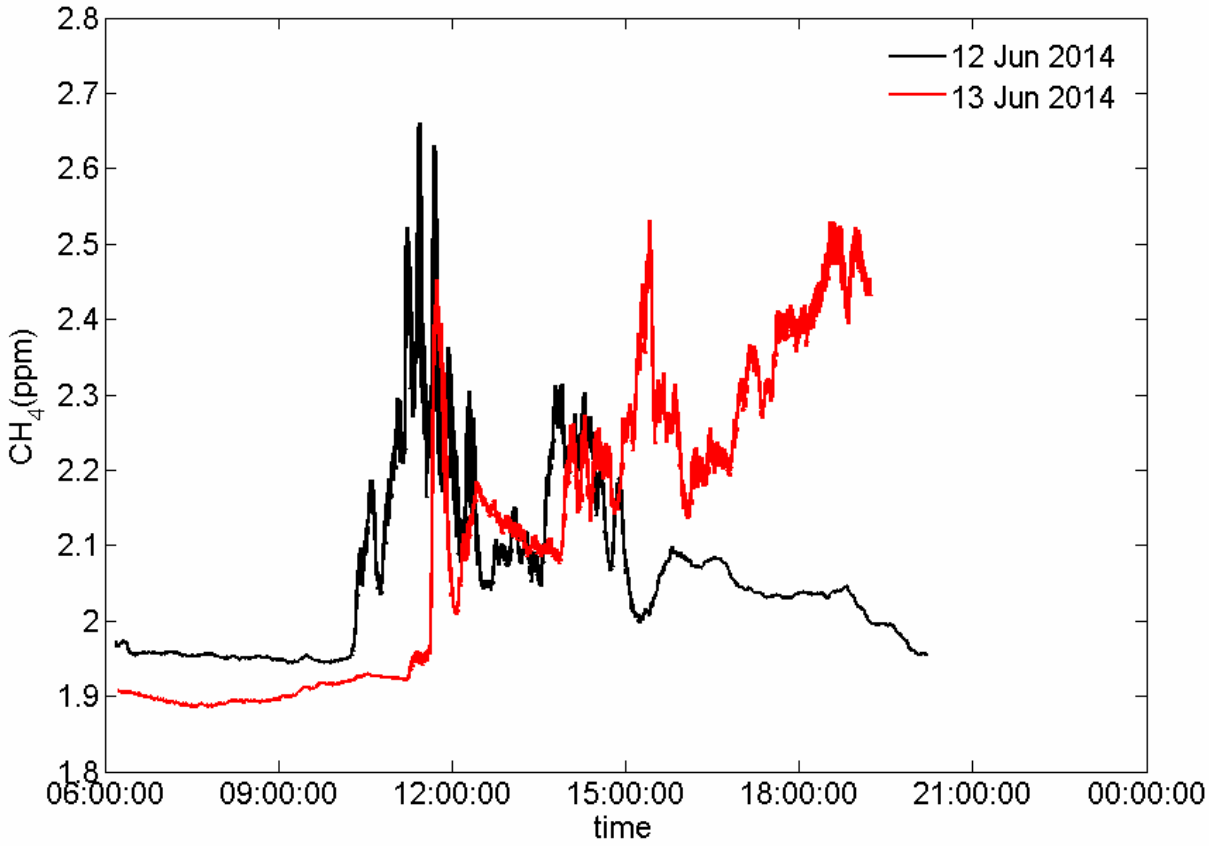

Figure 6 Daily dynamic of CH_4 in surface air over lake on 12 Jun 2014 and 13 Jun 2014

4.2 Daily dynamic of CH_4 and CO_2 in surface air over lake

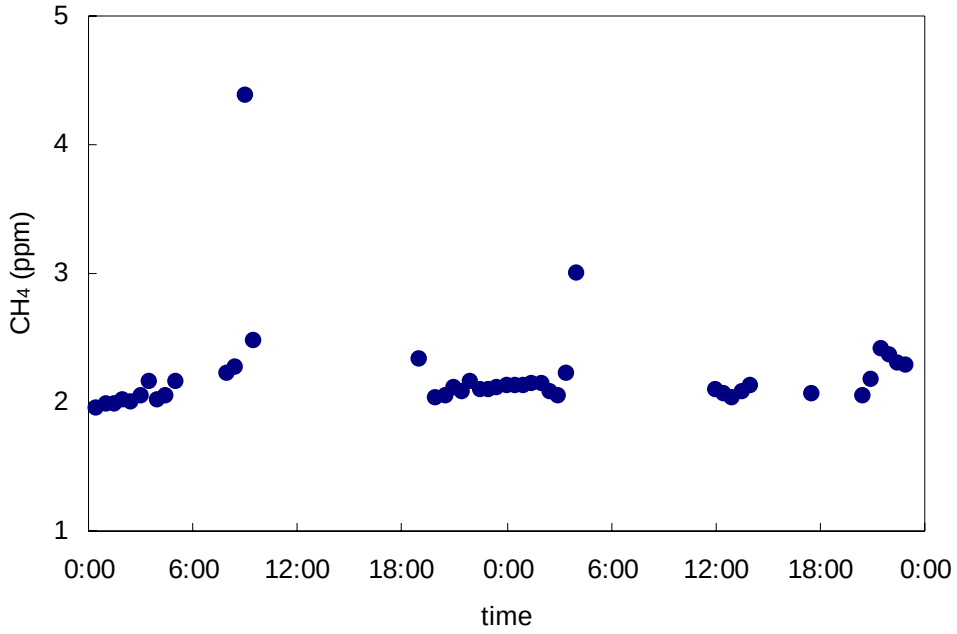

Figure 7 Daily dynamic of CH_4 in surface air measured by Li7700 at Bifenggang site on 12 Jun 2014 and 13 Jun 2014

4.2 Daily dynamic of CH_4 and CO_2 in surface air over lake

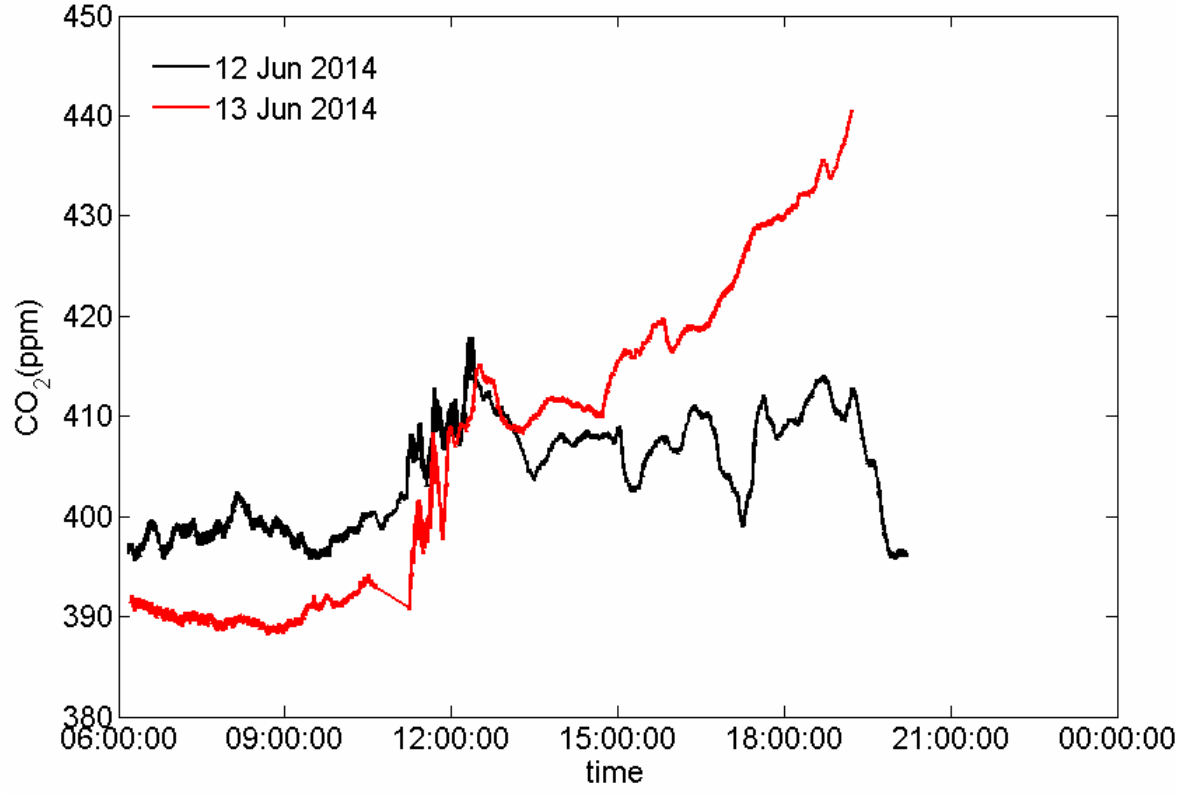

Figure 8 Daily dynamic of CO_2 in surface air over lake on 12 Jun 2014 and 13 Jun 2014

4.3 Spatial variations of CH_4 in surface air over Lake Taihu

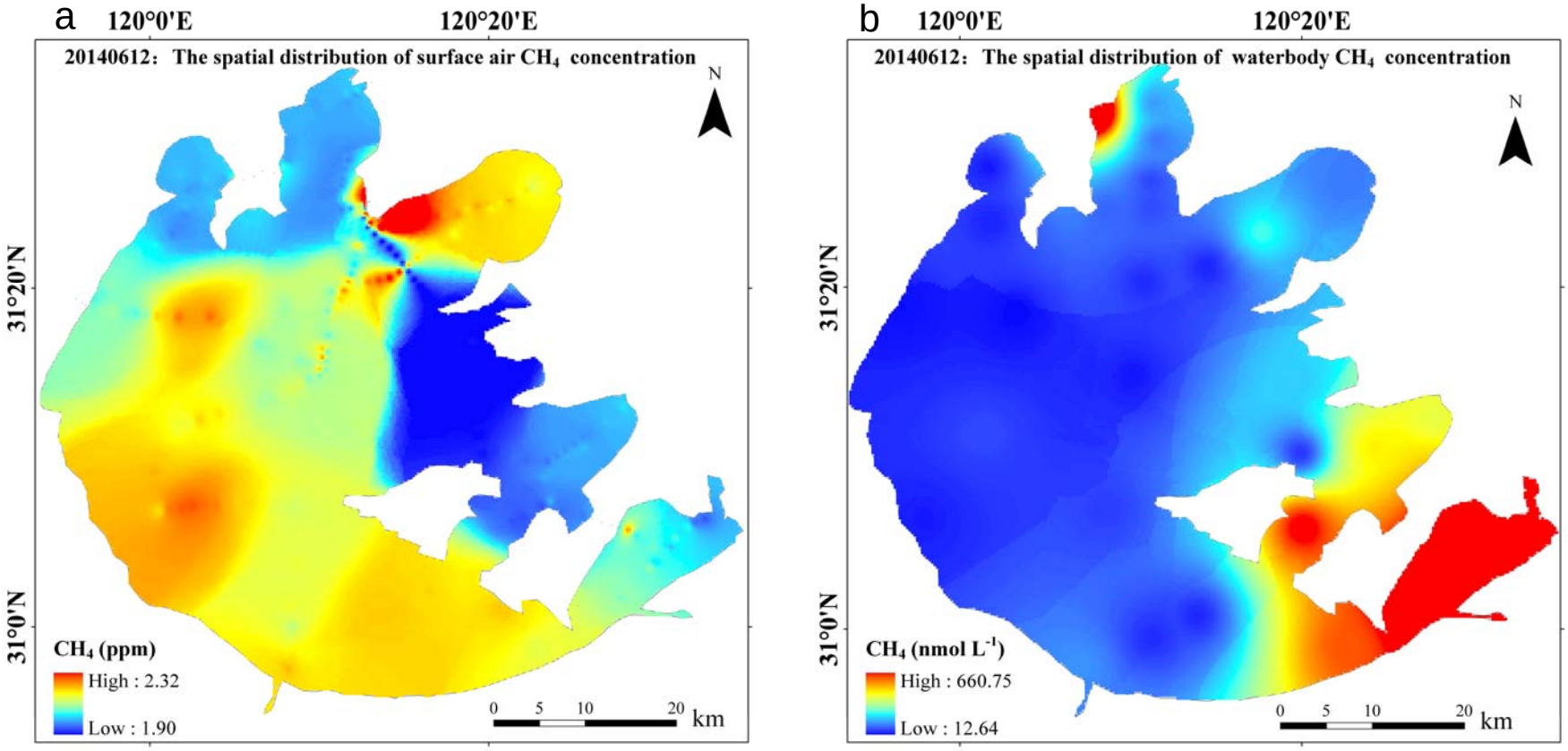

Figure 9 Spatial variations of CH_4 in surface air (a) and in waterboday (b) of Lake Taihu.

4.3 Spatial variations of CH_4 in surface air over Lake Taihu

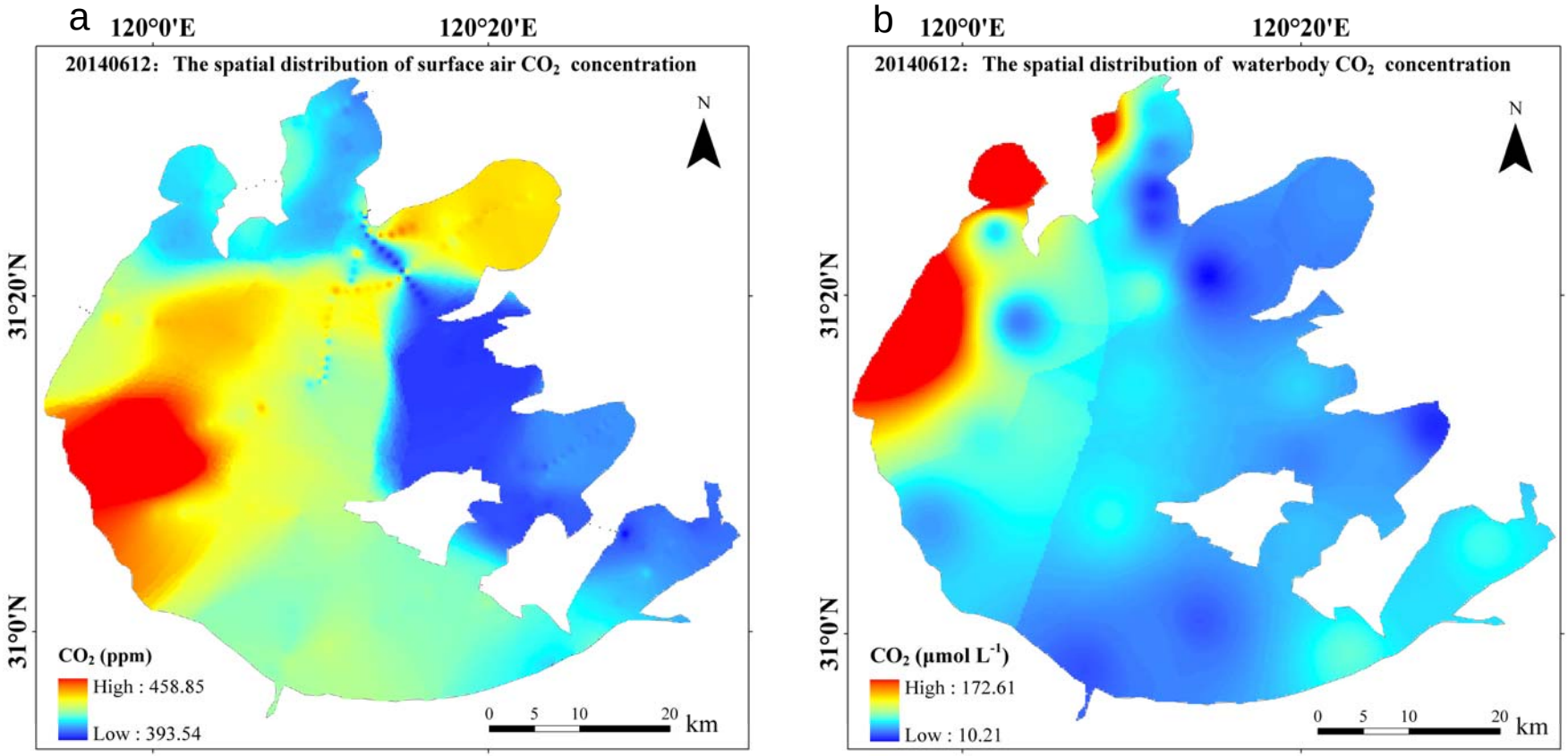

Figure 10 Spatial variations of CO_2 in surface air (a) and in waterboday (b) of Lake Taihu.

5 Work plan

- How to eliminate the temporal variation when we analyze the spatial pattern?
- What are the reasons that lead to the difference between the spatial pattern of CH_4 in surface air and the spatial pattern of CH_4 in waterbody.
- What are the mechanisms that control the CH_4 spatial pattern?


Thank you!
Welcom any comments and suggestions!