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Temporal and Spatial distributions of HDO and $H_2{}^{18}O$ of water in Lake Taihu

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Outline

- Introduction
- Materials and Methods
- Results
  - Temporal distribution
  - Spatial distribution
- Conclusions
- Discussion
- Next work

Introduction

- The stable isotopes of lake water play an important role in tracking water vapor sources, predicting lake-water residence time, and recording the change of geology.

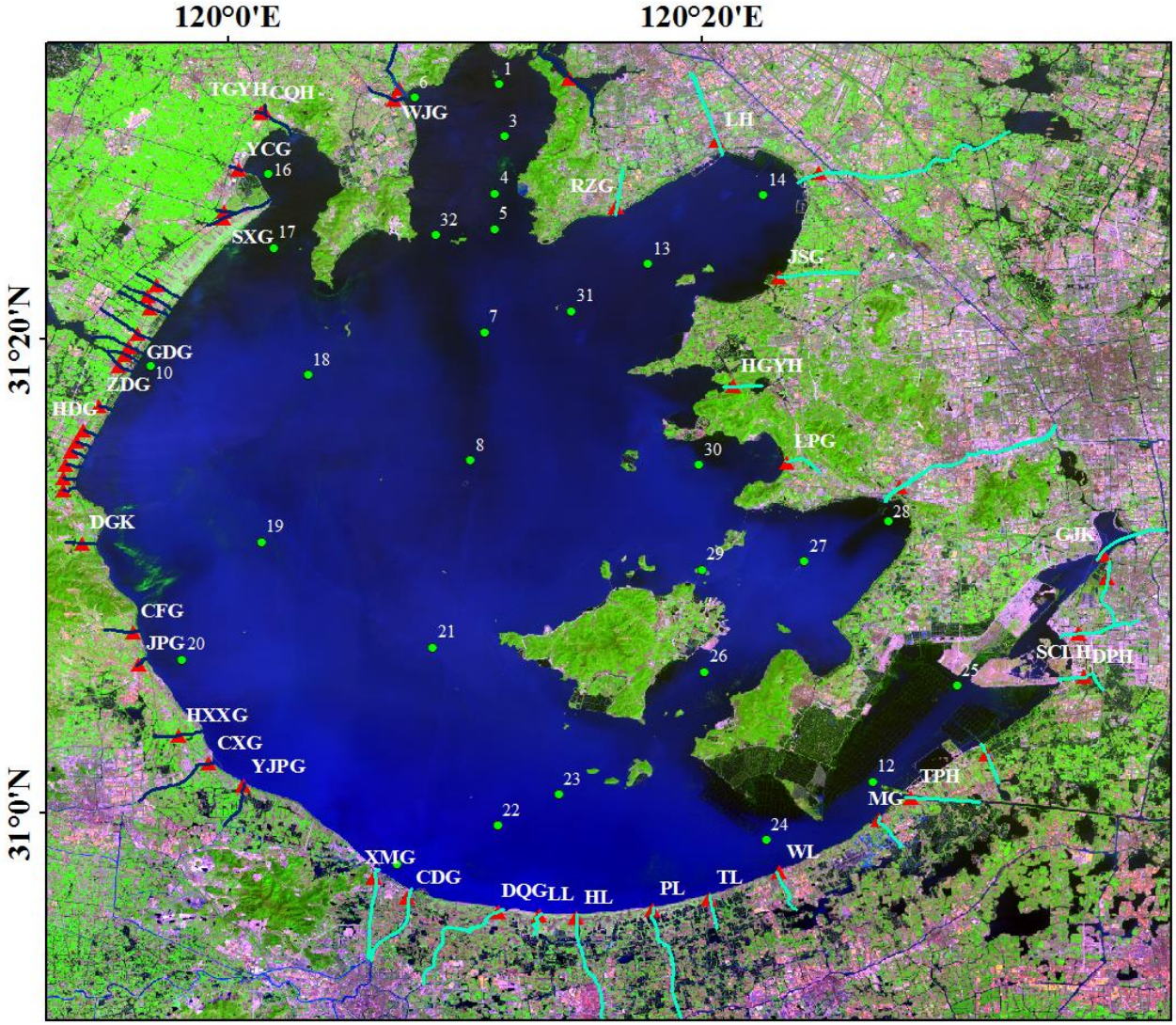
  (Gibbson et al. 1993; Get et al. 1970).
- As a part of researching section environment, spatial and temporal distributions of stable isotopes in Lake Taihu can retroactively affect the water cycle, provide theoretical support for palaeoclimatic reconstruction (Christine et al. 2003).
- The temporal and spatial distribution of hydrogen and oxygen stable isotope will be shown in this article.

Materials and Methods

- Study area:

The Lake Taihu is located in the southern of Yangtze river delta, with an average depth of 1.9 meters, the area of 2400km^2, the water capacity of 2.72 billion cubic meters .

The depth of Lake Taihu in the northwestern lake (depth 2.5 m) is deeper than that in the eastern lake (depth <1.5 m), (Qin et al. 2007).



The river sampling points. The lake sampling points.

Fig. 1 . Sampling points distribution in or around Lake Taihu.

Time:

The lake-water have collected from 2011/05/26 to now in every season, and the river-water samples have began with 2013/05/13.

Sampling sites:

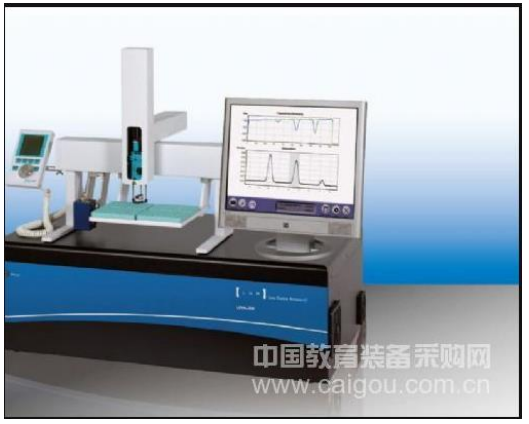
29/51 sampling sites distribution in/around the Lake Taihu.

Methods

Sampling

Filtering

Analyzing (DLT-100, Los Gatos Research, USA)



Results

- Temporal distribution

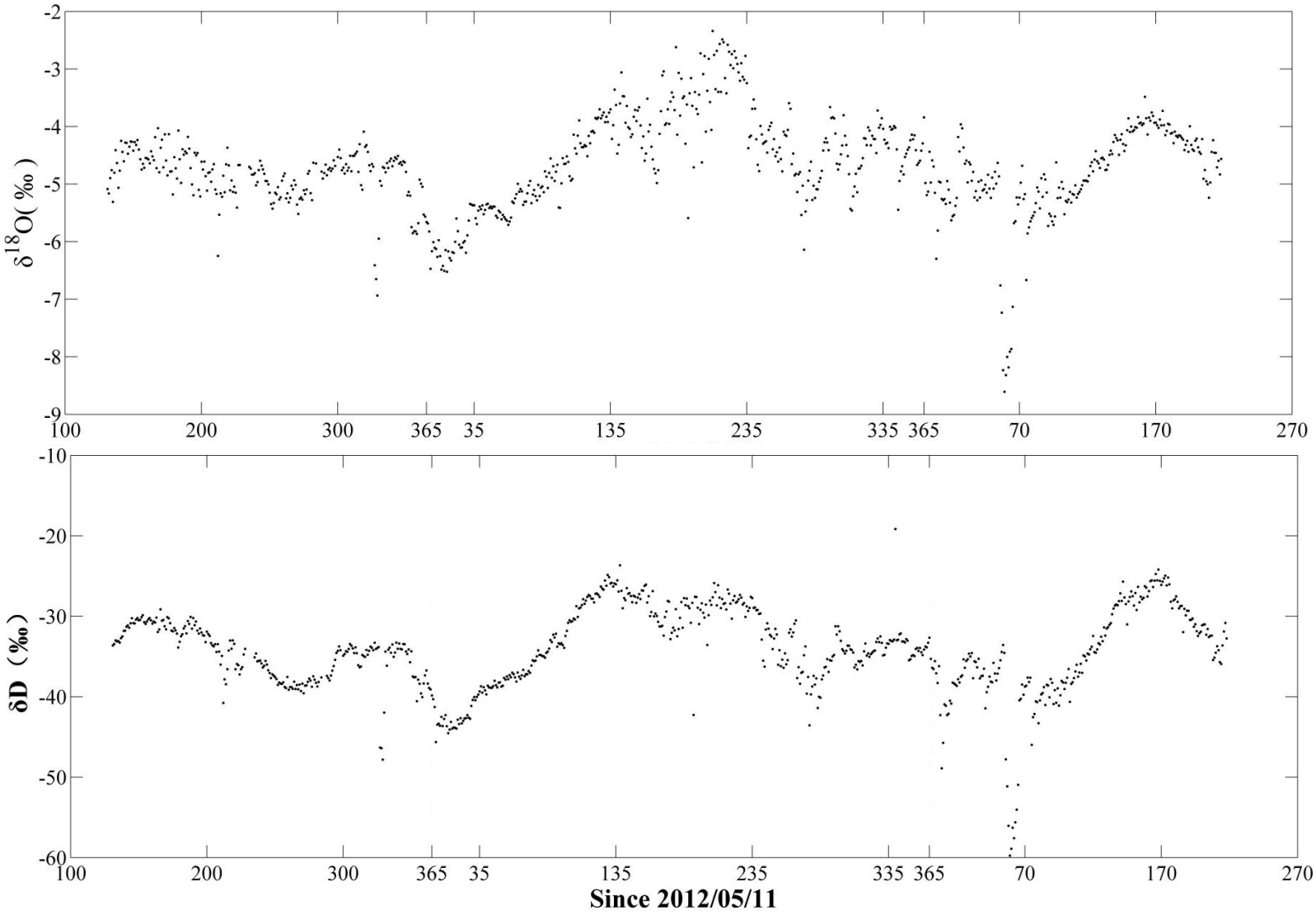


Fig .2 . $\delta^{18}O$ and δD time sequence diagram in MLW. From the picture $\delta^{18}O$ and δD are lower in the winter and bigger value in the May or June.

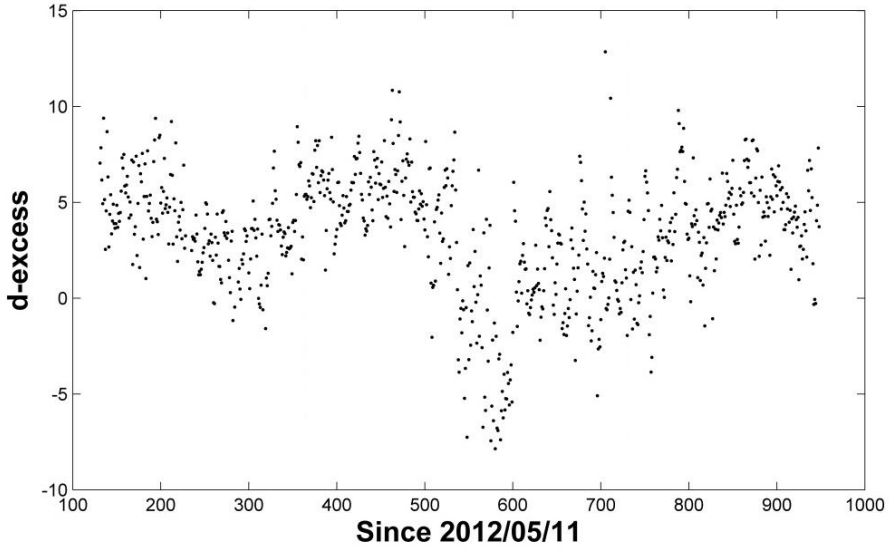


Fig. 3. Time series of d-excess of MLW

(a) The d-excess gets biggest value in the winter, showing that the evaporation is lower than other seasons.

(b) The major points is below GMWL （y=8x+10）.

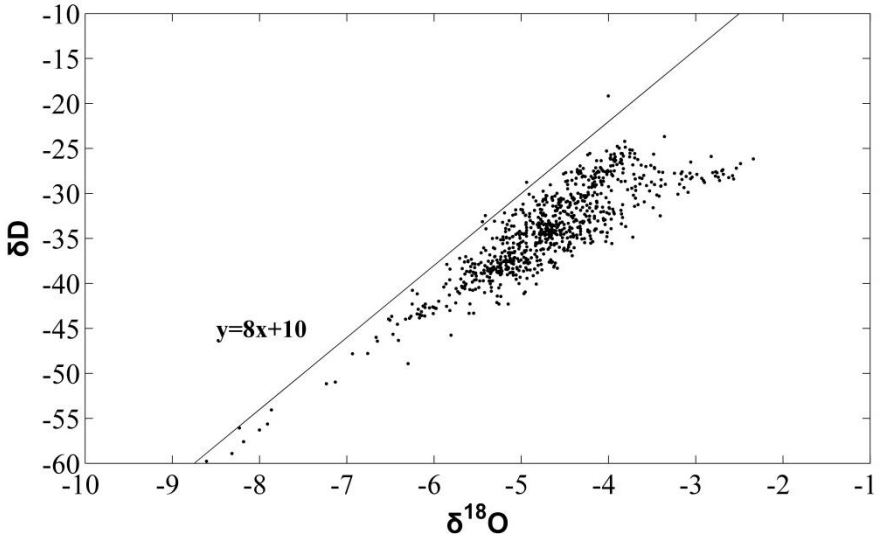


Fig. 4. The relationship between $\delta^{18}O$ and δD of MLW

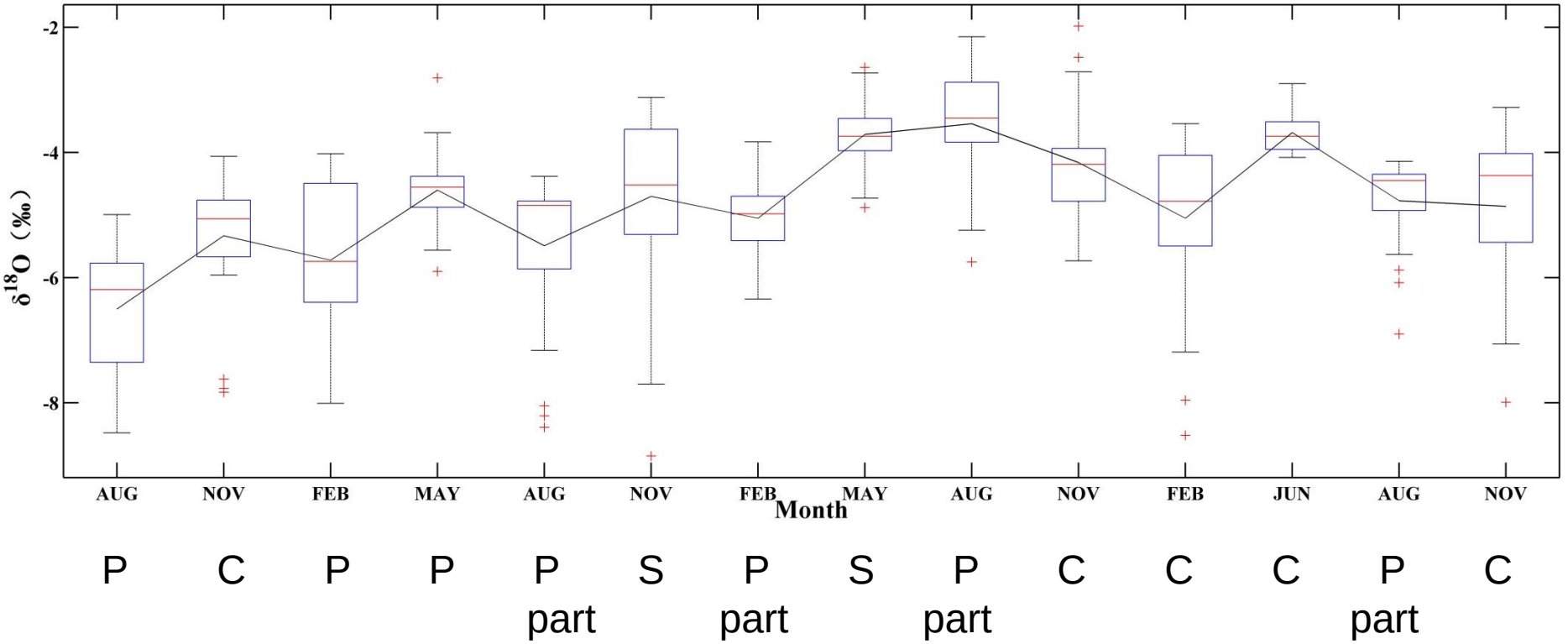


Fig. 5. The season boxplot about $\delta^{18}O$ from 2011/08 to 2014/11. The narrower of the box body means the more concentrated data. (P: precipitation, C: cloudy, S: sunny.)

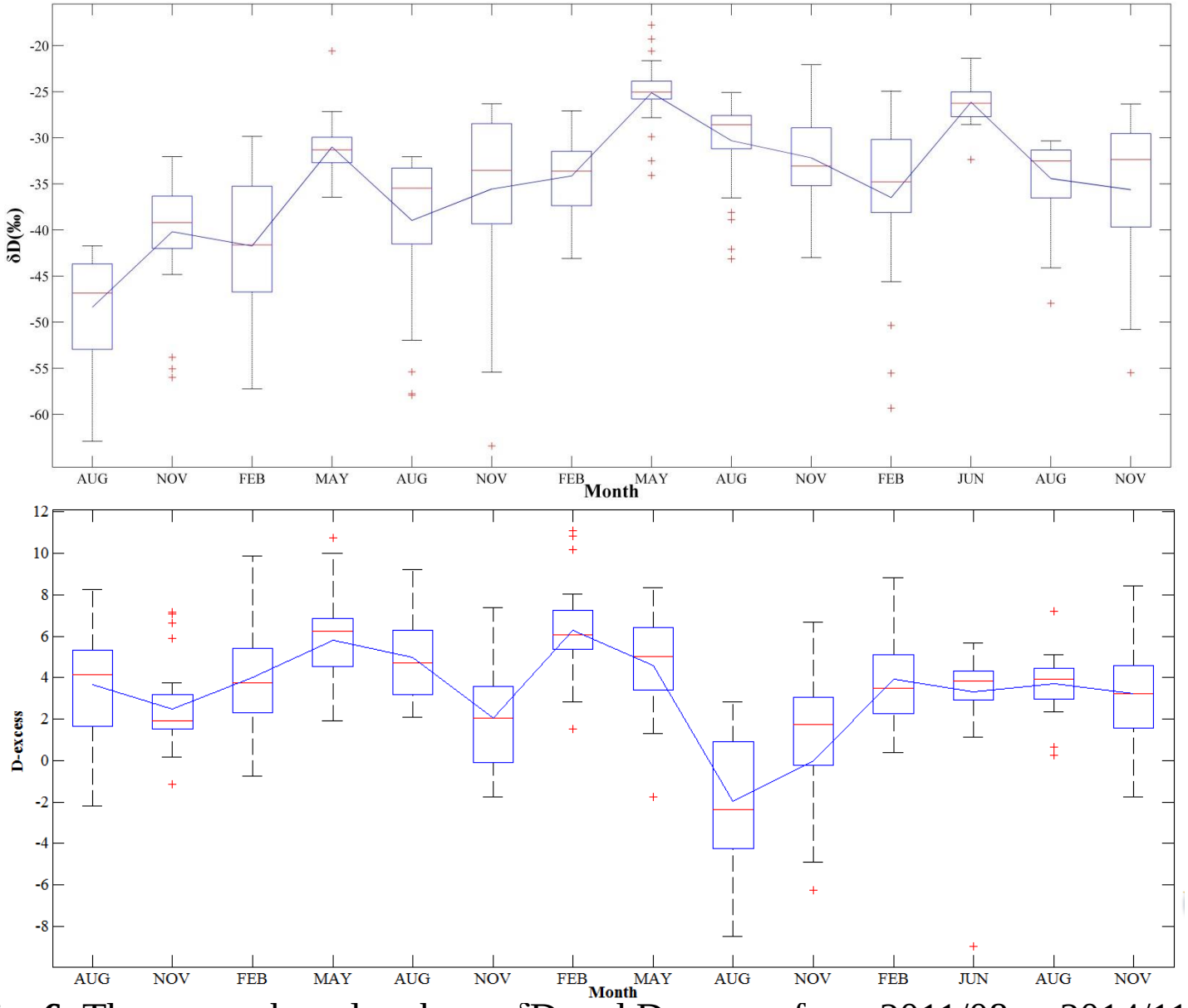
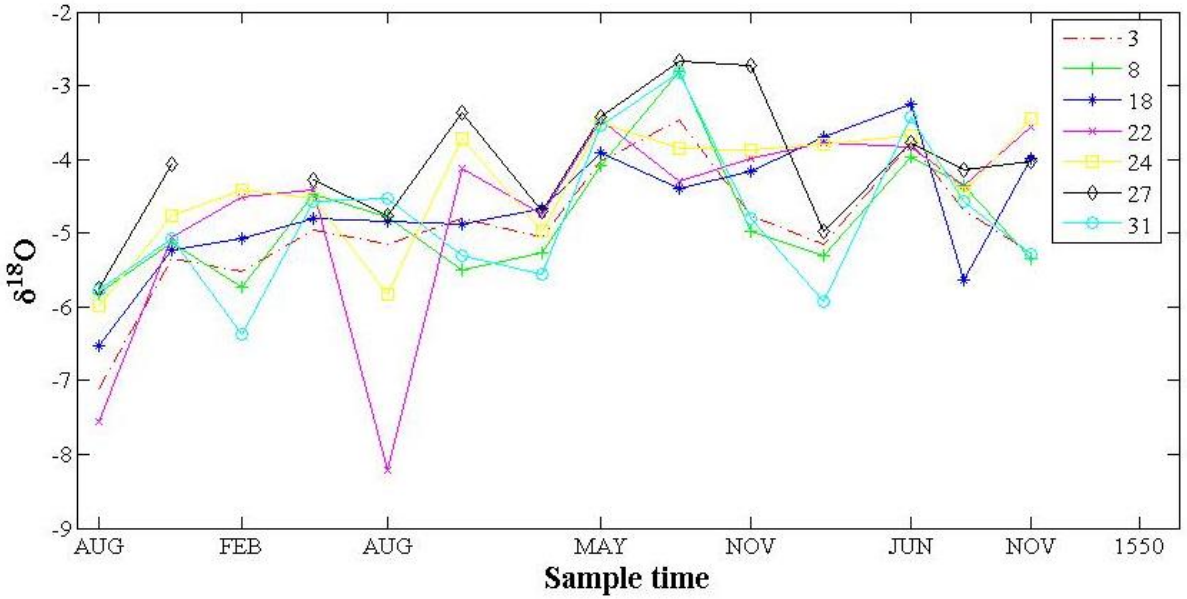
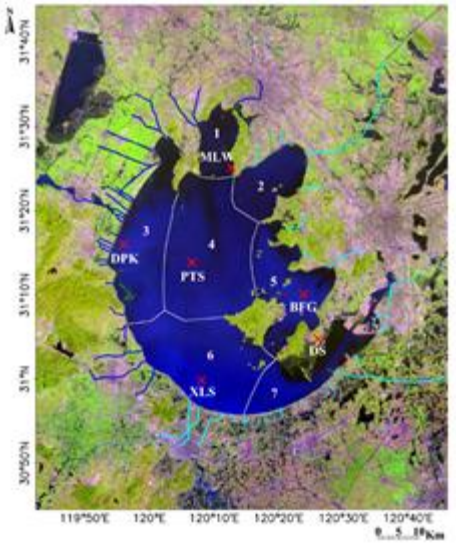
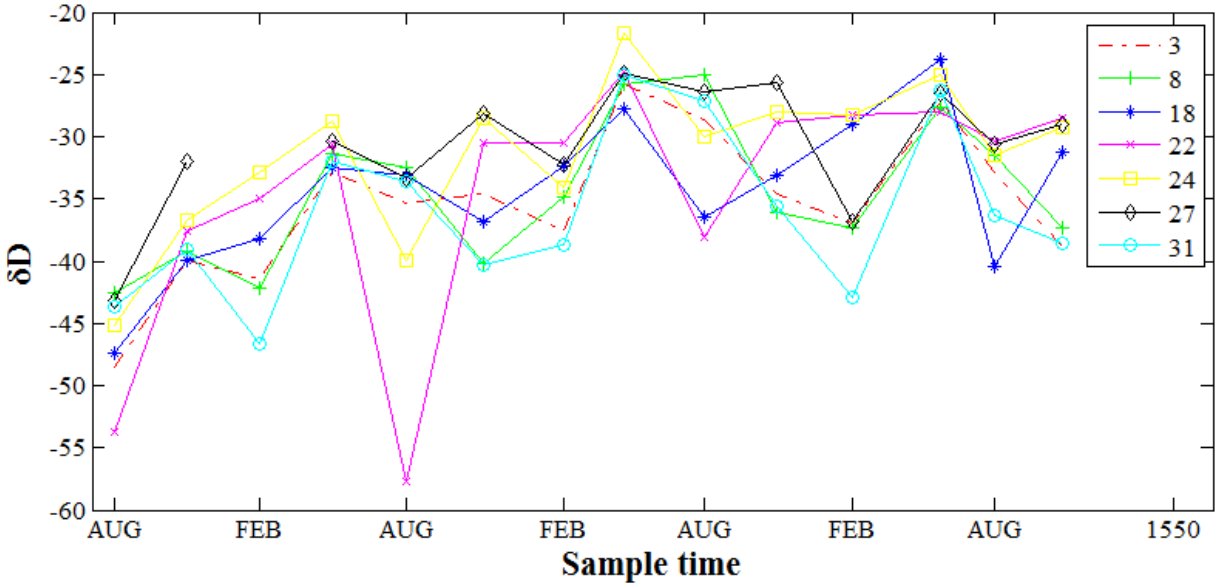


Fig. 6. The season boxplot about δD and D-excess from 2011/08 to 2014/11





(Hu et al. 2011)



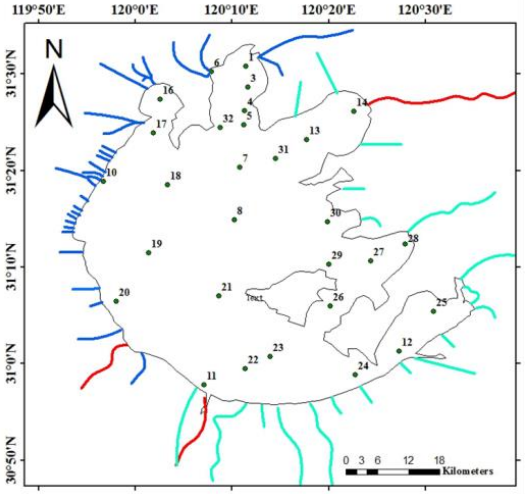


Fig. 7. The seasonal variation of $\delta^{18}O$ and δD in seven sampling points that belonged to different biophysically distinct zones.

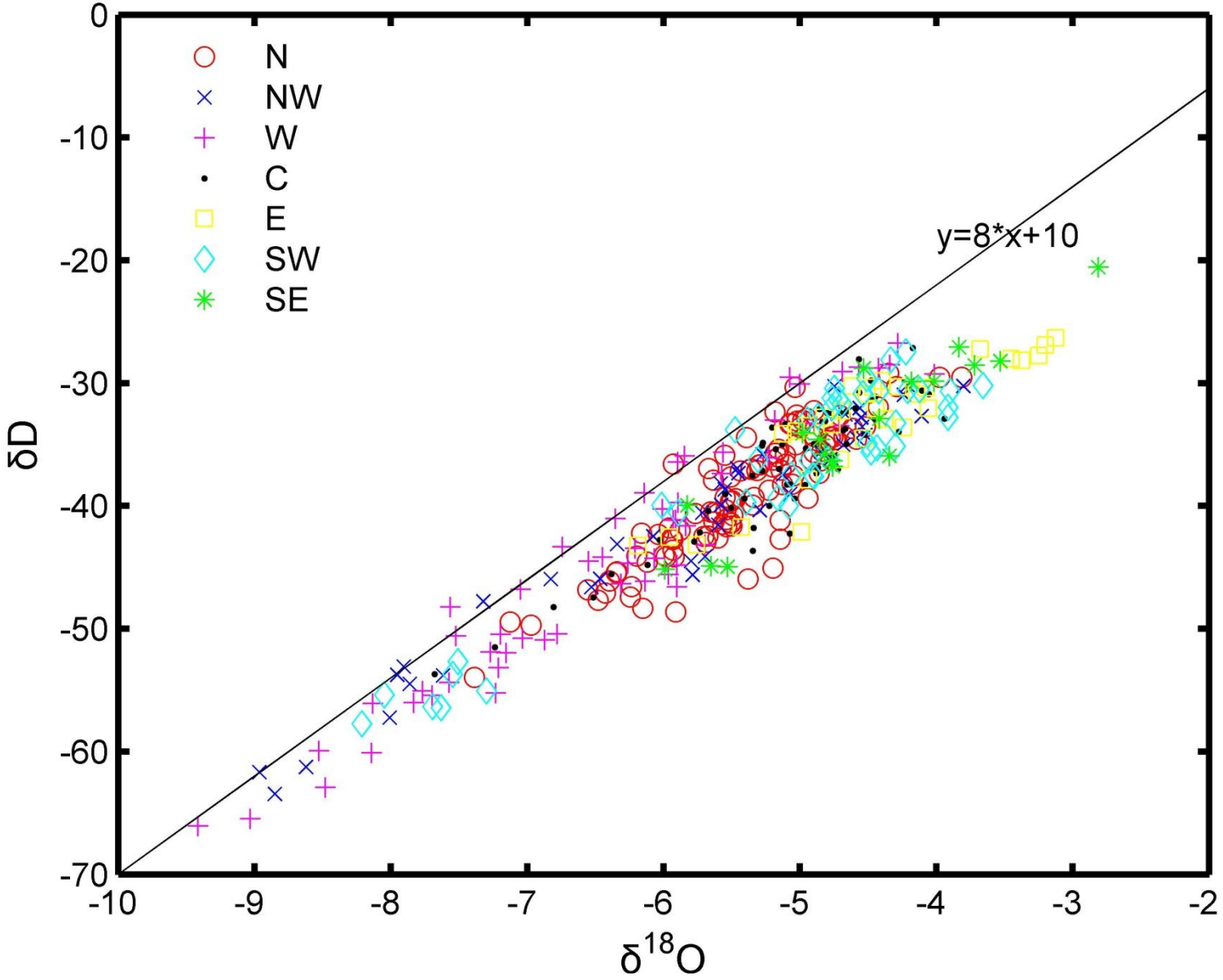


Fig. 8. The relationship between $\delta^{18}O$ and δD in seven biophysically distinct zones .

- Spatial distribution

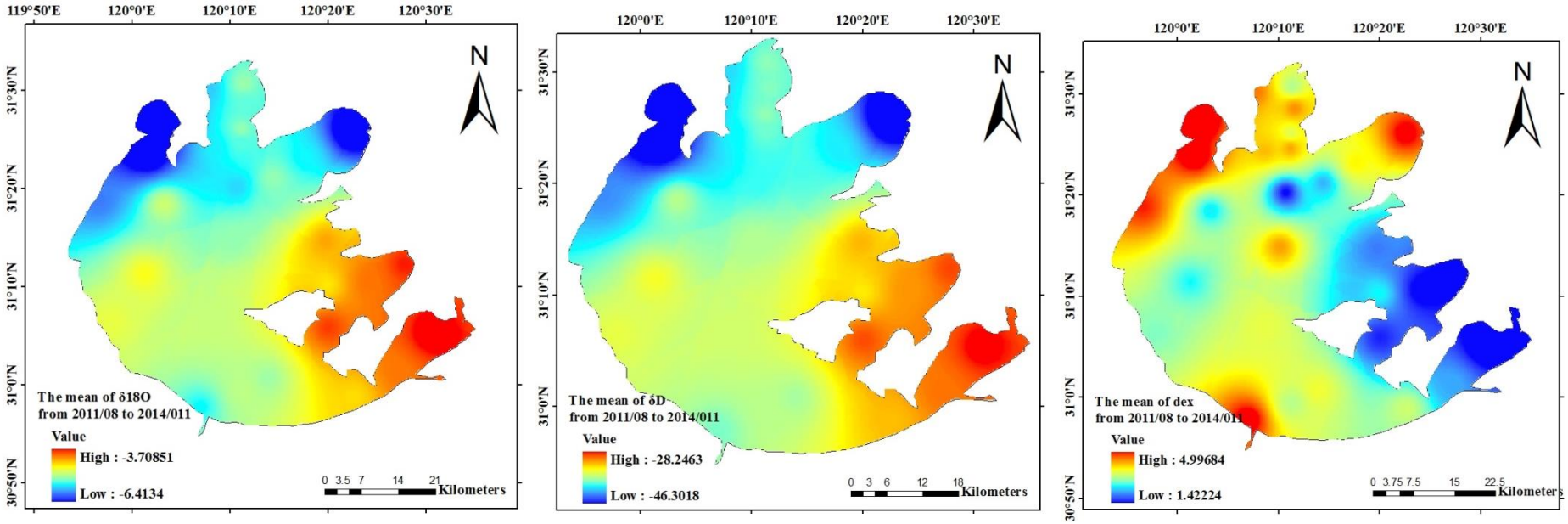
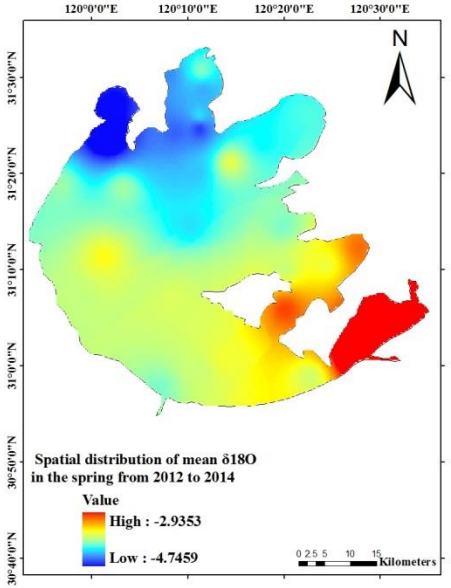
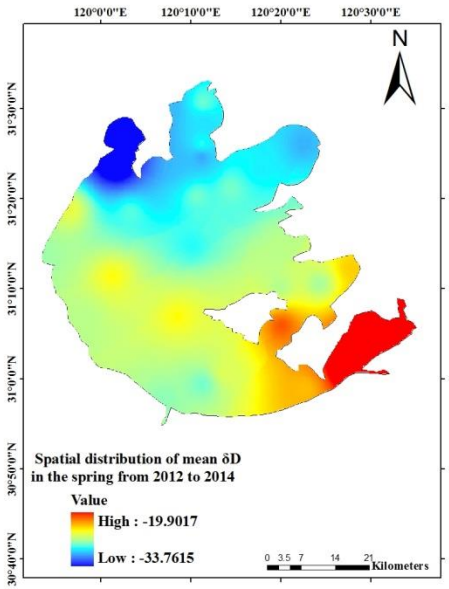
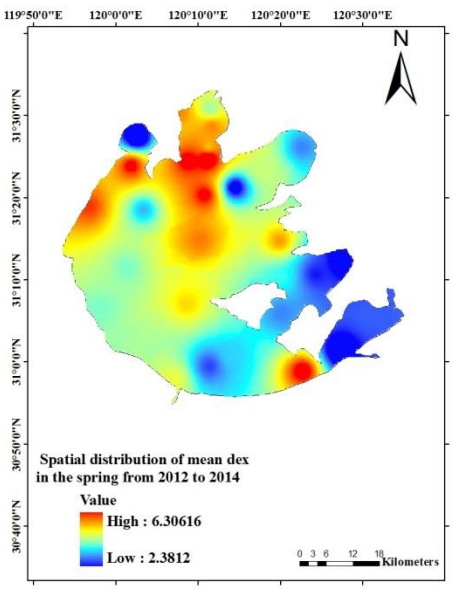


Fig. 9. The spatial distribution of the mean of $\delta^{18}O$, δD and d-excess from 2011/08 to 2014/11

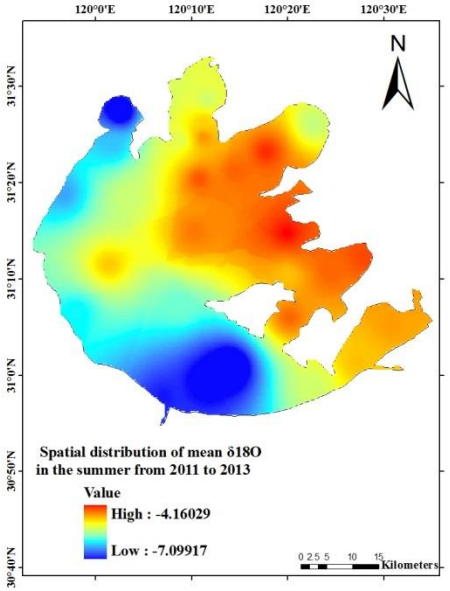
Spring

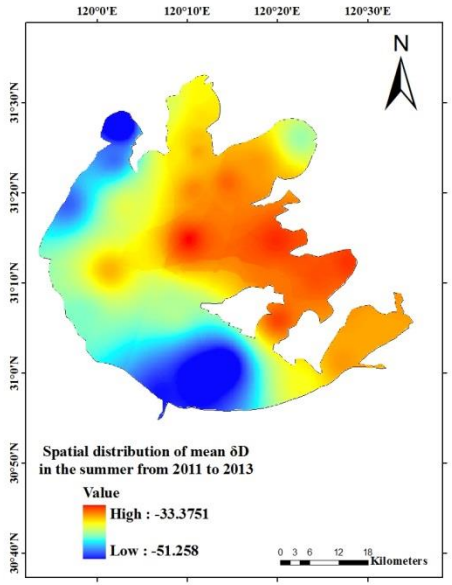


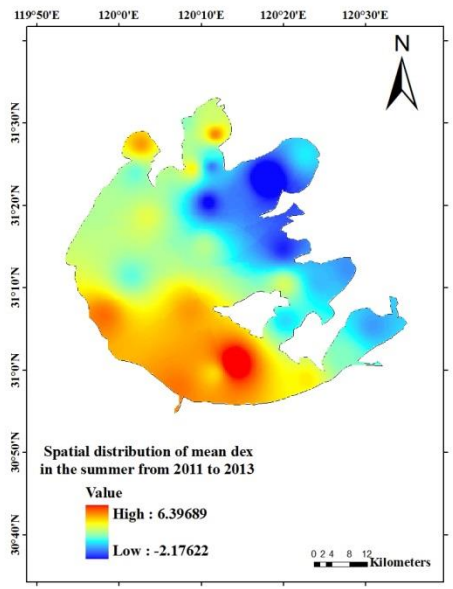




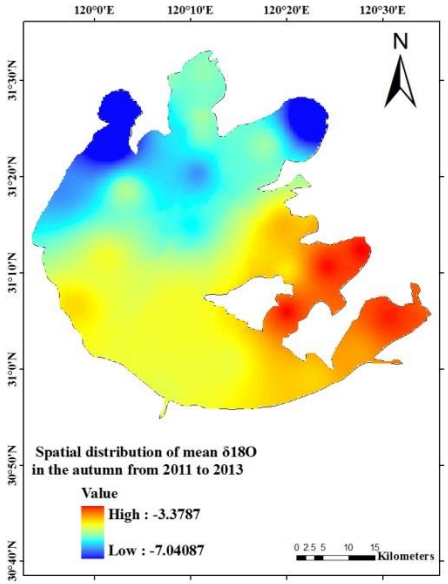
Summer

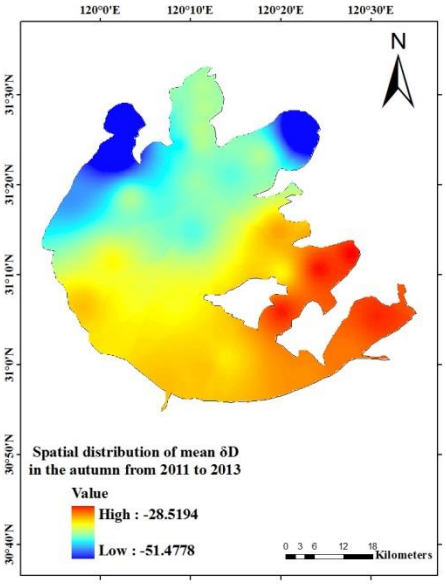


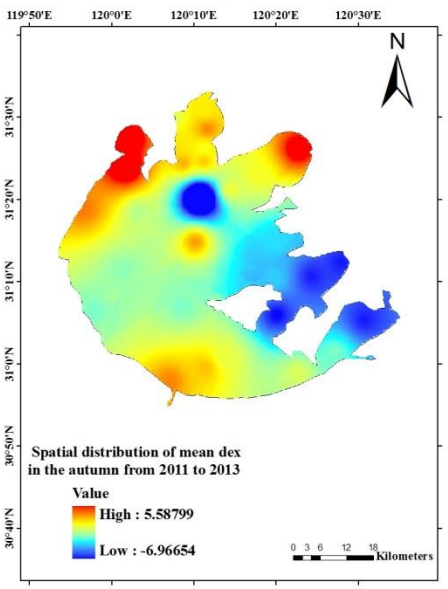




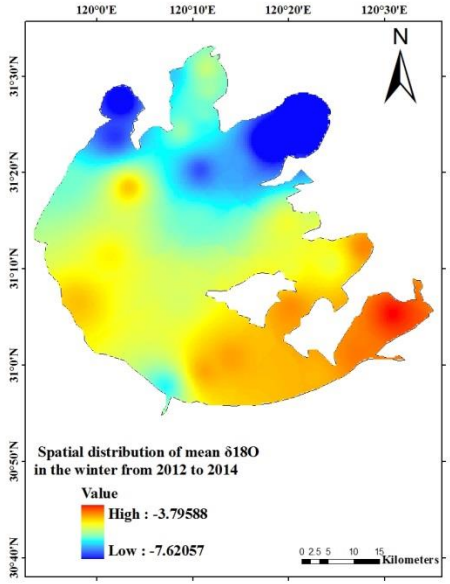
Autumn

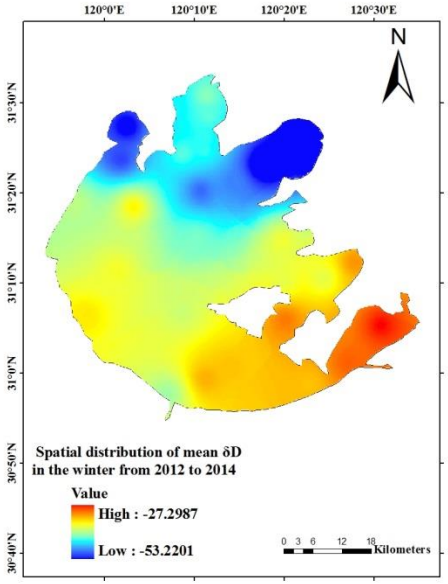


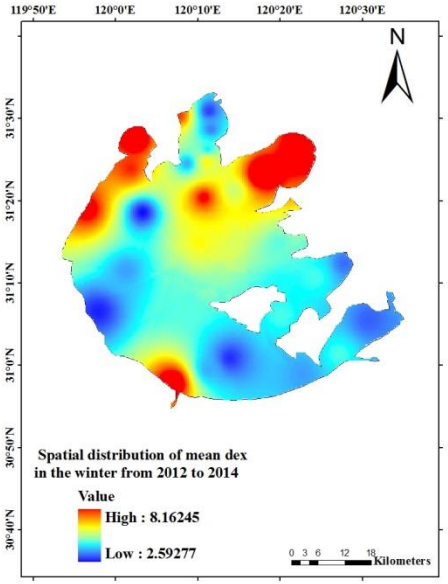


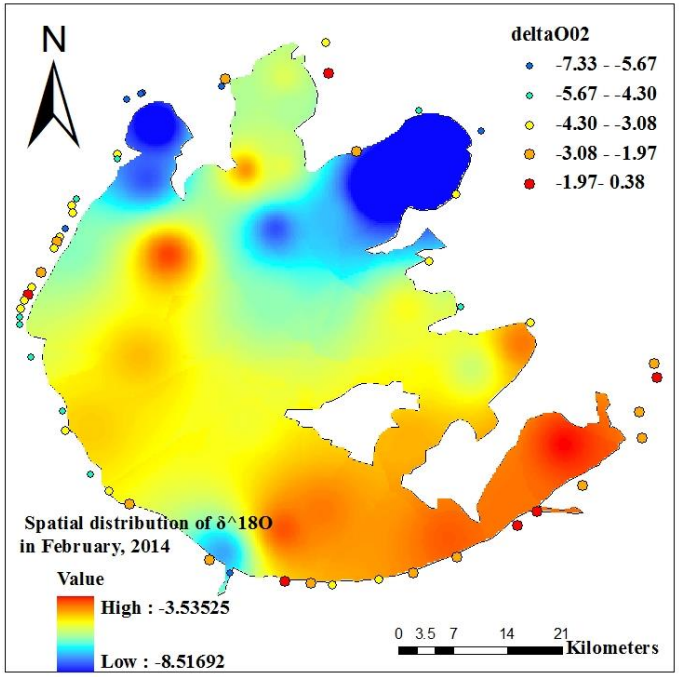


Winter

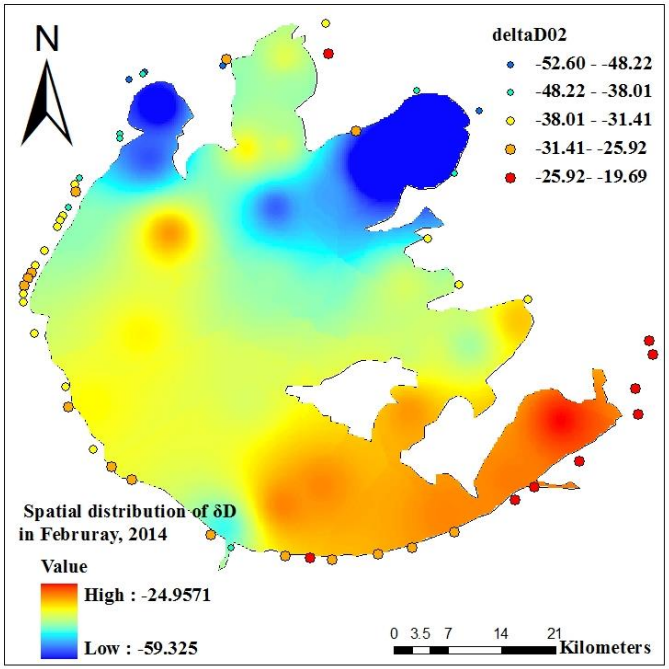




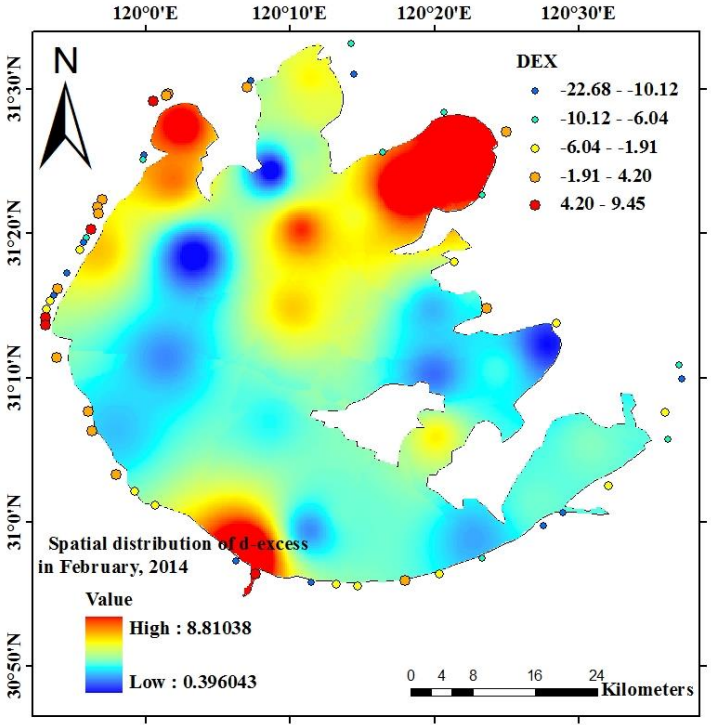




(a)



(b)



(c)

Fig. 12. Spatial distribution of stable isotopes in February, 2014. (a): $\delta^{18}O$ (b): δD (c): d-excess

Conclusions

- The stable isotopes varies in different seasons, usually peaked in May or June, and the data is most concentrated in the spring.

- In spring, autumn and winter, δD and δ^{18}O are increased from north to south. While in summer δD and δ^{18}O present the tendency, which depleted in west and enriched in east. The main reason is the supplement of Yangtze River water to the lake, and the lake-water delay time.

- Stable isotopes value are larger in the output lake area than input, beacuse of water will be evaporated in the process of flowing.

- Temporal and spatial distributions of HDO and $H_2{}^{18}O$ of water in Lake Taihu can be used to calculate the lake-water delay time.

Discussion

- Whether the temperature is the main impact factor for stable isotopic enrichment .

- What’s the effect of stable isotopes in the sunny days of the summer.

Next work

- Calculate the lake-water residence time.
- Calculate the parameters of stable isotope mass balance method and water balance method.
- Write a Chinese paper about temporal and Spatial distributions of HDO and $H_2{}^{18}O$ of water in Lake Taihu.

Thank you !