TPM11 - Session 4

PRA1. Freshwater Pollution
- Progress in TPM Fresh Water

The Tripartite Presidents Meeting among CRAES, NIES and NIER

Progress in TPM Fresh Water

Chinese Research Academy of Environmental Sciences

November, 2014

Contents

- **Part I: Organization of the Workshop**
- **Part II: Presentation No. 1**
- **Part III: Presentation No. 2**
- **Part Ⅳ: Onsite Visit of Menlou Reservoir Basin**
- **Part Ⅴ: Prospects**

Part I

Organization of the Workshop

First Invitation of the workshop

2014-8-26
CRAES sent the invitation and agenda of the workshop on freshwater pollution control under the framework of TPM to NIER and NIES.

- **Date: Sep. 22-23th, 2014**
- **Venue: Yantai, China**
- **Schedule: 4 Presentation(two from CRAES, one from NIES and one from NIER) Onsite Visit of Menlou Reservoir Basin**

2014-8-29
Mr. Hideyuki in NIES replied and agreed to attend the workshop but has some difficulty in flight.

2014-9-1
CRAES suggested the date of the workshop on 23-24th, 2014 considering Mr. Hideyuki's difficulty of flight.

Rearrangement of the Workshop

2014-9-2
Mr. Hideyuki in NIES wrote to CRAES and noted that there would be another meeting during Sep. 22-25th, and hope to rearrange the date or specialist.

2014-9-2
CRAES replied to NIES that, rearrangement of the date would not be easy, hope NIES could reconsider to send another specialist.
Given that both CRAES and YEMC have well prepared for the workshop, not only the Yantai local Municipal Environmental Protection Bureau but also the Yantai Municipal Government would participate in the workshop.

2014-9-2
CRAES wrote to NIER to ask their advice of the workshop again but did not get any response from NIER.

Postpone and cancel of the Workshop

2014-9-11

CRAES wrote to NIES and NIER to suggest to postpone the date of the Workshop to the week of Oct. 12-17th, considering the time constraints of Visa for both NIES and NIER.

2014-10-15

NIES wrote to CRAES that they could not attend the workshop.

2014-10-27

CRAES still could not get any positive response of the workshop from NIER, and decided to report the workshop directly on the TPM, considering the date of the TPM has approached.

Part II

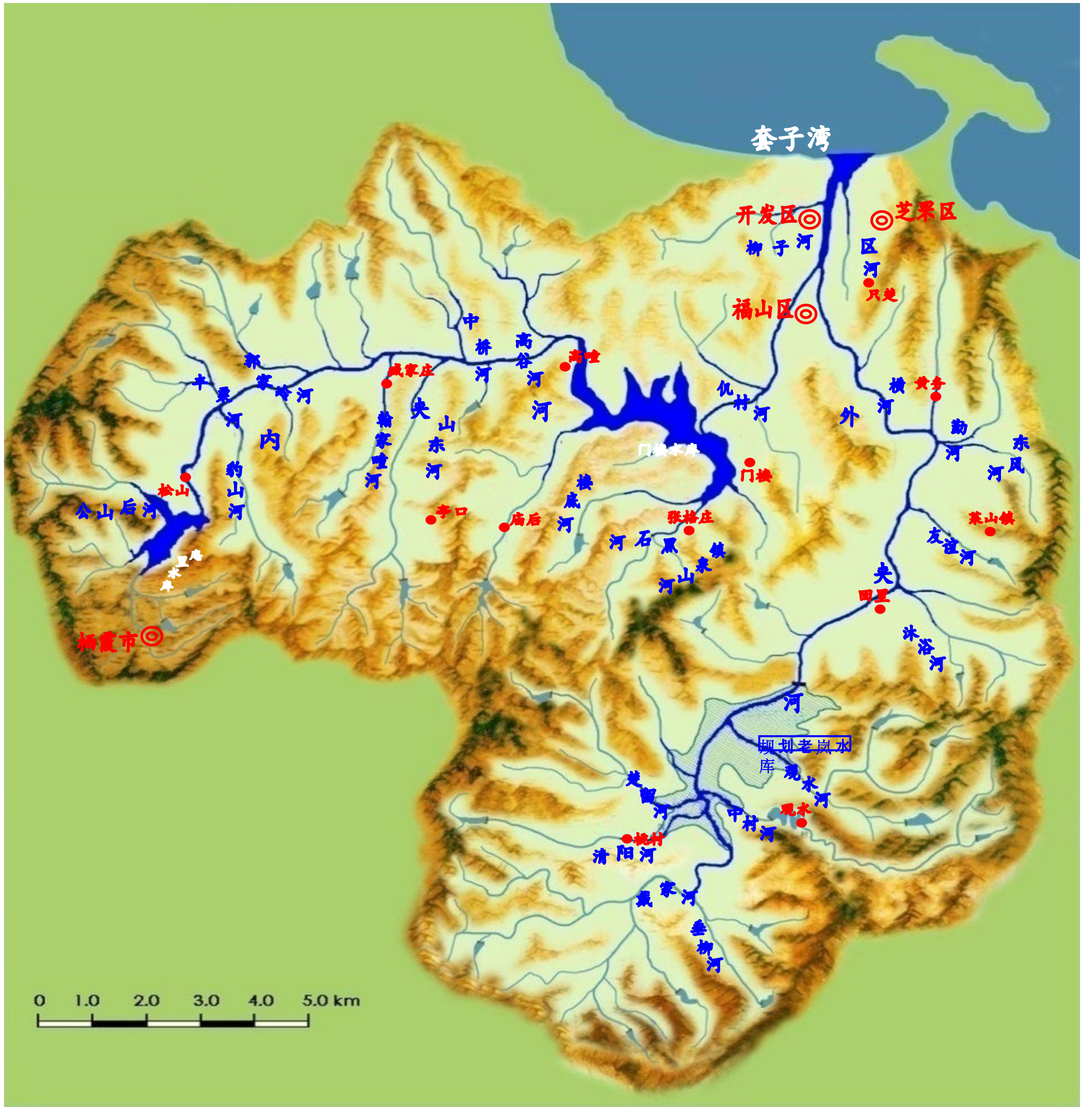
Presentation No. 1

Non-point pollution Control of Menlou Reservoir in Yantai China

Menlou River Basin

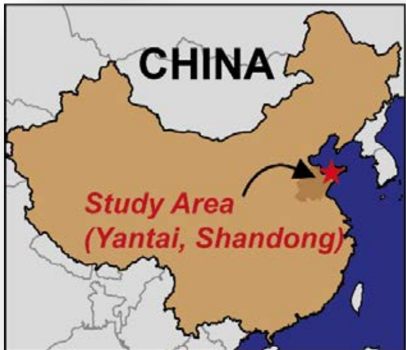
Tributary	Length (km)	Area (km^2)
Baoshan River	17.2	53
Feili River	13.6	84
Guojialing River	15.1	41
Hanjiatuan River	16.1	34
Shandong River	21	120
Zhongqiao River	17.8	53
Gaogu River	17	60
Loudi River	21	93

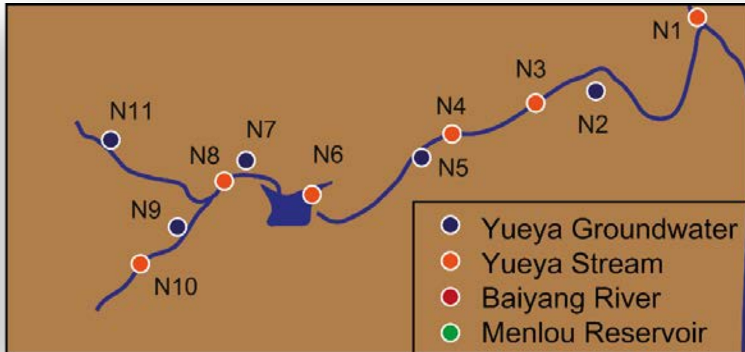
Name	Menlou Reservoir
Venue	Yantai Fushan
Storage Capacity	23.21 million m^3
Depth	Max16.68m,Average13m
Catchment Area	$1077km^2$
Flow	$2.77m^3/s$
Flow Rate	2.77m/s

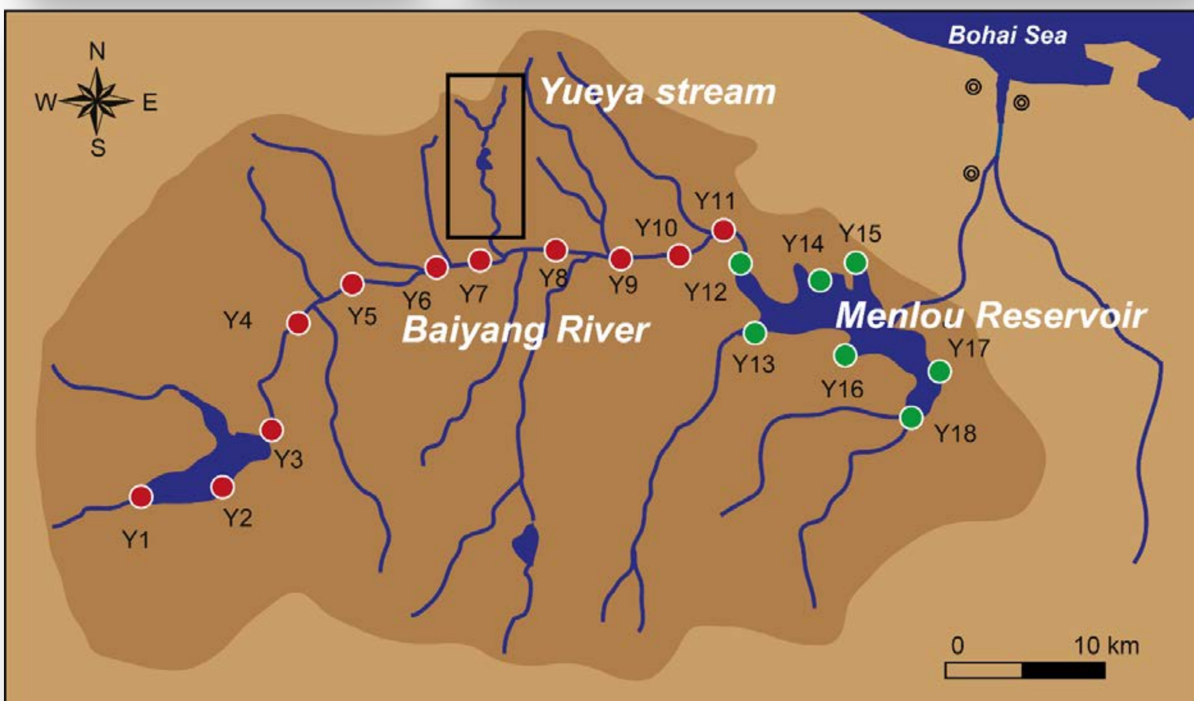


STUDY AREA

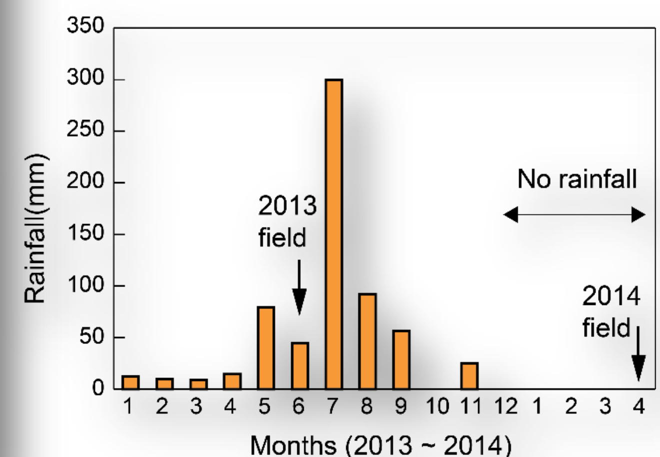
- Baiyang River watershed (1077 km2) in Yantai City, Shandong Province in East China. (121°50’ ~ 121°18’E, 37°21’ ~37°34’N)







- Samples (2014):
- 1) Menlou Reserovir
- 2) Baiyang River
- 3) Yueya Stream
- 4) Yueya Groundwater



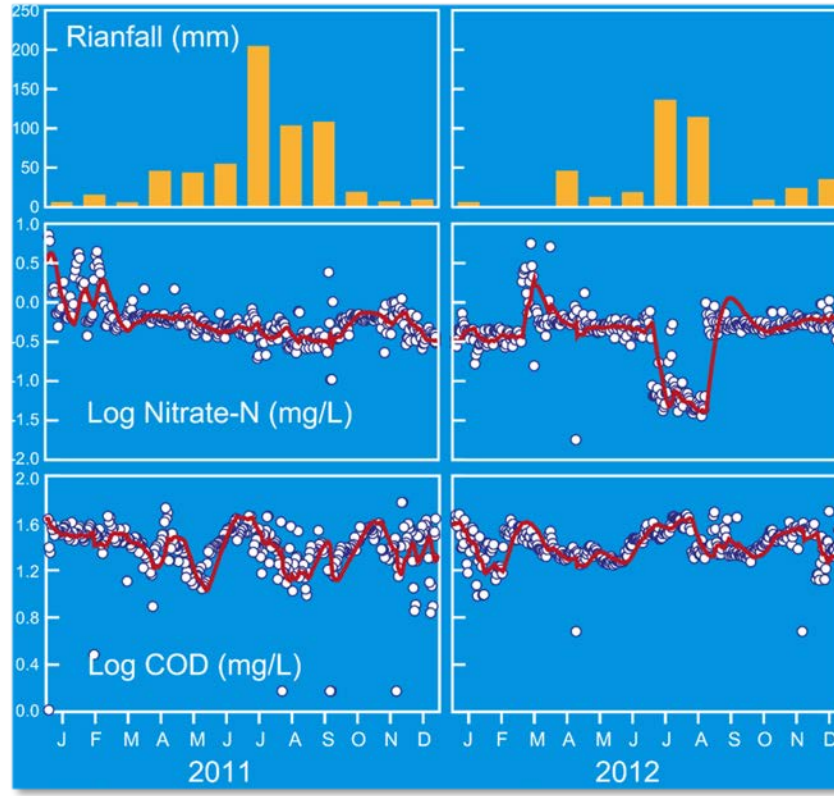
Water pollution & Purposes of This Study

- ☐ NO_3-N and COD during two years (2011 ~ 2012)
- ☐ The average NO_3-N of this study area were 12.7 and 21.5 mg/L

✓ The objectives are to assess the water quality status and to identify the major pollution sources.

✓ For this, we sampled different water bodies and analyzed:

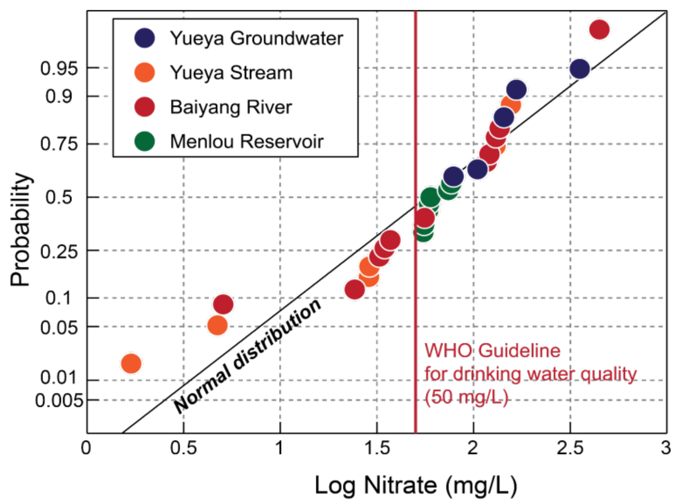
- Inorganic chemical compositions (pH, Cations, and Anoins)
- Dual isotopic values of nitrate (δ^{15}N and δ^{18}O)

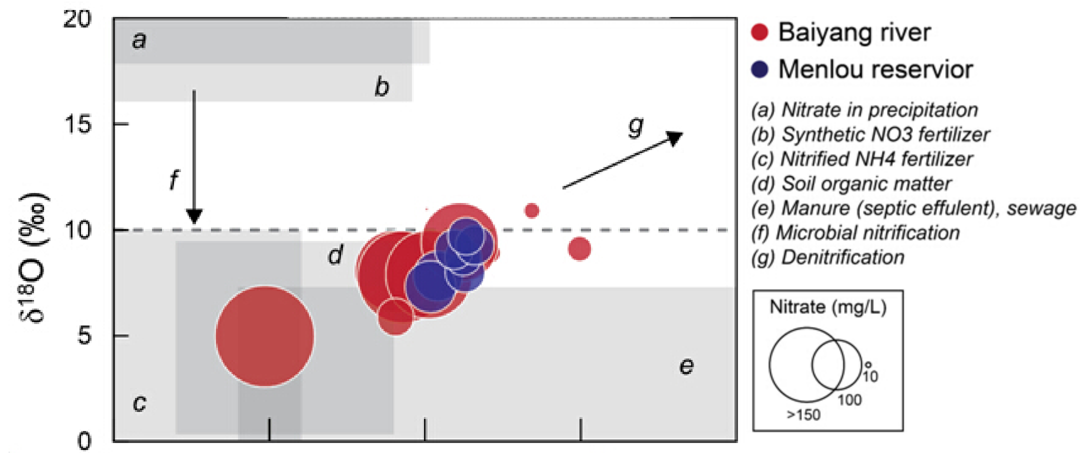


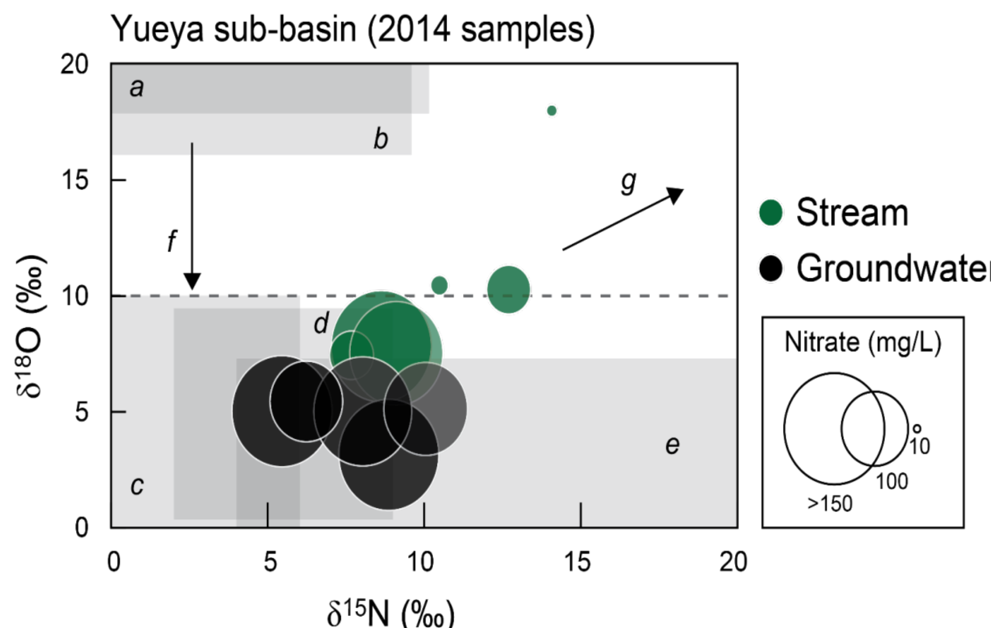
- ☐ Project for the Comprehensive Watershed Management Study in Qingdao and Yantai to Reduce Pollutants in the Yellow Sea
- ☐ KOICA KIST KU
- ☐ 2012.2-2014.8

Analytical Results of Nitrate

- ❖ Many Samples exceeds the WHO guideline of nitrate
- ❖ Groundwater is highly vulnerable to the nitrate contamination







Seong-Taek YUN
Kyoung-Ho KIM
(Korea University, Korea)

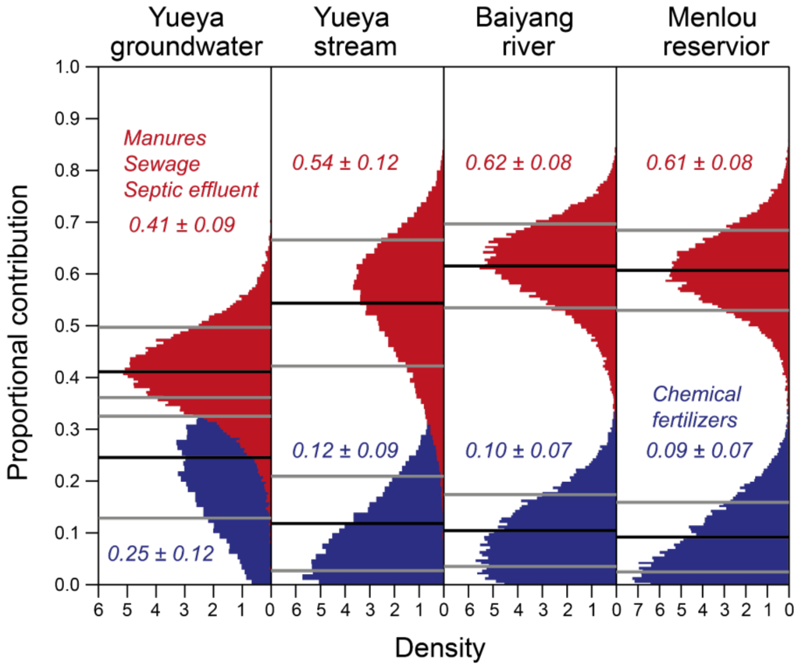
✓ **Nitrate sources:**

1) **fertilization**
2) **Sewage (wastewater)**

Nitrogen source & Tentative conclusions

✓ **Calculate quantitative contribution of nitrate sources on water samples based on a mixing model (SIAR) with Bayesian statistical framework**

	Sampling site	Nitrate in precipitation		Soil N		Synthetic fertilizer		Manure & sewage	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
2014	Baiyang River	0.11	0.01	0.17	0.10	0.10	0.07	0.62	0.08
	Menlou Reservior	0.11	0.02	0.19	0.10	0.09	0.07	0.61	0.08
	Yueya Stream	0.15	0.04	0.19	0.12	0.12	0.09	0.54	0.12
	Groundwater	0.04	0.02	0.30	0.15	0.25	0.12	0.41	0.09



- **Agricultural pollution should be carefully managed.**
- **The overuse of fertilizers and manure on agricultural fields (esp., orchards) should be evaluated (i.e., fertilization efficiency) and controlled.**

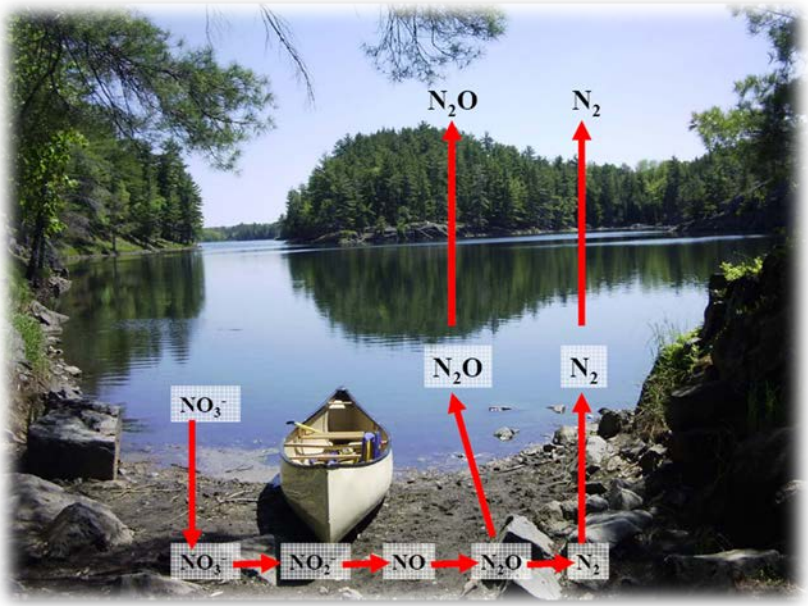
Part III

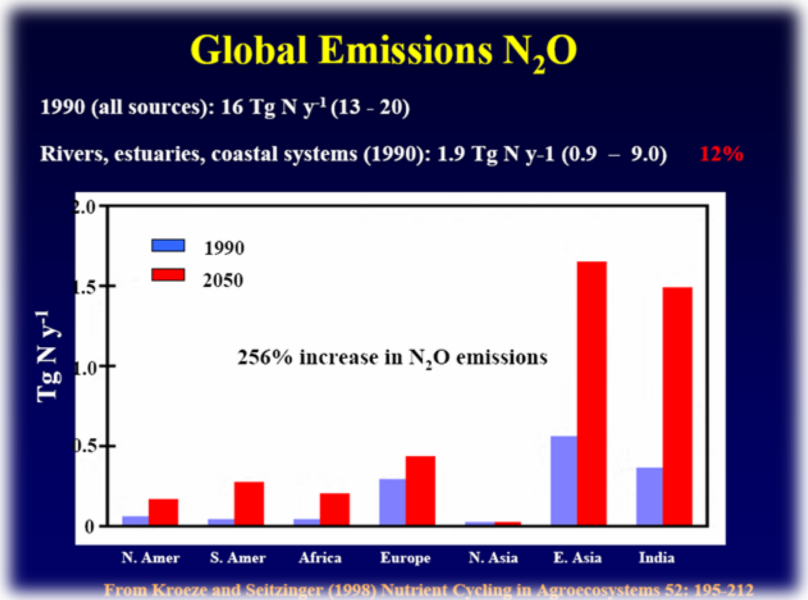
Presentation No. 2

Nitrous oxide concentration and emission from seven subtropical rivers: land uses and controlling factors

Nitrous oxide concentration and emission from seven subtropical rivers: land uses and controlling factors

- Nitrous oxide (N_2O) is a potent greenhouse gas that greatly contributes to global warming and stratospheric ozone. Global N enrichment has resulted in increased atmospheric N_2O concentrations.
- Anthropogenic N elevations had led to increased river N loading.
- More N_2O is produced from various streams and rivers.

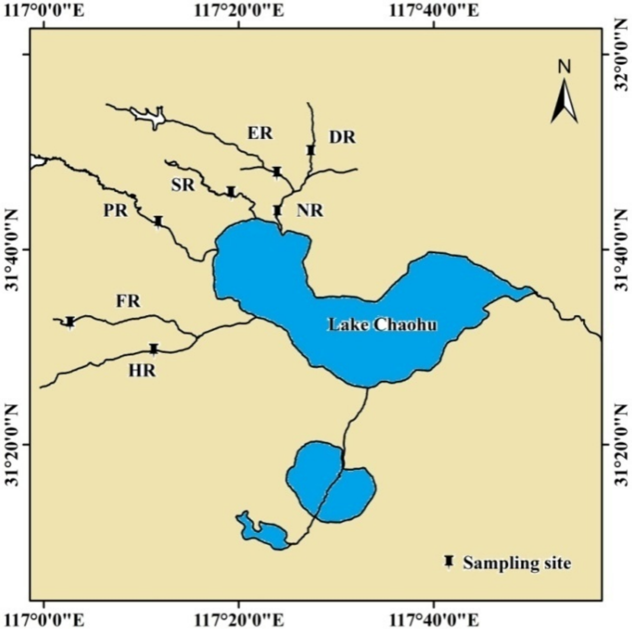




A case study in Lake Chaohu, China

■We report the result of a 12-month investigation on seven subtropical N enriched rivers (**including urban, rural and agricultural rivers**) in the Lake Chaohu basin, China.

■ Our work is an initial attempt to study **factors regulating N_2O yield and emission from rivers of different land-use types**.

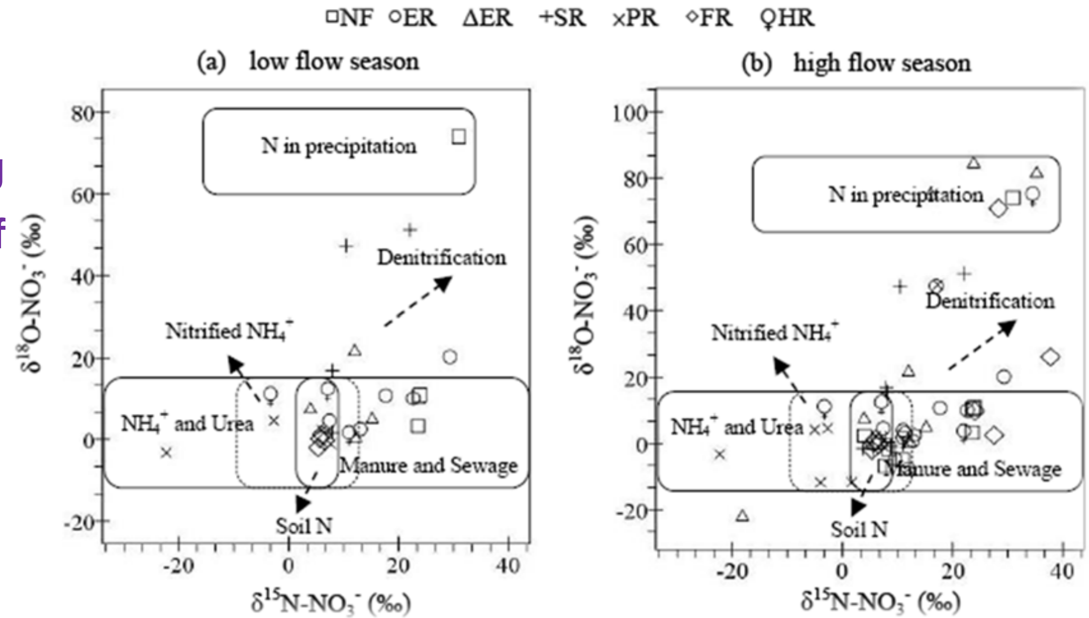


Sampling site	Dominated land use	River length (km)	Depth (m)	Flow velocity (m s-1)	DO (mg L-1)	NO3--N (mg L-1)	NH4+-N (mg L-1)	pH	SO42- (mg L-1)	Cl- (mg L-1)
NR	urban	70	3.2	0.10	1.51(1.98)	2.26(2.54)	12.75(5.70)	7.40(0.47)	111.70(101.4)	131.80(64.8)
ER		17	1.8	0.15	3.70(2.26)	4.81(5.38)	11.72(4.82)	7.61(0.54)	84.40(38.7)	81.10(23.6)
SR	rural	27	1.5	0.20	1.86(1.33)	1.53(2.73)	18.79(11.01)	7.49(0.33)	62.60(25.5)	42.70(18.4)
DR		30	2.5	0.10	4.80(3.5)	4.20(3.8)	2.90(1.7)	7.70(0.40)	154.40(217.1)	50.80(17.1)
PR		60	2.4	0.05	2.35(1.41)	0.90(0.47)	7.41(5.60)	7.52(0.41)	75.69(119.1)	23.52(12.11)
FR	agriculture	117	2.3	0.25	6.34(1.88)	0.86(0.41)	0.34(0.22)	7.49(0.42)	29.77(16.39)	23.54(12.77)
HR		145	4.0	0.20	6.24(3.24)	0.89(0.43)	0.51(0.49)	7.66(0.45)	57.16(52.52)	37.99(15.99)

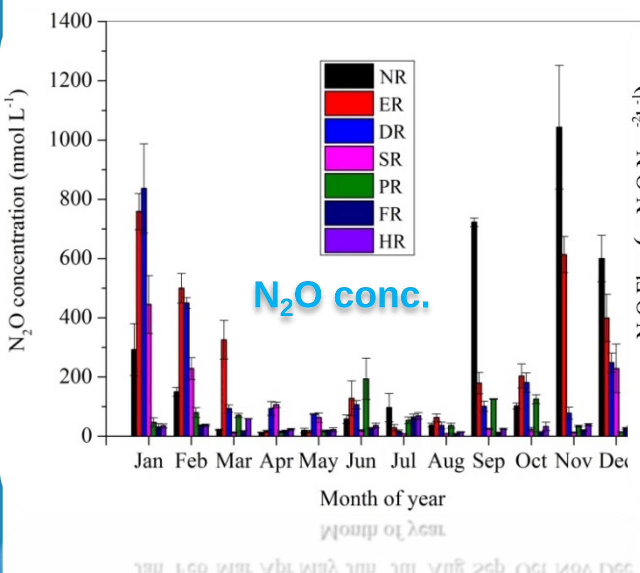
Results

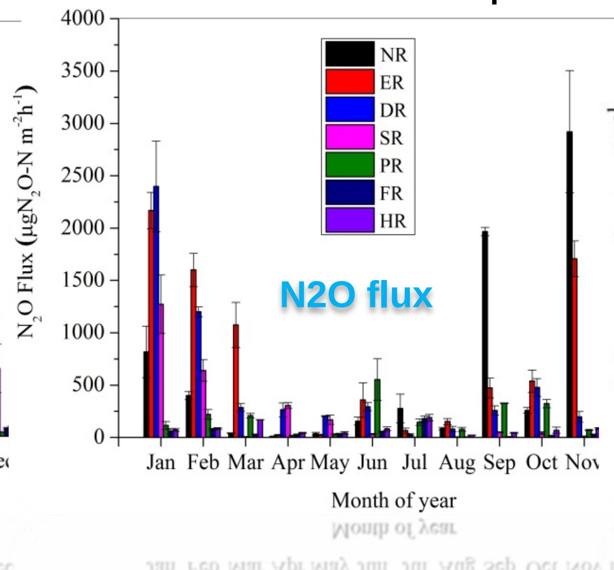
(1) Rivers that receiving anthropogenic N inputs is one of main sources of atmospheric N_2O.

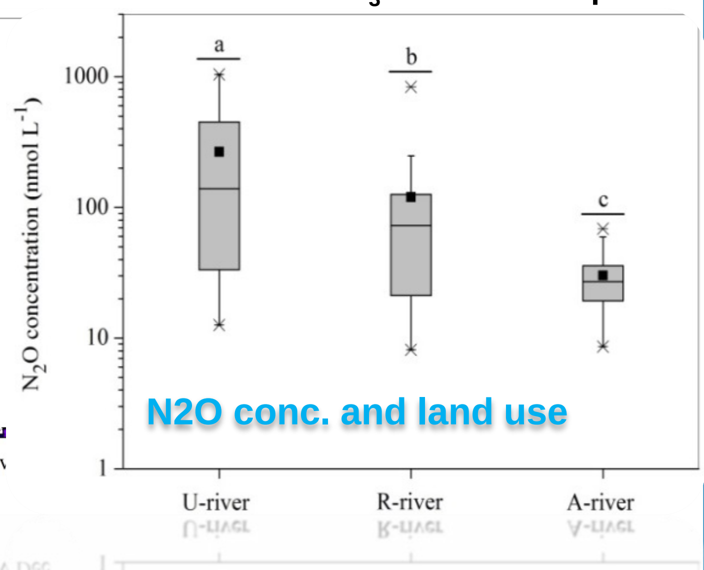
(2) Dissolved N_2O observed in urban rivers were significantly higher than in agricultural and rural rivers ($P<0.01$).



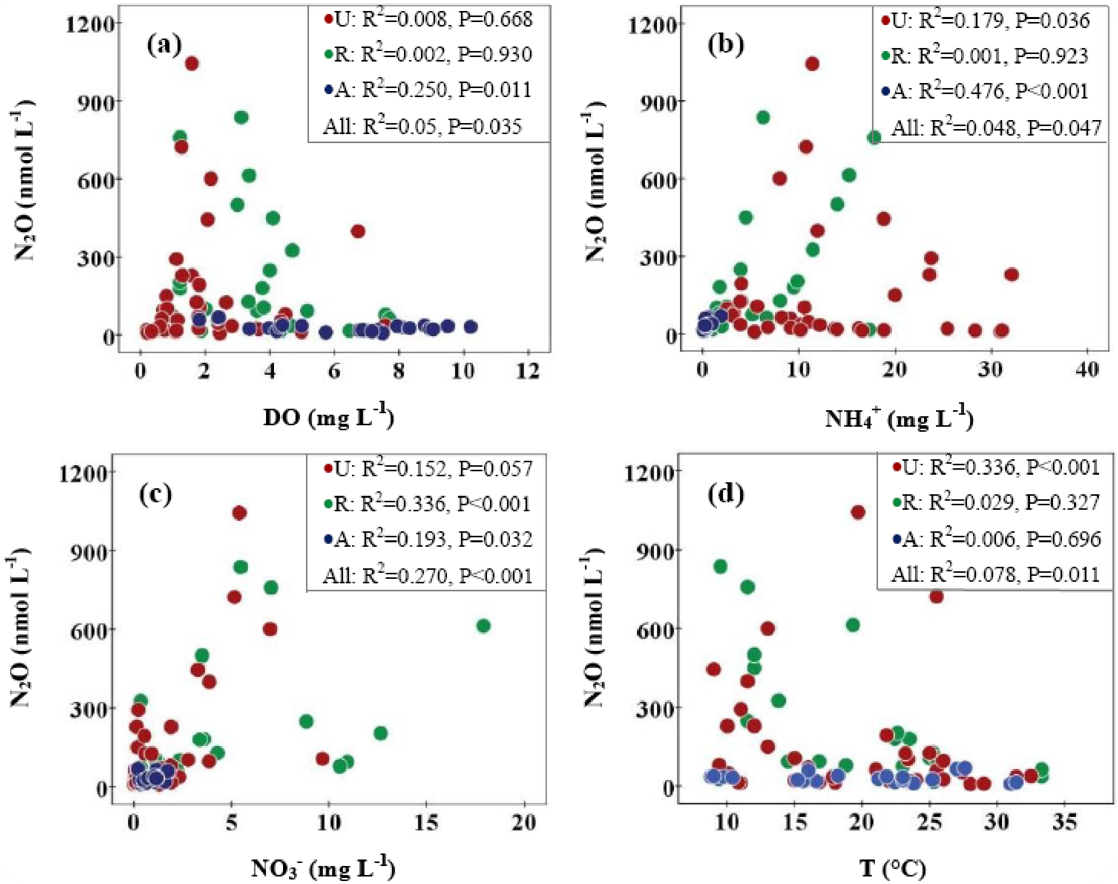
Relationship between $\delta^{15}N$ and $\delta^{18}O$ of NO_3^- in water sample

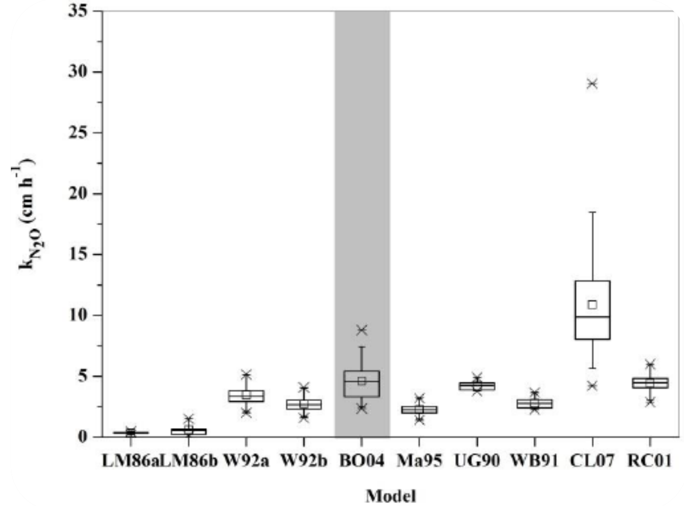






(3) Dependence of N_2O concentration in rivers change with land use. NH_4^+ and DO level had great control on N_2O concentration in the agricultural and rural river, respectively; while N_2O concentration in the urban rivers may be mainly controlled by direct N_2O inputs from industry sewage.





(4) Wide disparities in estimated N_2O fluxes were investigated among different models. It is may be more reliable to give a range for the fluxes by using a more than one model than generate a single flux value by using a single model.

Part Ⅳ

Prospects

Conclusions

- Feel Sorry For the Workshop this year
- For Water Pollution control, long-term efforts still needed
- More cooperation & extensive academic communication among NIES, NIER and CRAES are expected

Thanks you for your attention