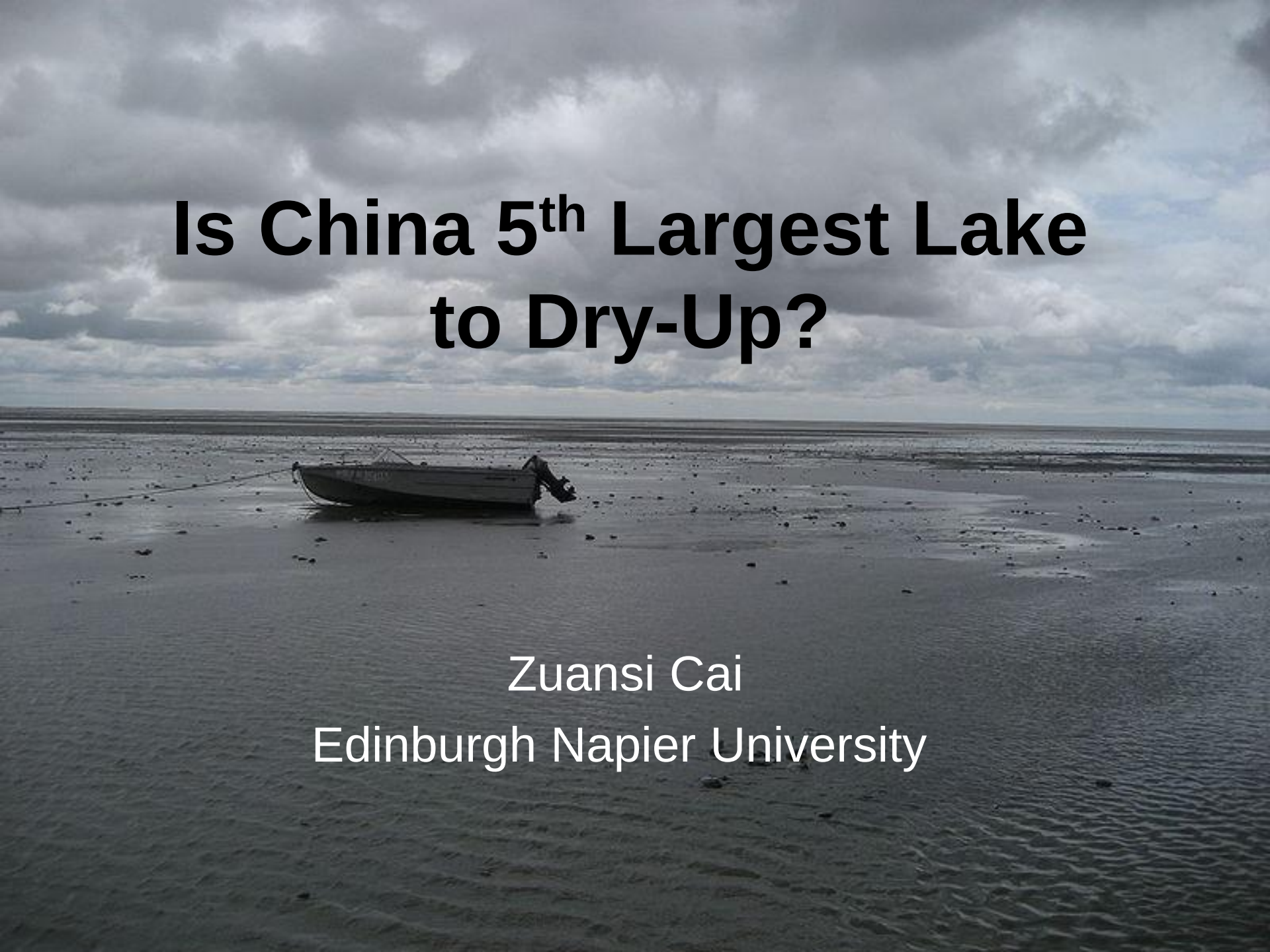

Is China 5th Largest Lake to Dry-Up?

Zuansi Cai

Edinburgh Napier University

Acknowledgments

- Taoyong Jin & Jiancheng Li, Wuhan University
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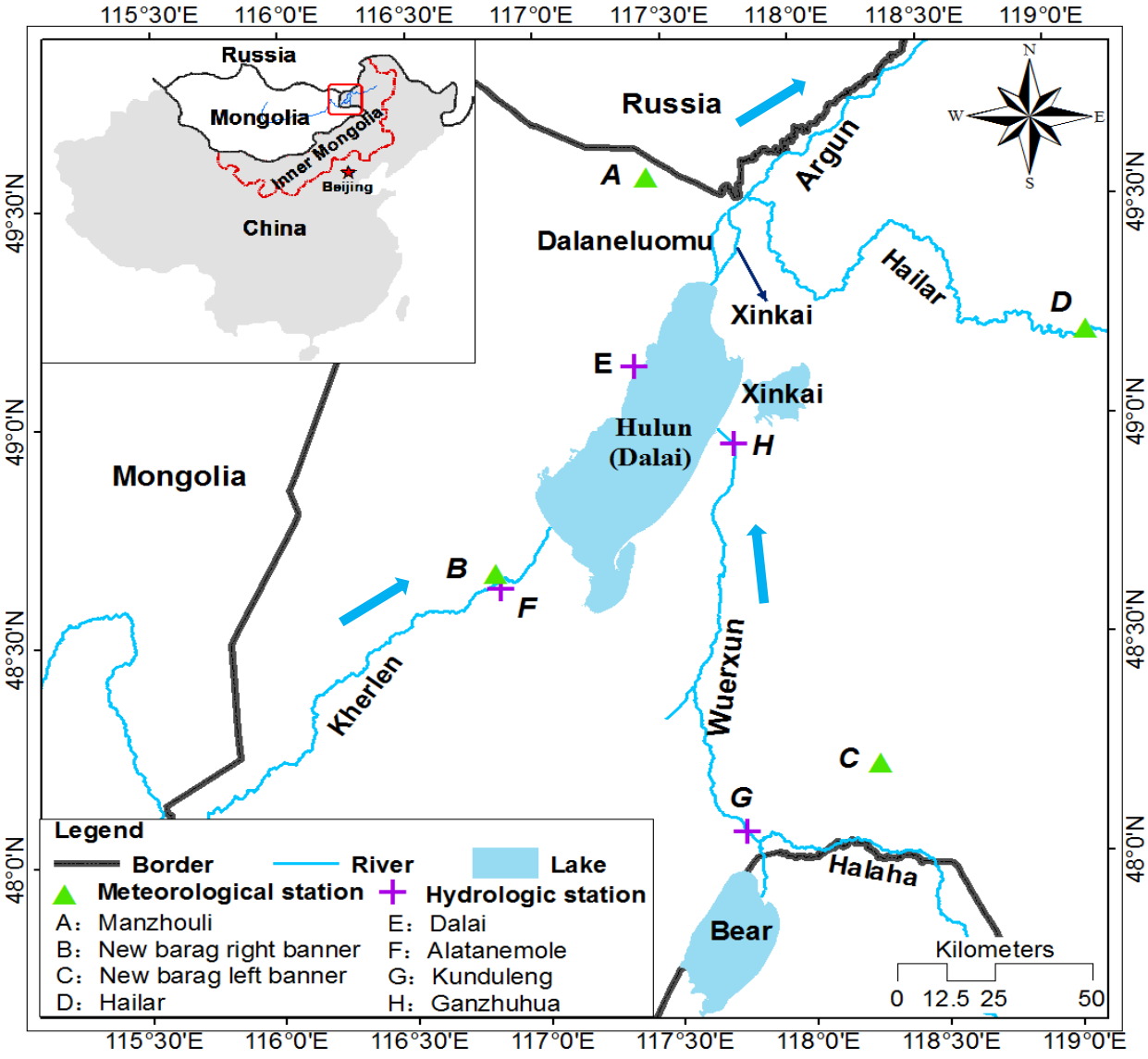
- Aizhong Ding, *Beijing Normal University*
- Ulrich Ofterdinger, Queen's Unviersity Belfast
- *Former PhD student Zhejie Wang, IMAU*

Hulun Lake


115°30'E
116°0'E
116°30'E
117°0'E
117°30'E
118°0'E
118°30'E
119°0'E
49°30'N
49°0'N
48°30'N
48°0'N
Russia
Mongolia
Inner Mongolia
Beijing
China
Russia
Argun
A
Dalaneluomu
Xinkai
Hailar
D
E
Xinkai
Hulun
(Dalai)
H
Mongolia
B
F
Kherlen
Wuerxun
C
G
Halaha
Bear
N
W
E
S
Legend
Border
River
Lake
Meteorological station
Hydrologic station
A: Manzhouli
B: New barag right banner
C: New barag left banner
D: Hailar
E: Dalai
F: Alatanemole
G: Kunduleng
H: Ganzhuhua
Kilometers
0 12.5 25 50

Problems Over Last Decade

1990s vs. 2010

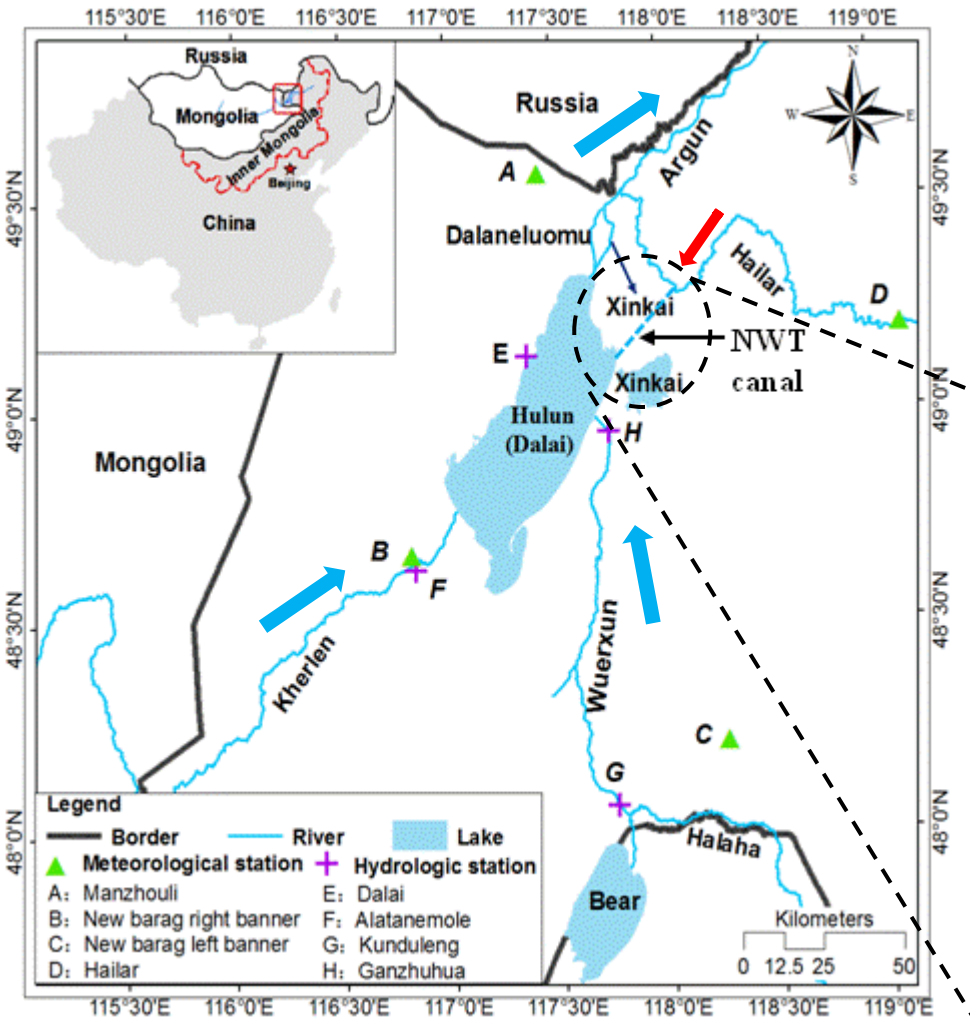
- A:2300; <1800 km^2 **(>25%)**
- V: 14; ~5 bn m^3 **(>60%)**
- D: ~6-7; ~2-3 m **(-4 m)**
- Q_{in}: 1.4; 0.3bn m^3/y **(>80%)**


這張照片就是1997年的7月份我來拍的


那麼這個水位已經下降了4到5米

A National Nature Reserve &
A list of International Important Wetland

Water Transfer Project

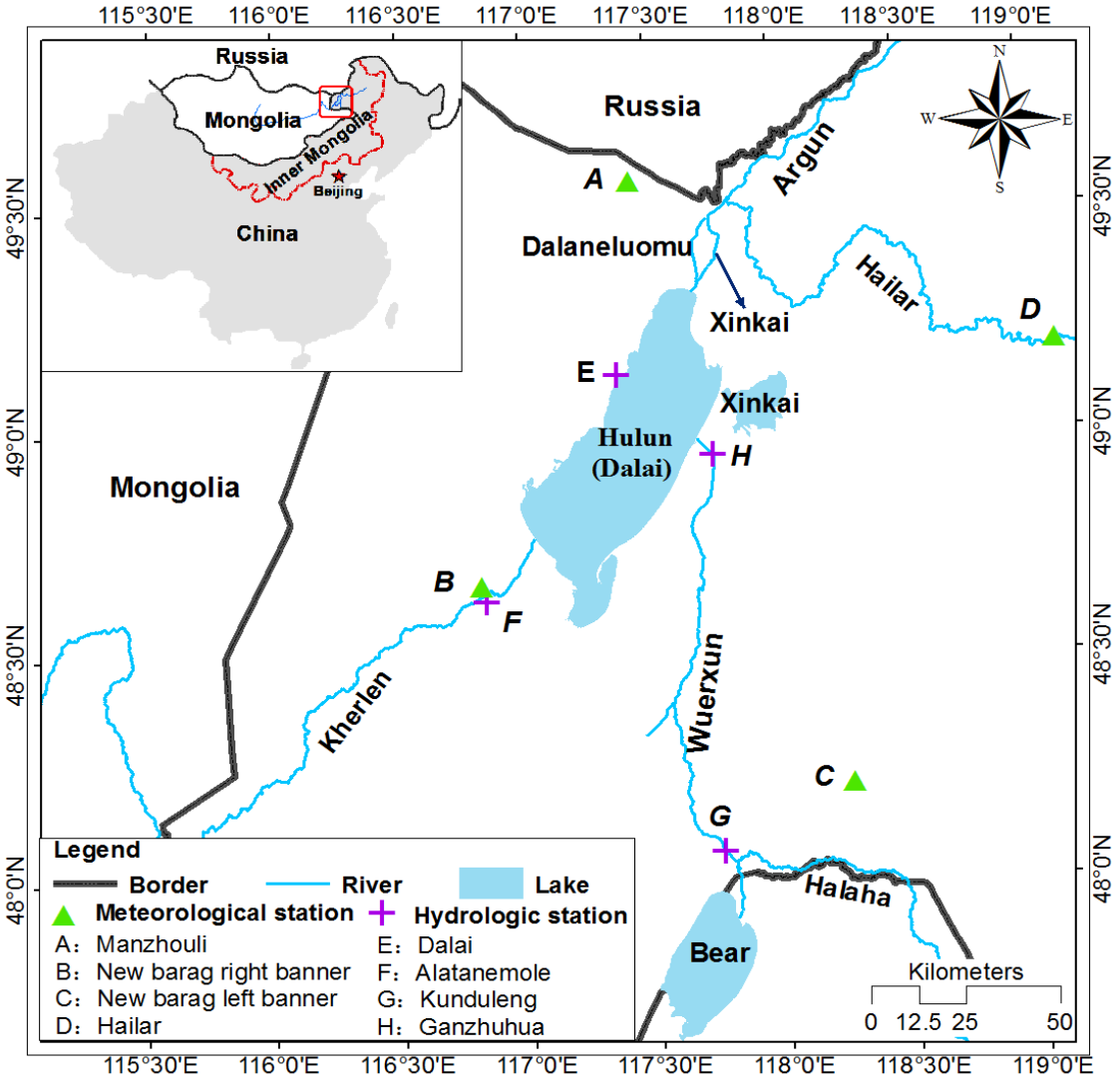


- Multi-million US dollar water transfer project started from 2007.

Objectives

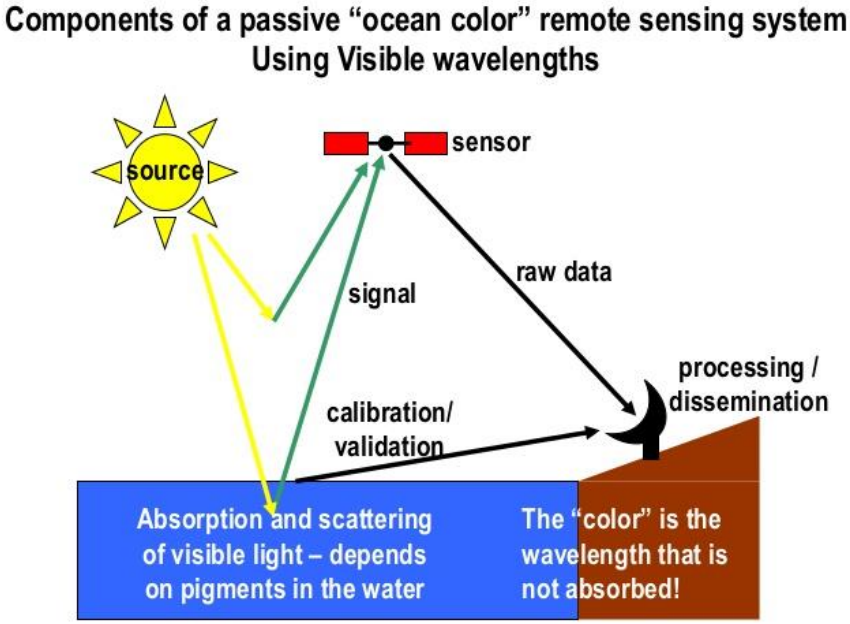
- To identify key drivers for falling water level
  - No major settlement around the lake
- To develop a modelling tool to manage lake water resources
  - For example, management of water account transferring from Hailar river

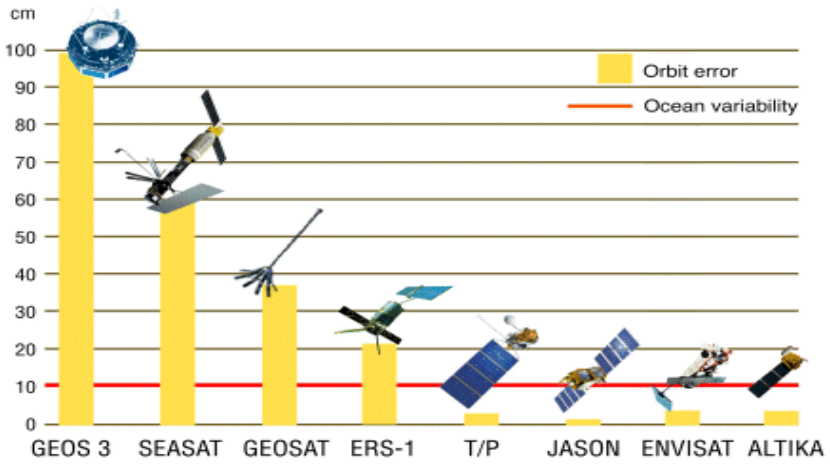
Data Collection



- Hydro. station:
  - River discharge
  - Rain fall
  - Evaporation
  - Temperature
  - Lake level (to 1980)
- Meteor. station
  - Rain fall
  - Temperature
  - Sunshine
  - Humidity

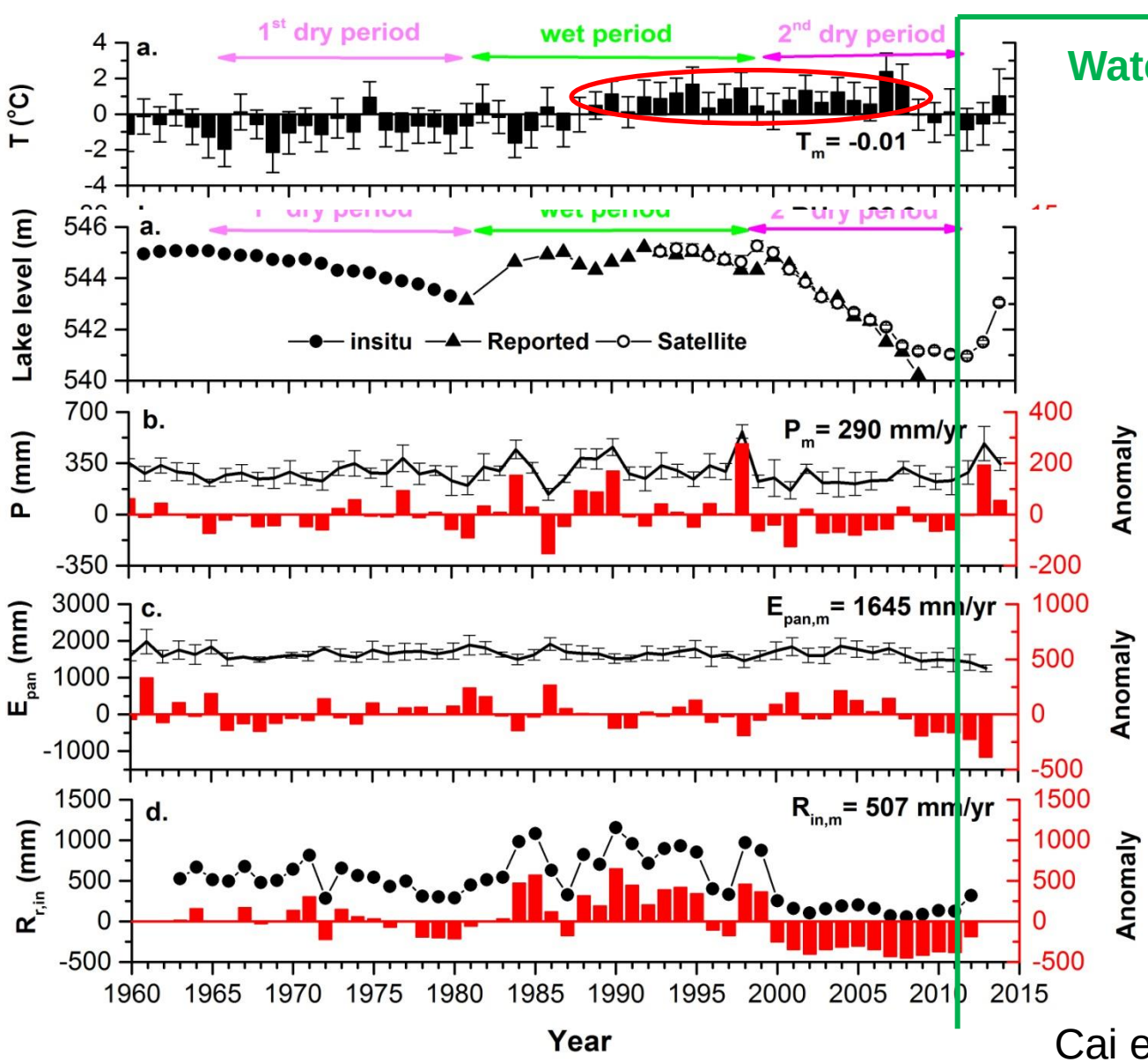
Satellite Altimetry





To reconstruct the lake water level after discontinuing ground-based measurements from 1980s

Five-Decade Data

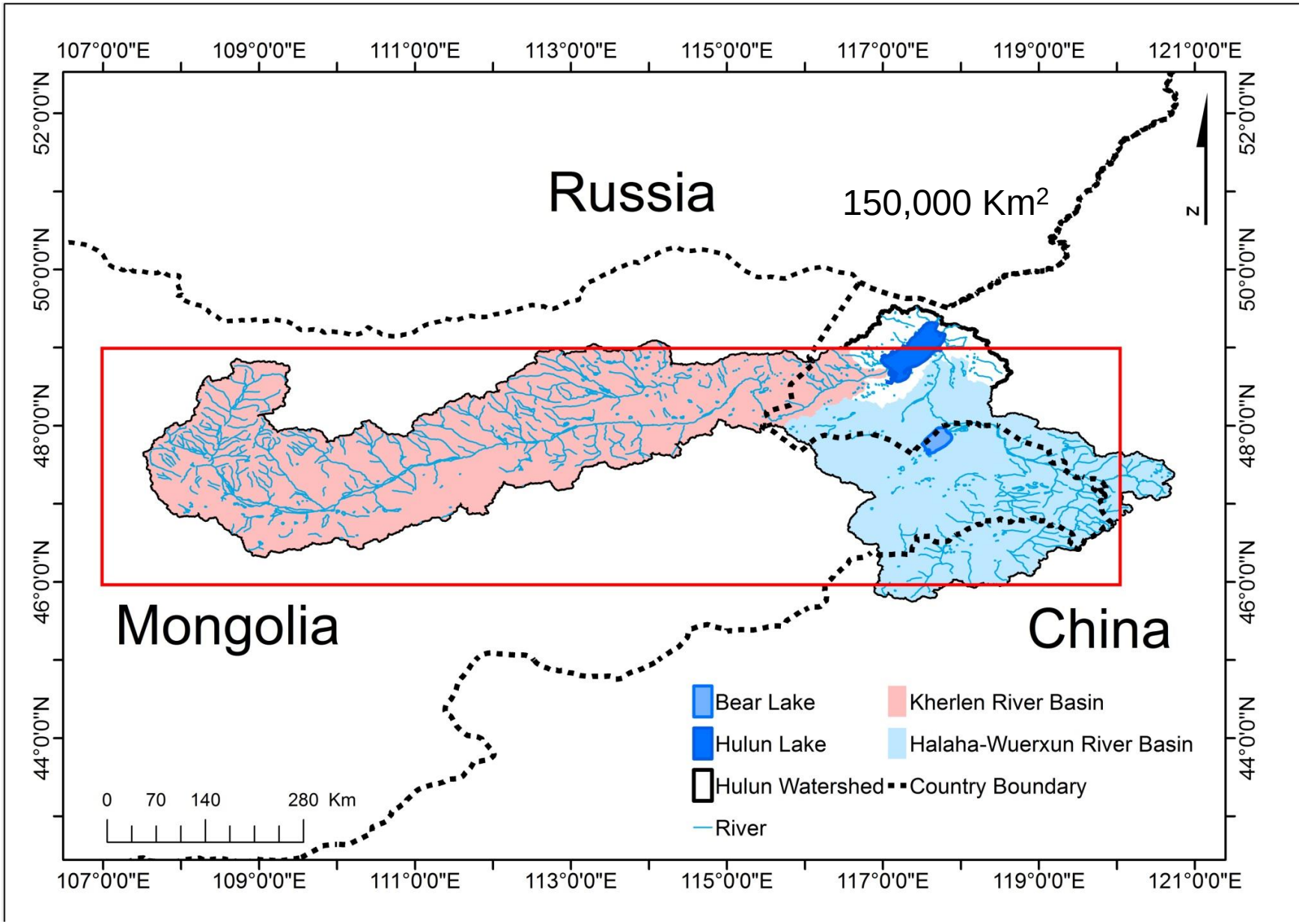


Cai et al (2016), ADWR

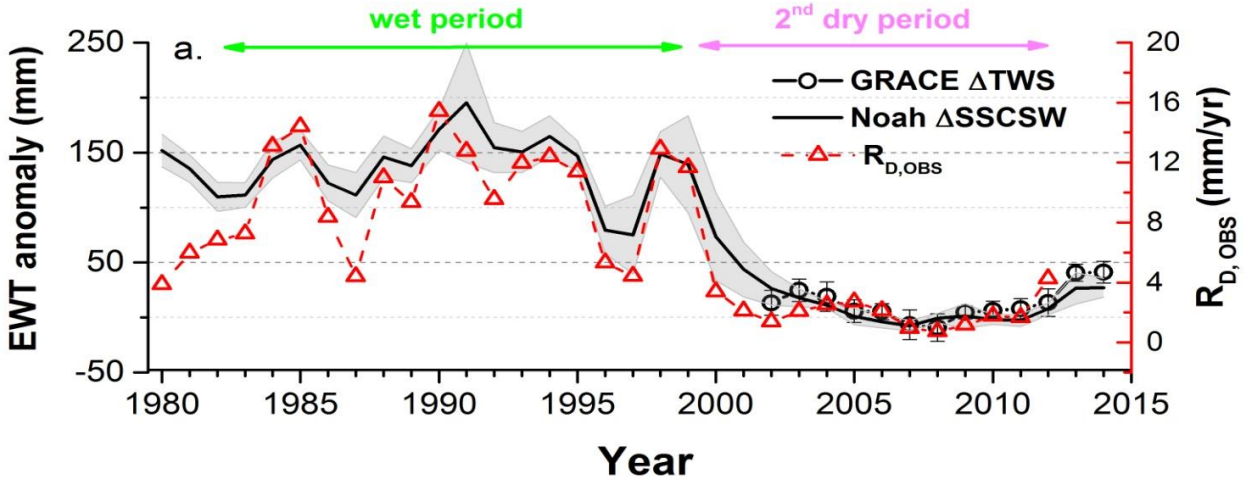
Key Drivers?

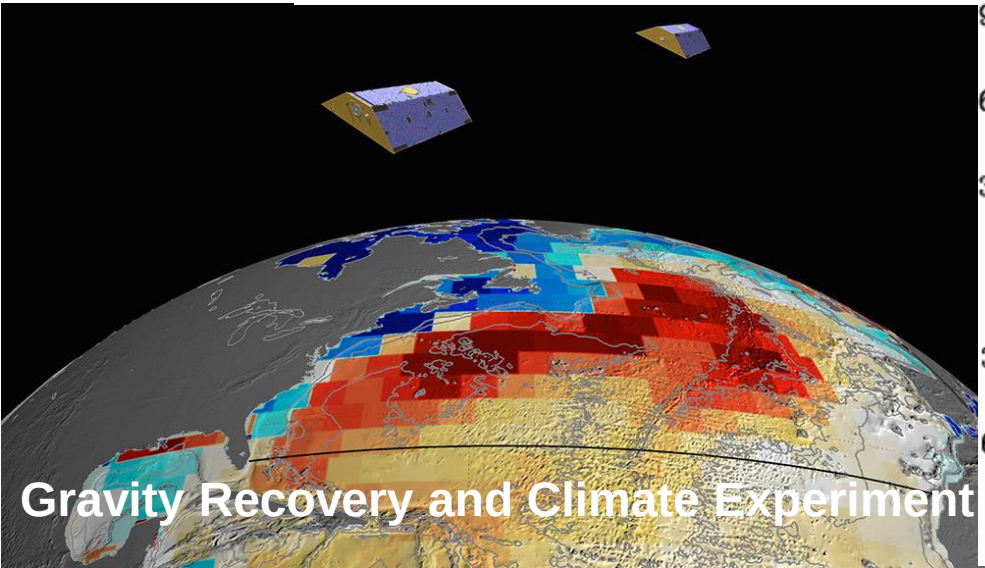
		$\Delta \boldsymbol{h_a}$	$\boldsymbol{P_a}$	$\boldsymbol{E_a}$	$\boldsymbol{R_{d,a}}$
Correction coefficient	Δh_a	1			
	P_a	0.34	1		
	E_a	-0.13	-0.18	1	
	$R_{s,a}$	0.57	0.26	0.01	1

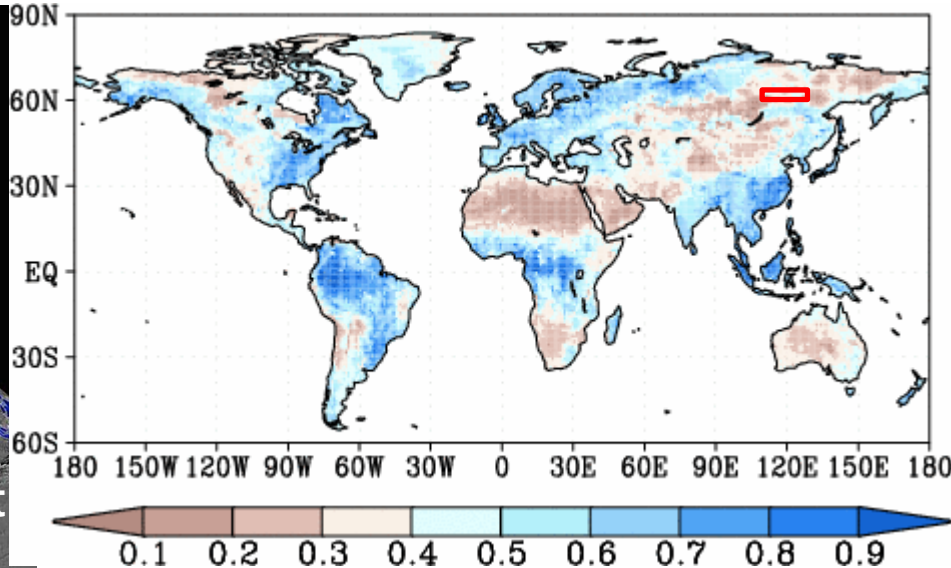
Lake Water Basin



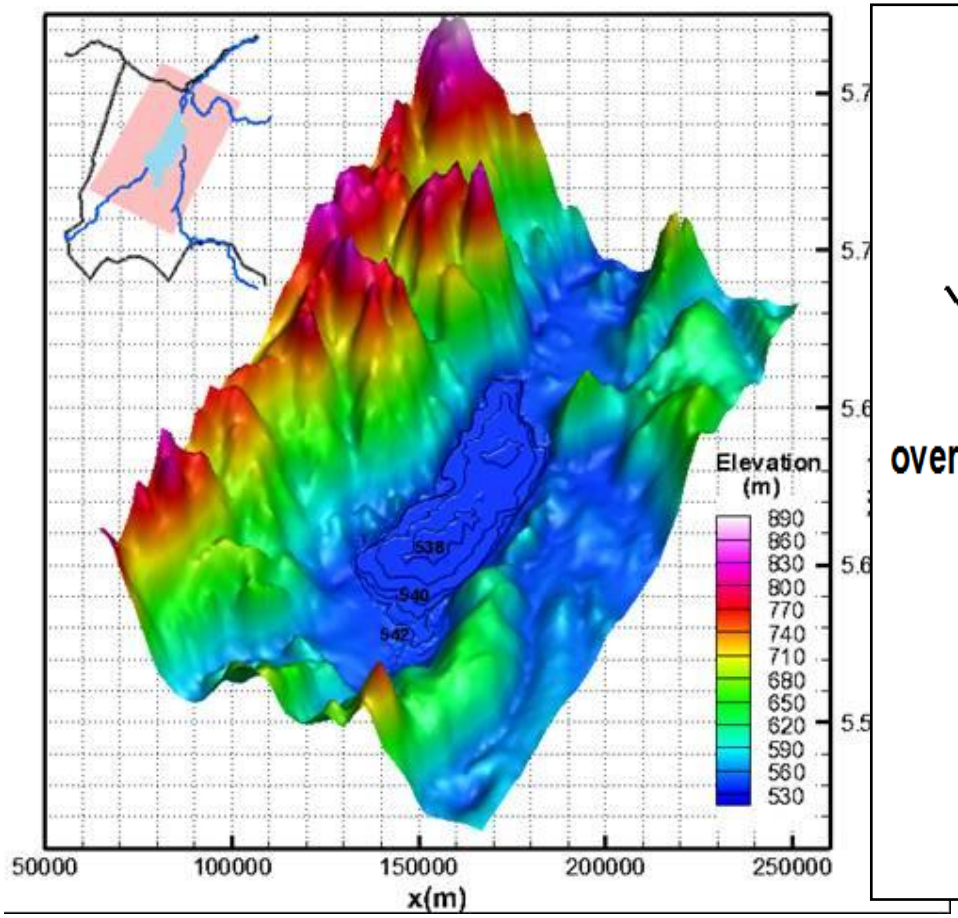
GRACE & Global Land Surface Modelling

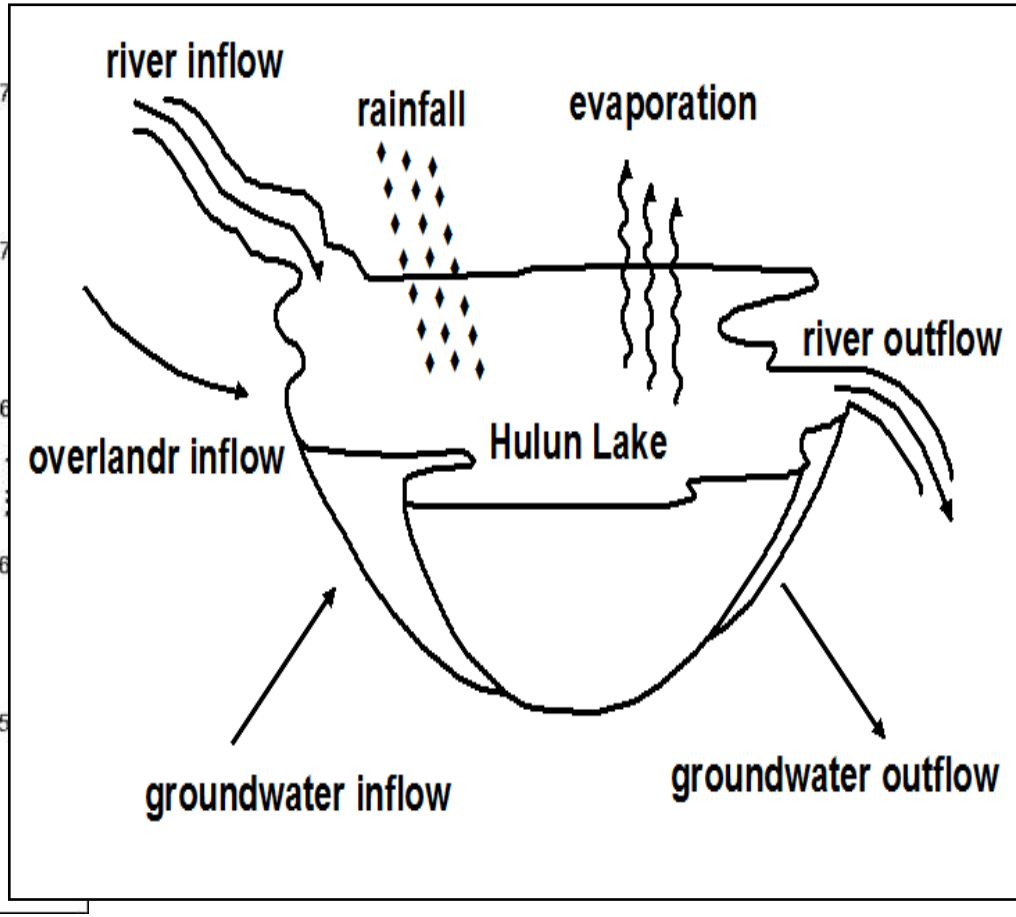




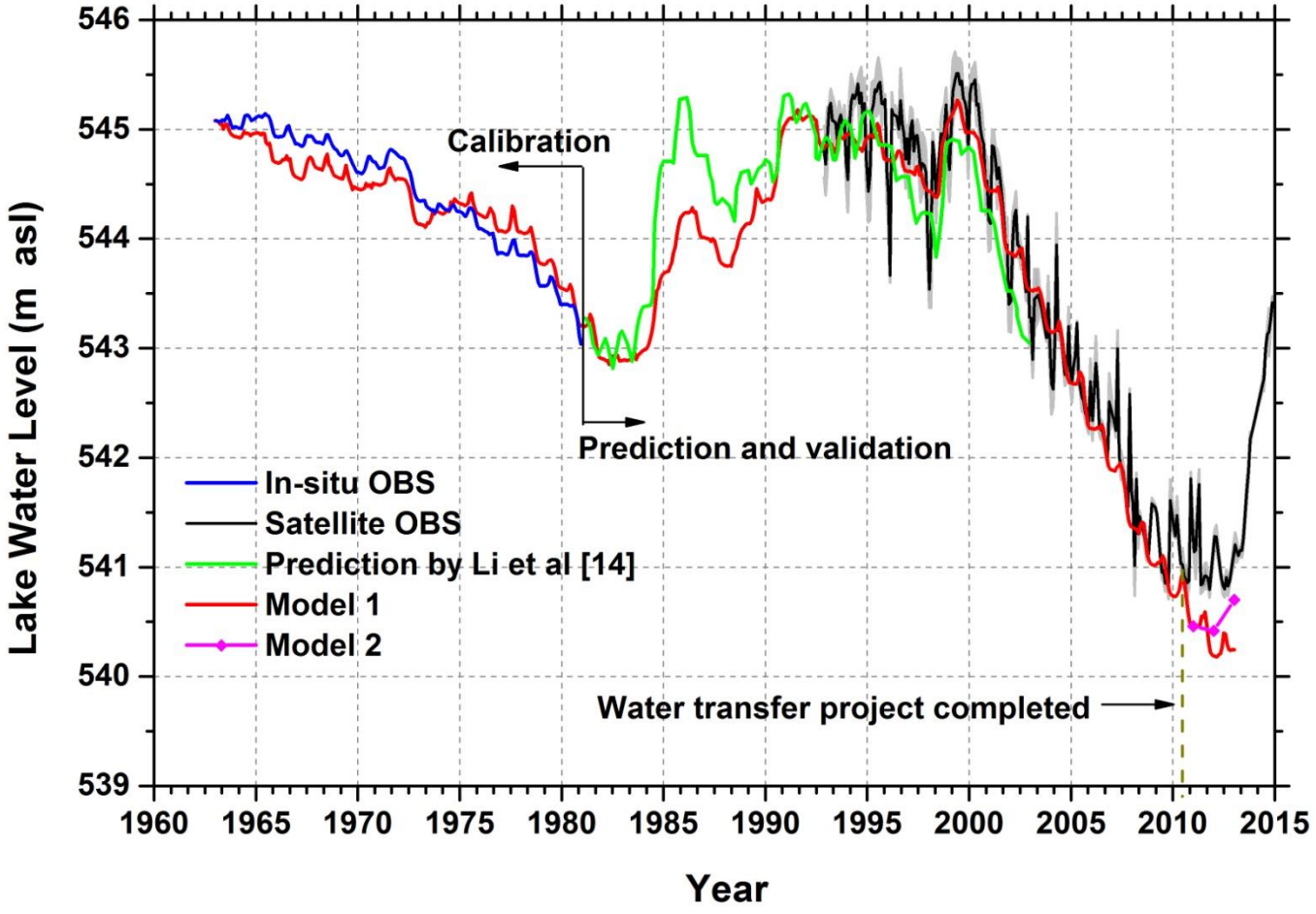


Water Balance Approach





Lake Level Predictions



2016

Conclusions

- The reduction of river discharge was the key factor for the lake water decline between 2000 and 2010
- The reduction of river discharge due to depletion of soil moisture with watershed
- The lake water balance model can provide useful tool to manage lake water resources


Eutropication of lake water

Lake Water Quality

- No outflow from the lake for 15 years
- Poor water quality of Hailar River via water transfer project
- On-going water quality research