Third Pole Environment (TPE) Programme

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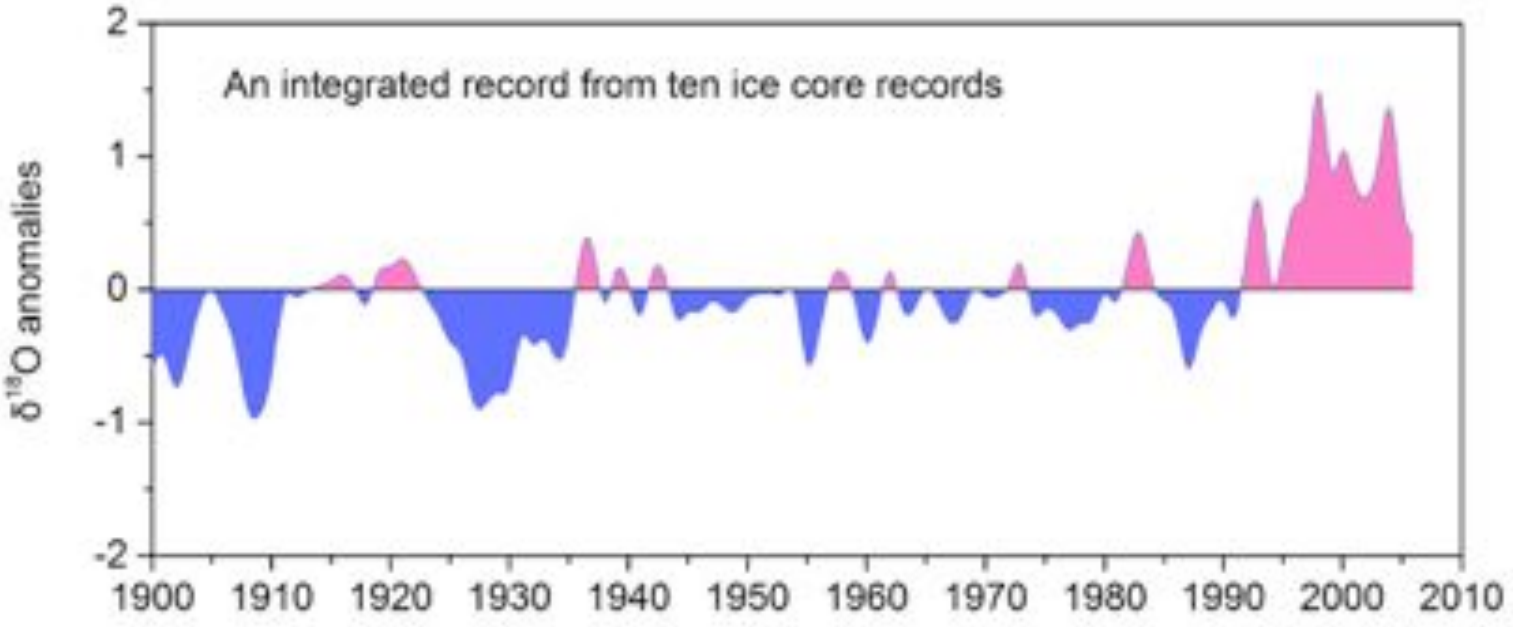
Chinese Academy of Sciences

TPEMIP workshop, 8-9 Dec. 2018, Washington

The Third Pole covers nearly 5 million square kilometers. It is the youngest, highest and largest plateau on the Earth. Third Pole environment changes affect more than 2 billion people in the region.

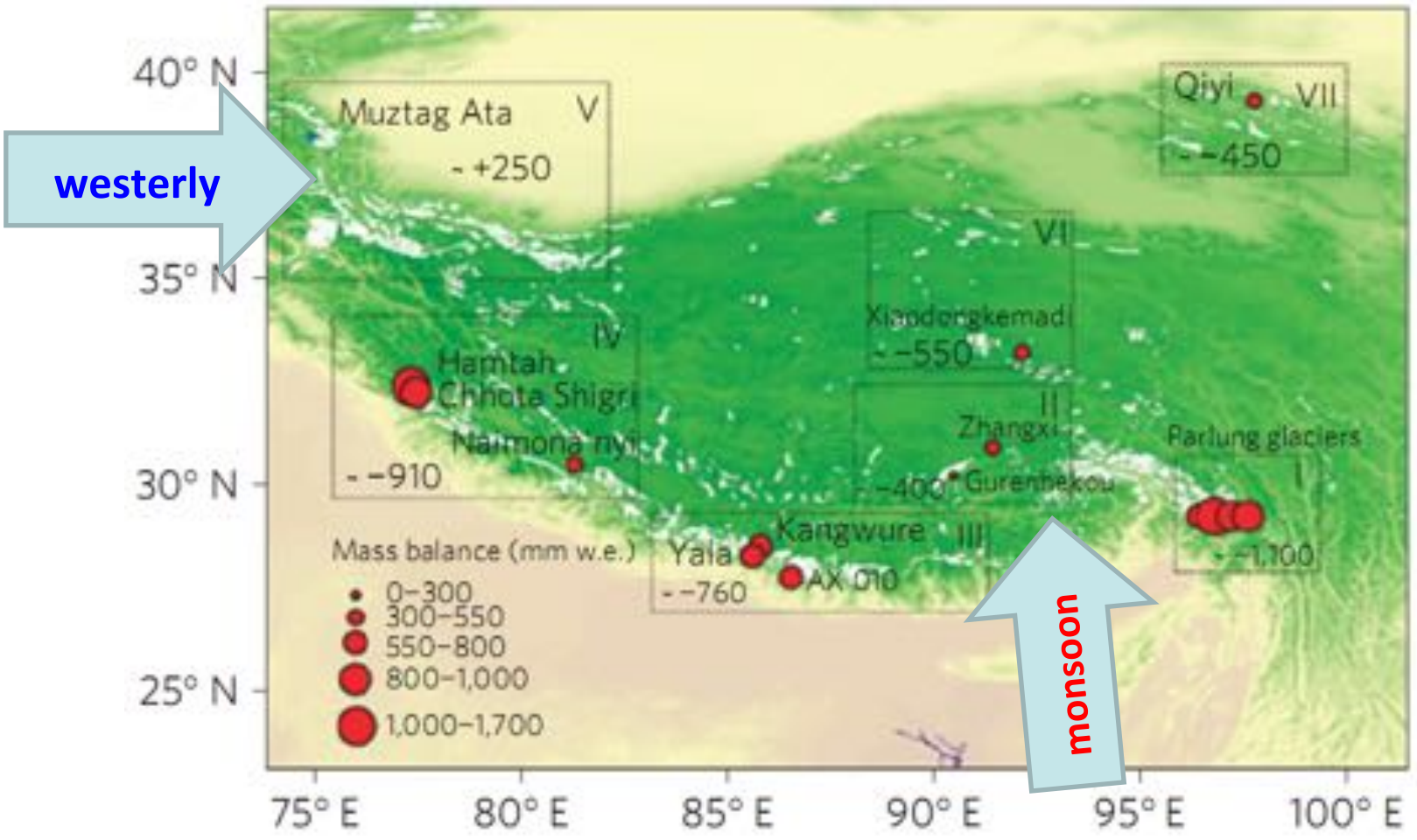
The Third Pole Provides Water Resources and Ecosystem Services for About 2 Billion People

The warmest is after the 1990s in the last 100 years



Data from Gao and Yao et al., J. Geophys. Res., 2015

Glacier mass balance change in the Third Pole region

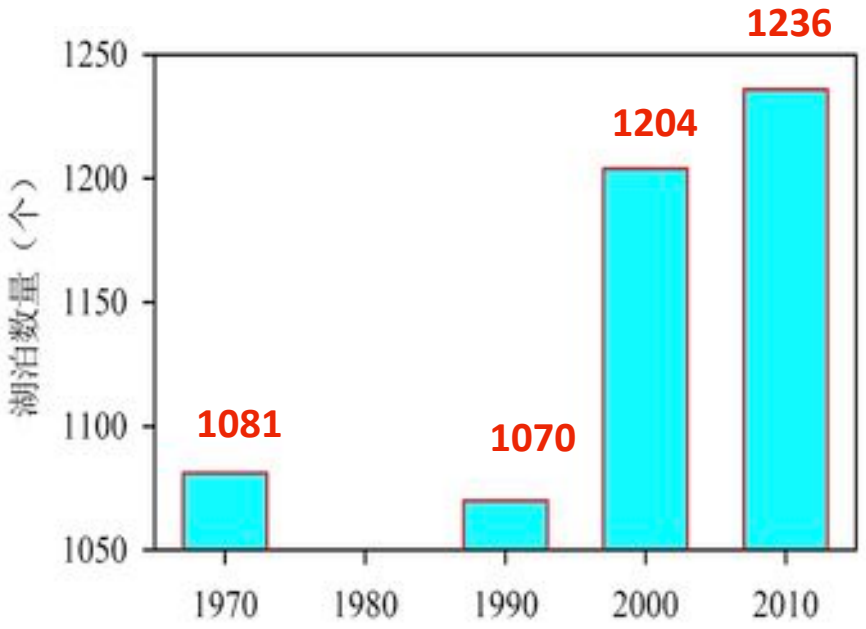


Pattern： **The most negative mass balance in the Himalayas, modest mass loss in continental interior, positive mass balance in in northwest Third Pole**

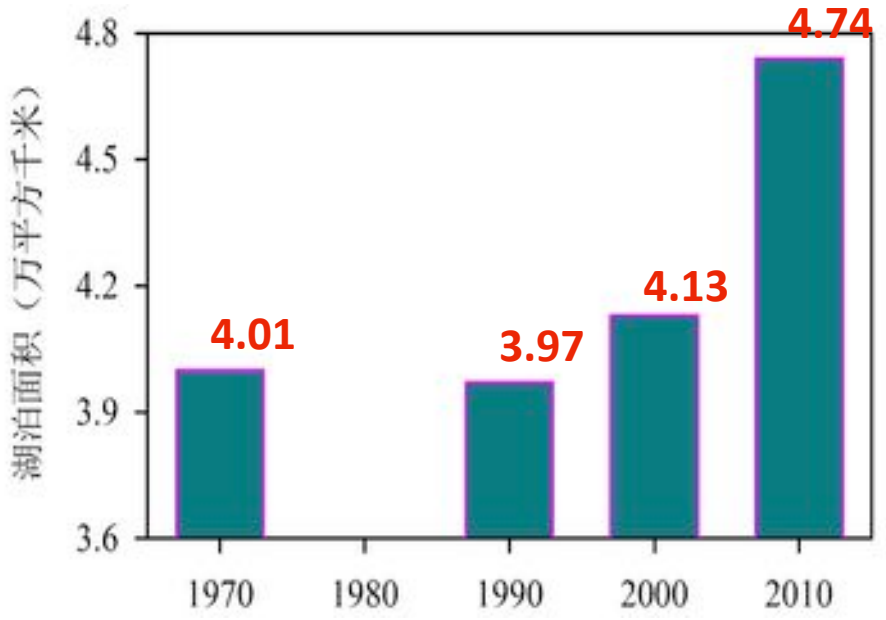
Yao et al., Nature Clim. Change., 2012

Increasing lakes in Tibetan Plateau of China in last 40 years

Changes of lake number

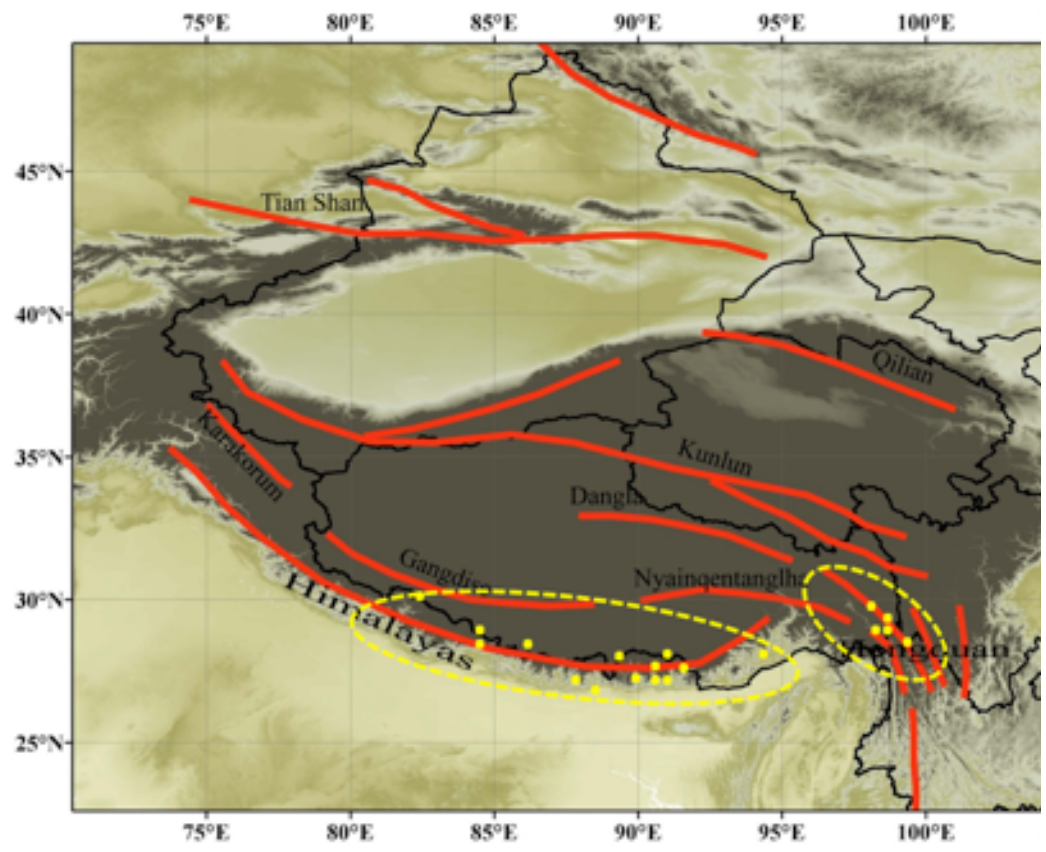


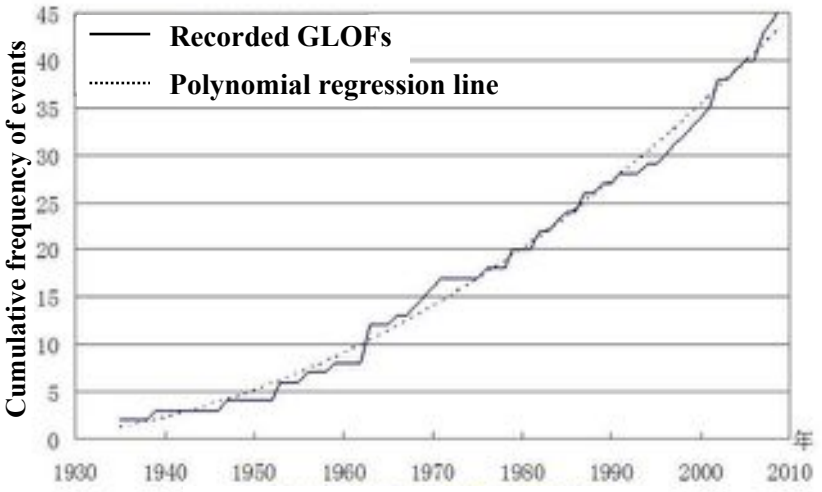
Changes of lake area (10,000 KM^2)



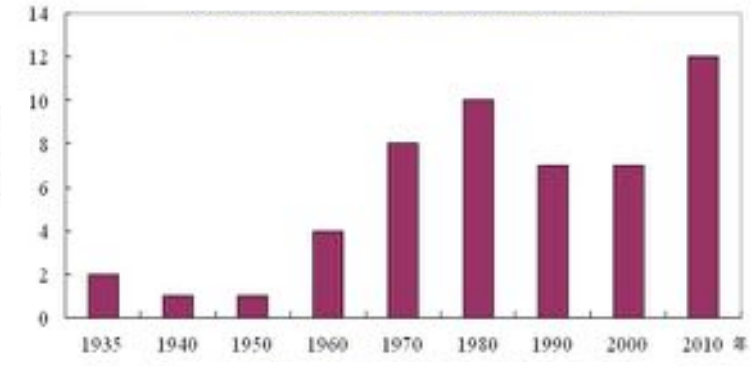
Only calculating the Lakes with area > 1 km^2

Glacial lake outburst (GLOF) . With global warming and glacial retreat, the frequency of GLOFs has increased in recent years.





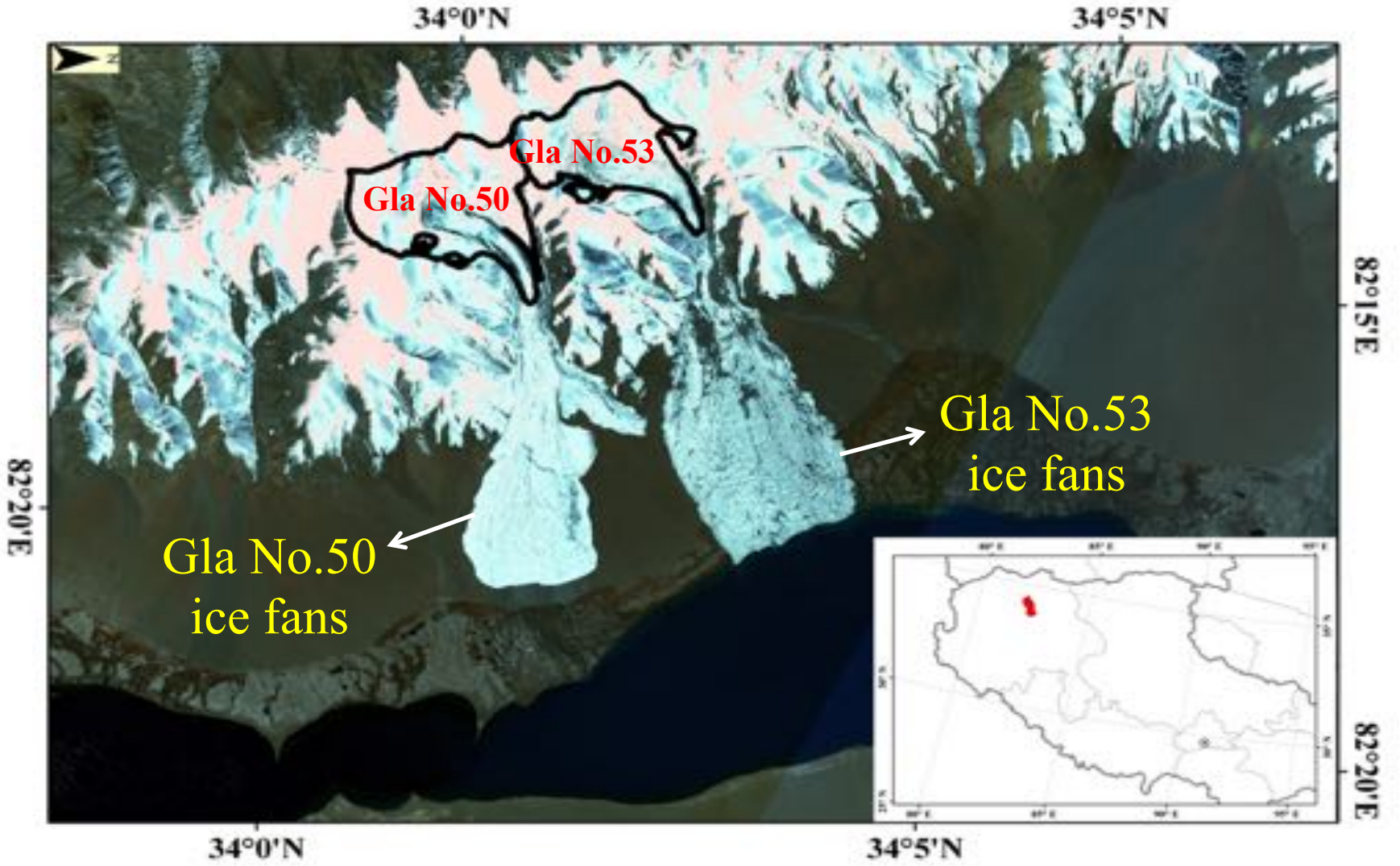
Cumulative GLOFs in China, Nepal and Bhutan



GLOFs in the Himalayas

Yao et al., Assessment of Environment Change on the Tibetan Plateau, 2015

Ice Avalanches in the northern Tibet in 2016



Third Pole Environment (TPE) Programme Launched in 2009 Supported by CAS

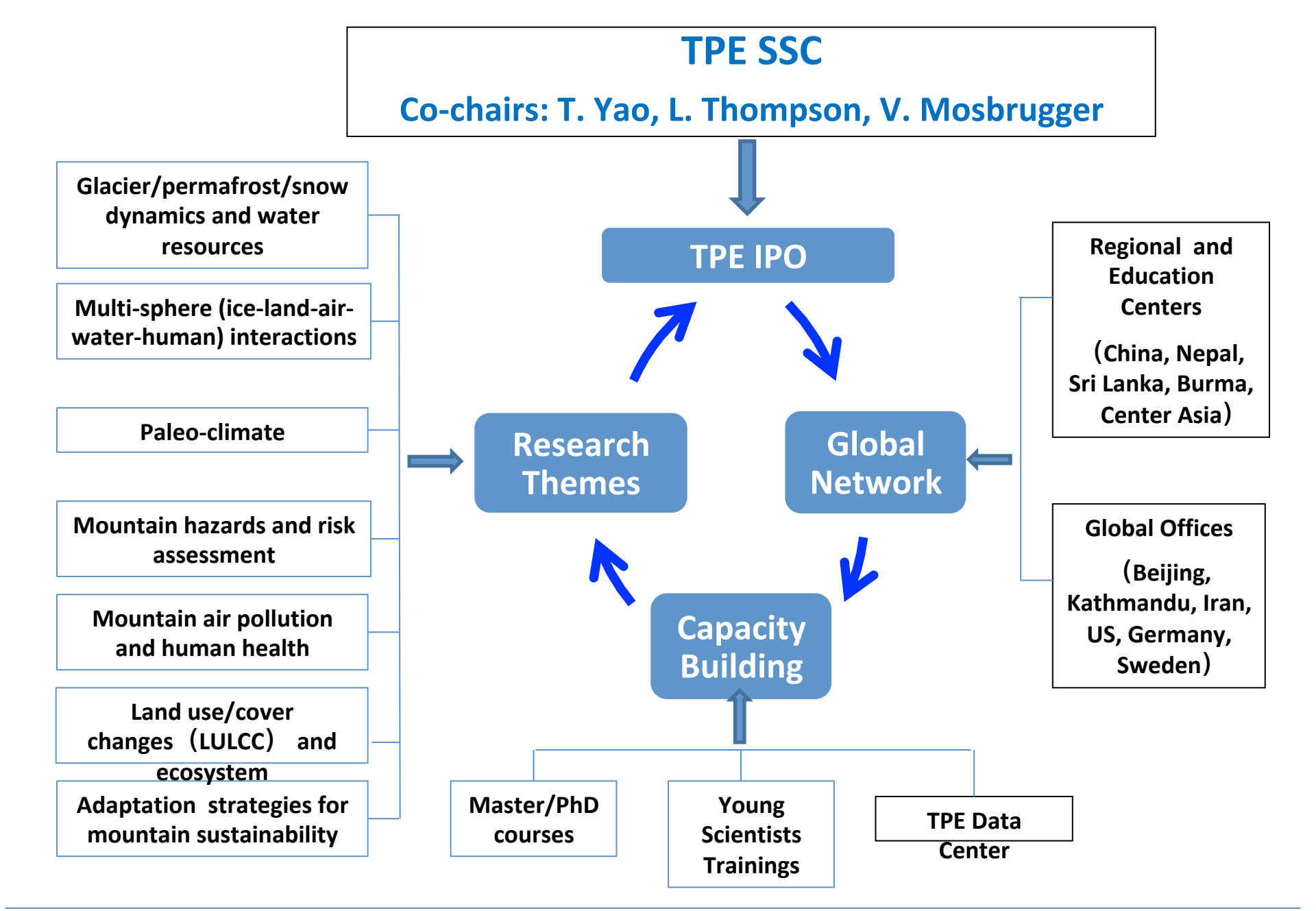
The Objectives of TPE

✓ To obtain a system understanding of the evolution of third pole and of its impact on the dynamics of the earth system: past - present - future.

✓ To understand the mechanism of Ice-Water-Atmosphere-Ecosystem-Human interaction in Third Pole region to support the sustainable development of the region.

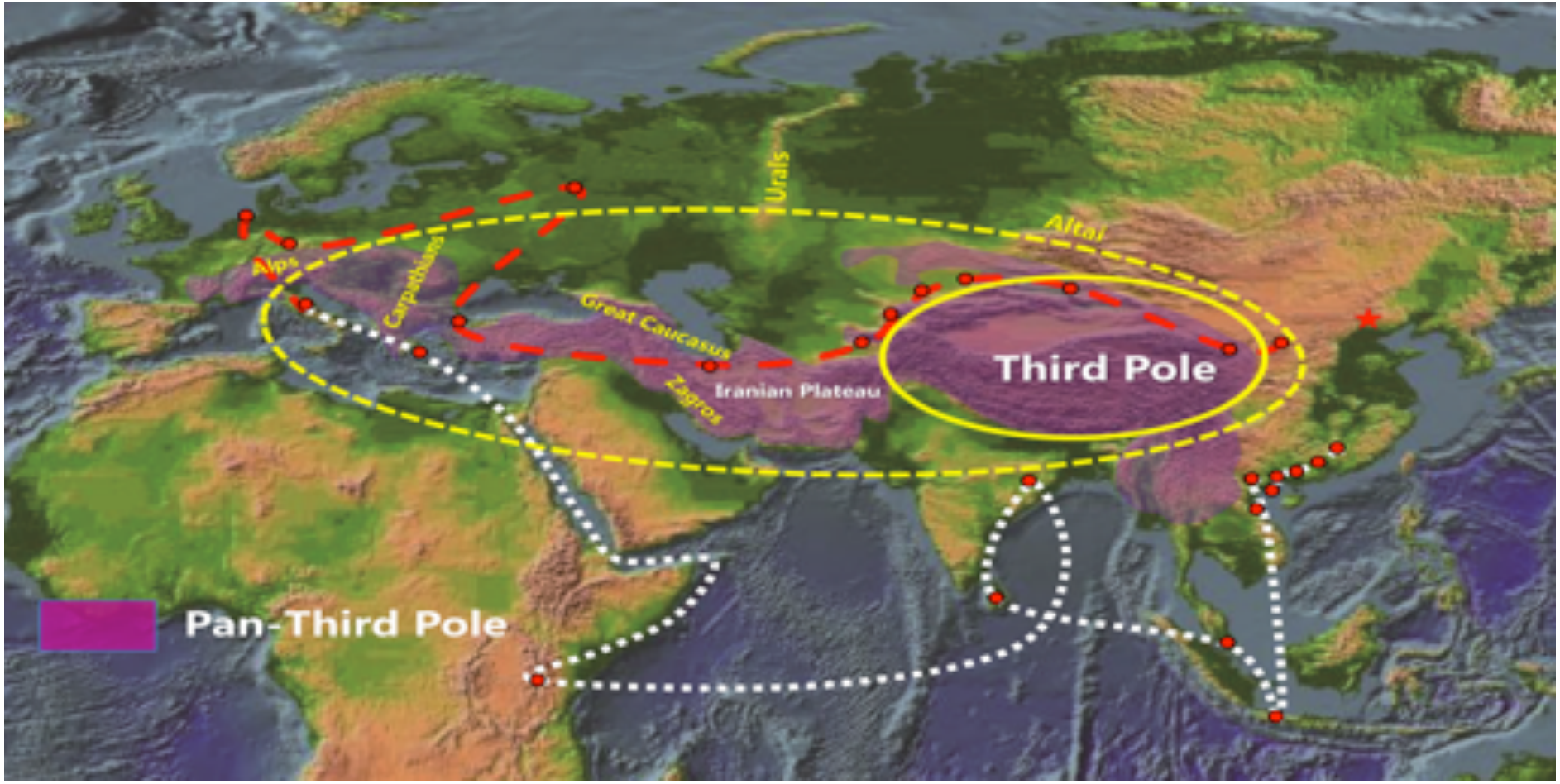
TPE Research Priorities

- ✓ The key earth system processes and their interactions among multi-spheres in Third Pole region
- ✓ The impacts of global change to Third Pole environment, livelihood and society.
- ✓ Scientific assessments and adaptation advices to government/ policy makers to support the sustainable development of the society



Structure of TPE programme

CAS Strategic Priority A Program: Pan-Third Pole Environment Study for a Green Silk Road (2018-2023, PI: Tandong Yao)



TPE
THIRD POLE ENVIRONMENT

Pan-TPE
PAN THIRD POLE ENVIRONMENT

Objectives of CAS Pan-TPE Program

- To illuminate Water Tower of Asia change and its impacts on the Silk Road associated with climate change and earth system interactions
- To reveal water-ecosystem coupling mechanism and to project future environmental consequences along the Silk Road under different climate scenarios
- To propose new models of green growth for the regions

TPE and GEWEX

GHP-TPE joint workshop

17-19 Oct 2017, Kathmandu

1. Atmospheric circulation in high-latitude and the Third Pole region
2. Remote sensing and data retrieval for cryosphere
3. Land-surface interaction water resource/cycle in high-latitude and the Third Pole region
4. Climate modelling and future projection for Third Pole
6. Natural hazards and human adaptation in Third Pole

Proposal of New GHP RHP Project:

Third Pole Environment (TPE) Water-Sustainability

TPE Water Sustainability (TPEWS)
----The Science Plan----

Scientific Questions

1. What are the changes in glaciers, snow and permafrost of the high Asian mountain region in last 50 years?
2. Why are these changes happening and what are the main drivers of these changes in Third Pole region? natural variability or human activities?
3. How are the various drivers affecting the hydrological cycle, natural hazard and ecosystem in the region?
4. Can we predict high-impact hydro-meteorological events and future water cycle changes?

TPE Water Sustainability (TPEWS)
----The Science Plan----

Research Priorities

1. Water-energy exchanges and transport over the Third Pole region based on observation (in situ and satellite)
2. Mechanisms and changes in hydrological cycle over the Third Pole region
3. Regional/global modeling focusing on Third Pole, especially improving modeling capacity and providing high resolution model products for the region
4. Data assimilation and prediction of high-impact hydro-meteorological events and future changes in hydrological cycle and water-energy exchanges