

SuMaRiO scientific advisory board

- Members and aims
- Meetings, work done
- Review

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Permafrost in the Chinese Tian Shan

- relevance for water balance and as hazard factor
[catchment of Aksu, P.R. China]

Lorenz King & Stephan Imbery

SuMaRiO scientific advisory board:

Aim of the scientific advisory board:

Review of report and amendments of project progress (80 to 125 pp.)

Transfer of expertise and experiences concerning work conditions in Xinjiang

Discussion on applicable scientific methodology

Members

- Christian Opp (university Marburg)
- Marco Roelcke (Braunschweig)
- Lorenz King (JLU Gießen)
- Emil Dister (KIT Karlsruhe)
- Ernst Giese (JLU Gießen)
- Philip Brunner (university Neuchâtel, Switzerland)

SuMaRiO scientific advisory board:

Meetings in Munich (07-2011, 12-2012, 02-2014)

- organized and led by Markus Disse & Christian Rumbaur (Munich), and co-leader Bernd Cyffka (Eichstätt)

Successful steps during SuMaRiO project:

- Excellent Information management, from the start of project
- SuMaRiO Flyers already in May 2011 (both, in English and German)
- SuMaRiO-Websites: information and data exchange, stepwise developed
 - Good Communication between different work packages
- List of publications (regular updates) in SuMaRiO project
- Initiation of different collaborations (institutions and projects (e.g. GLUES and others))
- **Final Sino-German Conference of SuMaRiO**
 - Presentation of Results and the DSS for the Tarim River Basin

Main difficulty:

- lack of official document of approval for SuMaRiO issued by MoST (Beijing) (door-opener to official institutions in Xinjiang)
 - interview officers in governmental institutions;
 - approval for field excursions, visa applications.

Overall impression:

- Very good cooperation within the SuMaRiO team:
 - Contributions to the amendments, scientific reports delivered in time
- “SuMaRiO progress report” well approved by the project sponsor BMBF (project evaluators from the Project Management Agency DLR)
 - Overcoming of project milestones → prolongation of the SuMaRiO project.

Some project highlights:

- Workshops in Xinjiang (“Sustainable use of the Tugai Forest along the Tarim River, evaluation of methods and management options”) with 38 participants.
- presentation of the SuMaRiO at the UN Convention on Biodiversity (with representatives of the Chinese Ministry of Environment, and the UN Convention to Combat Desertification - UNCCD)
- Workshops in Xinjiang with participation of stakeholders from different government levels and scientific institutions
- Stakeholder dialogues for land and water management in the Tarim River Basin

All the board members give their thanks to the leaders / managers of the project:

Markus Disse, Bernd Cyffka & Christian Rumbaur

Permafrost in the Chinese Tian Shan

- relevance for the water balance and
as hazard factors for a sustainable development
[catchment of Aksu, P.R. China]

assisted by Stephan Imbery

Project background (SuMaRiO, Aksu-Tarim),

Study objectives and research areas,

Methods and work done ,

Results and conclusions: Permafrost.

1. Project background:

The Aksu (DFG) project groups: “Climate Change and Water Resources in Western China”

AKSU TARIM-CLIM University of Würzburg: Heiko Paeth, Birgit Mannig

AKSU TARIM-CRYO University of Giessen: Lorenz King, Stephan Imbery

AKSU TARIM-MELT University of Munich: Wilfried Hagg, Elisabeth Mayr
Bavarian Academy of Sciences and Humanities:
Christoph Mayer, Martin Juen

AKSU TARIM-RS University of Dresden/Zürich: Tobias Bolch,
Juliane Peters, Tino Pieczonka

Cooperation Partners

- CAREERI, CAS, Lanzhou

(Cold and Arid Regions Environmental and Engineering Research Institute
Liu Shiyin, Li Zhongqin, Gao Qianzhao

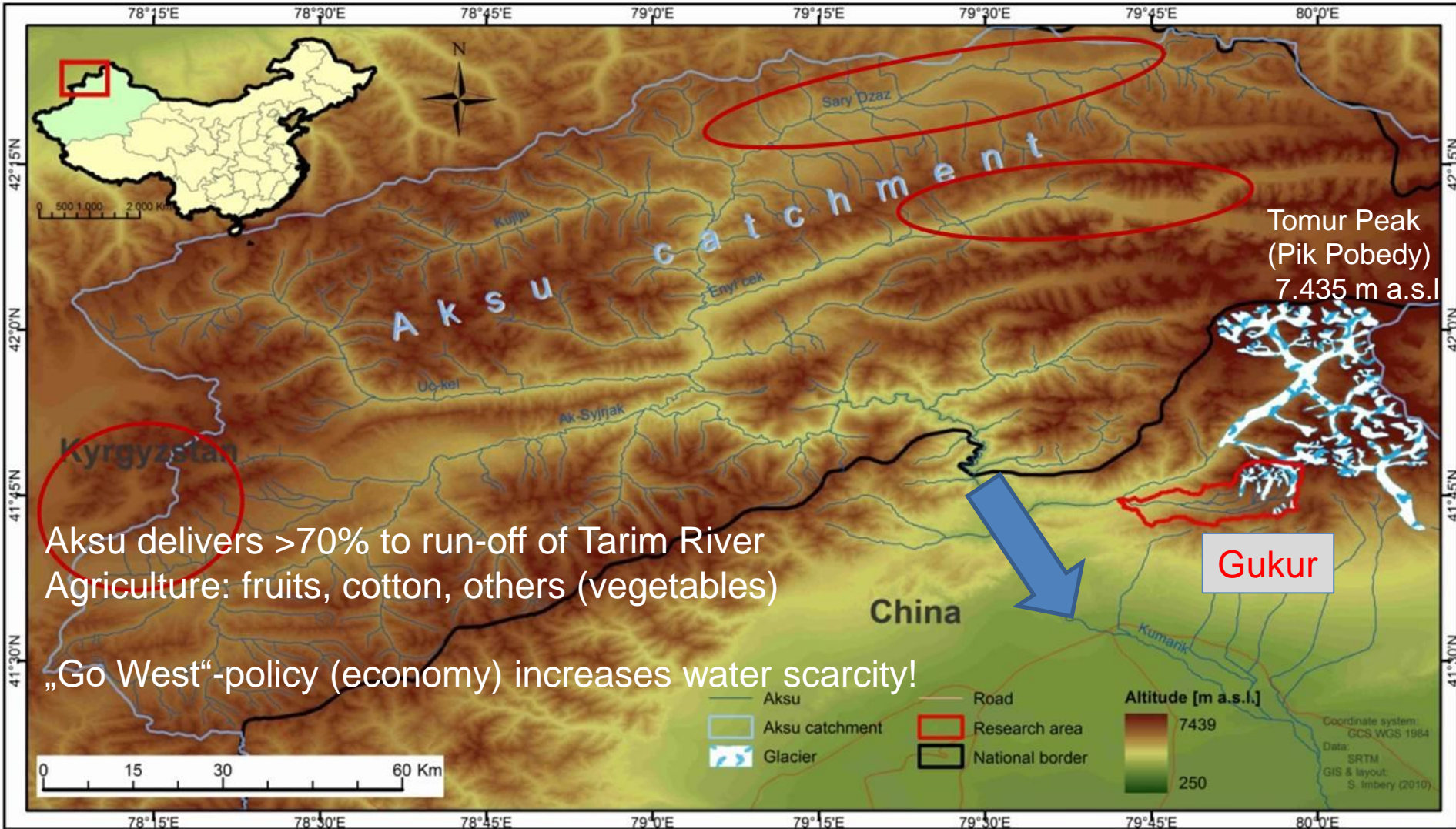
- Nanjing Institute of Geography and Limnology : Sun Zhandong; Gao Qianzhao

Study Objectives and research area

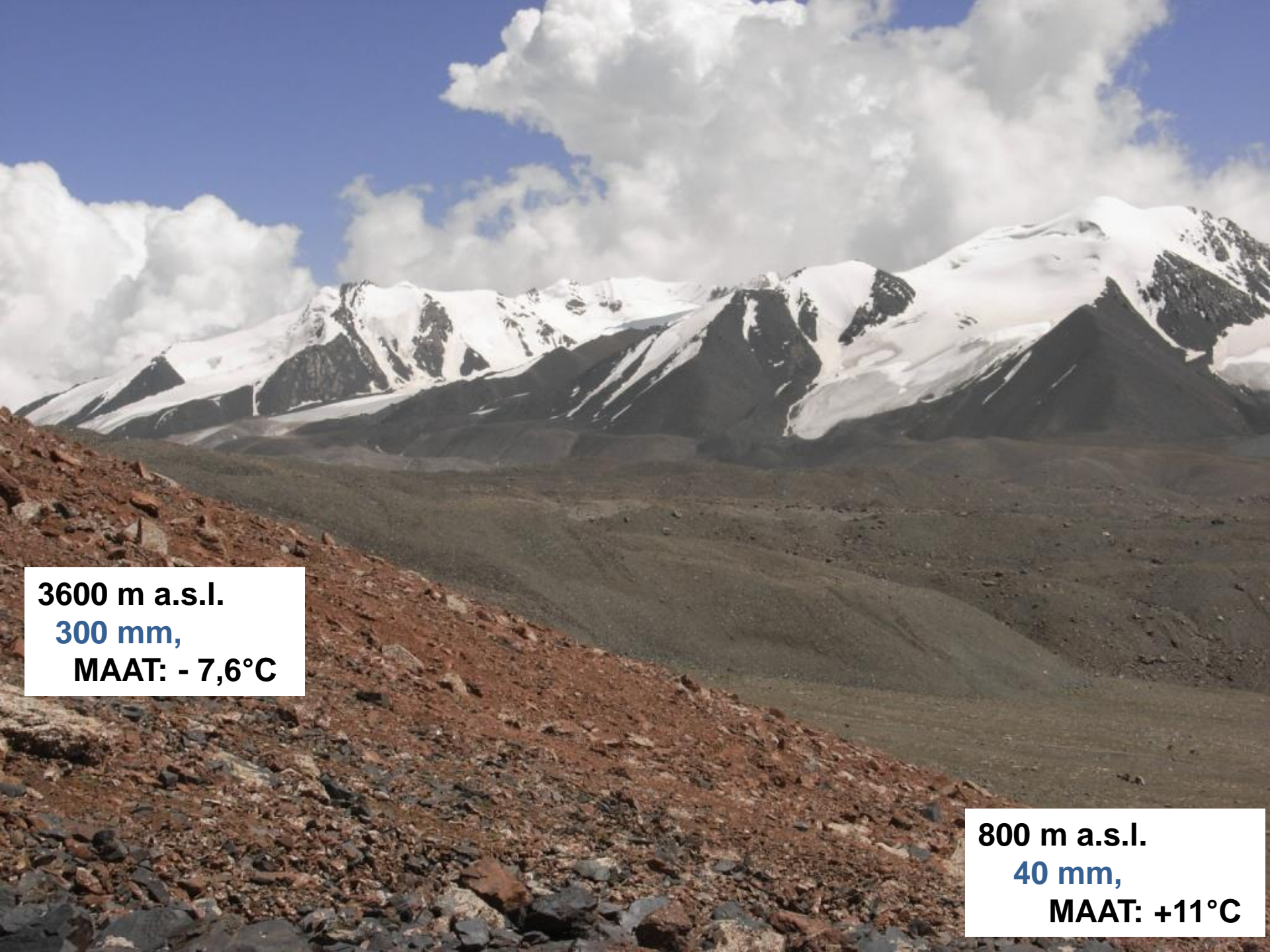
- New primary data for climate and ground temperature (loggers)
- Distribution and thickness of mountain permafrost
(model based on MASGT, topography, vegetation and snow cover)
- Regime of river flow and glacier run-off
- Glacier, Permafrost and Climate Change as Geohazards

Research area: Gukur catchment (130 km²)

Aksu and Gukur catchment areas (KYR + CN Tian Shan)



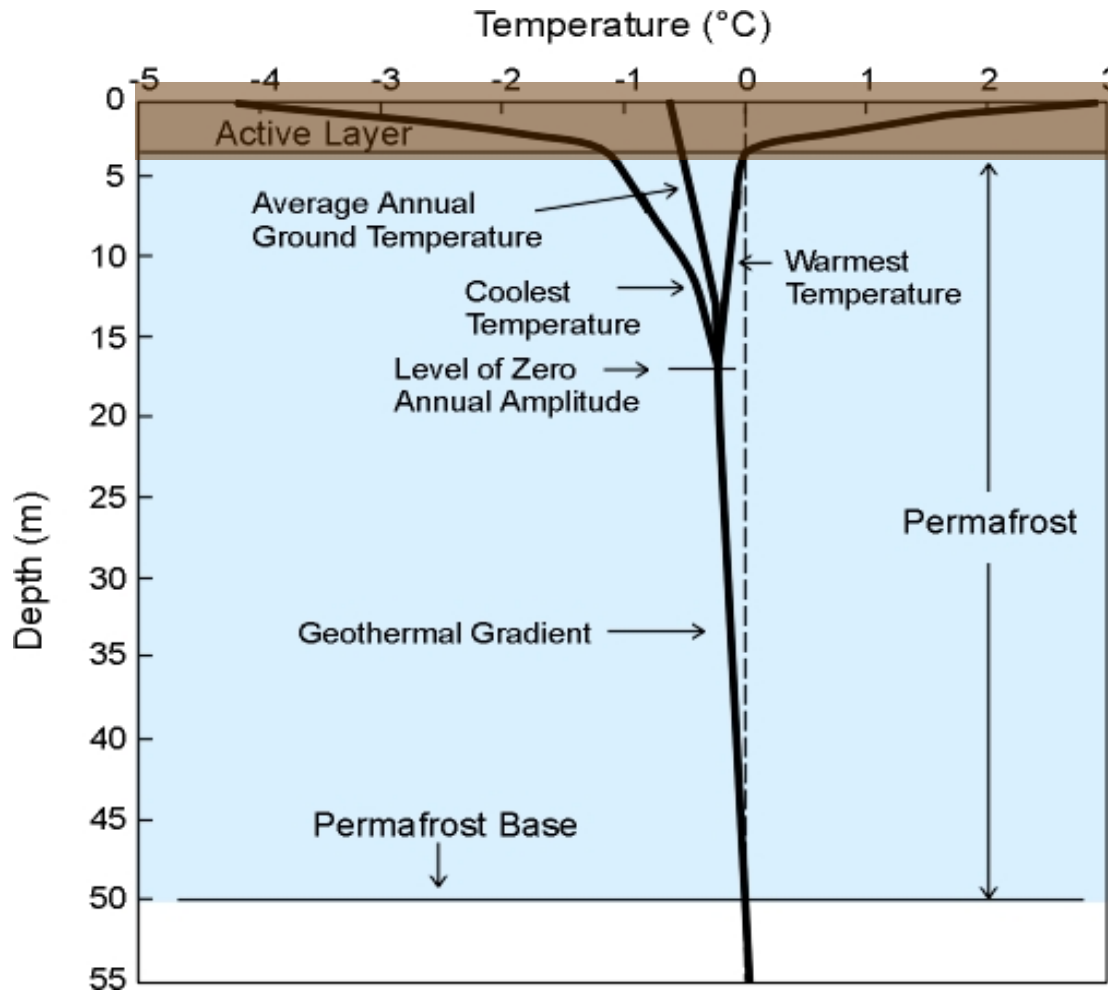




3600 m a.s.l.
300 mm,
MAAT: - 7,6°C

800 m a.s.l.
40 mm,
MAAT: +11°C

Glacier ice and ground ice under permafrost conditions



Source: Geological Survey of Canada (http://cgc.mcan.gc.ca/permafrost/whatis_e.php)

Debris cover

glacier ice,

massive ground ice,

interstitial ice,

ice in bedrock joints

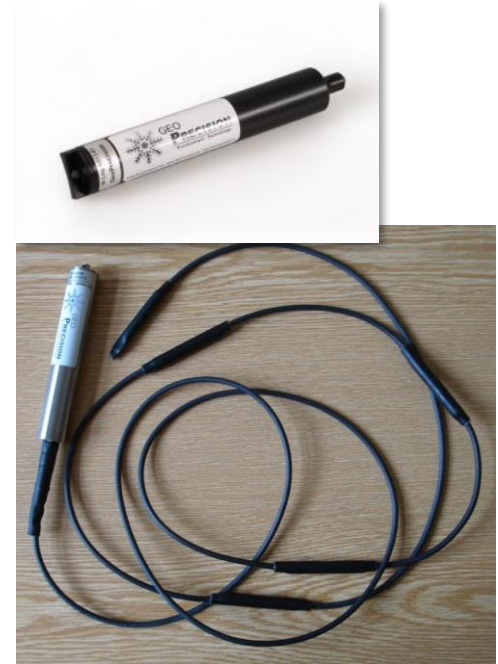
Ice below the active layer is conserved, also massive dead glacier ice

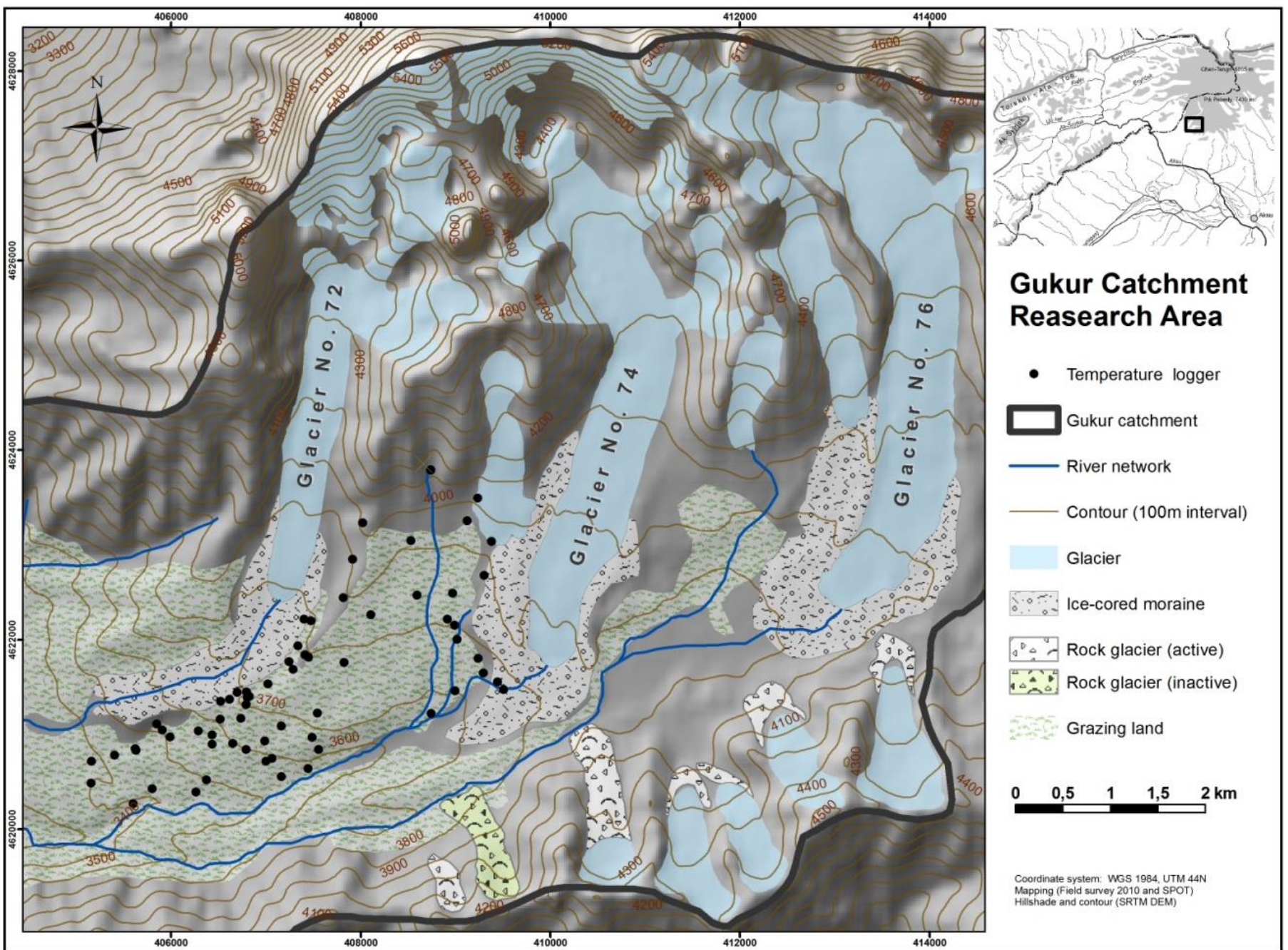
Methods and work done (permafrost studies)

- Temperature measurement chains connected to loggers, recording of hourly values over 3 years
- Single and multi chain loggers with 5 loggers, 120 cm depth (GeoPrecision and physics department at JLU)
- Accurate data can be recorded and stored up to 5 years (remote data read-out)

Gukur area (~130 km²)

- Installation at 69 locations (45 chains and 24 single loggers)





Gukur area: ~ 130 km²; 2.000 m – 6.000 m a.s.l.; Loggers: 2.476 m to 4.129 m a.s.l

Logistic success and difficulties



Inaktive rock glaciers



Solifluction lobes

Success:

Area reached by ATV

Snow may be in summer

Installation easily possible,

Read-out of data excellent

Difficulties:

-> No field work possible after 2010 in Gukur area

2011: -> short term refusal of permission 14

-> Loggers are read by Chinese partners

2012: -> Loggers are read by Sun Zhandong,
(Gao Qianzhao) snow in summer 2012 !!

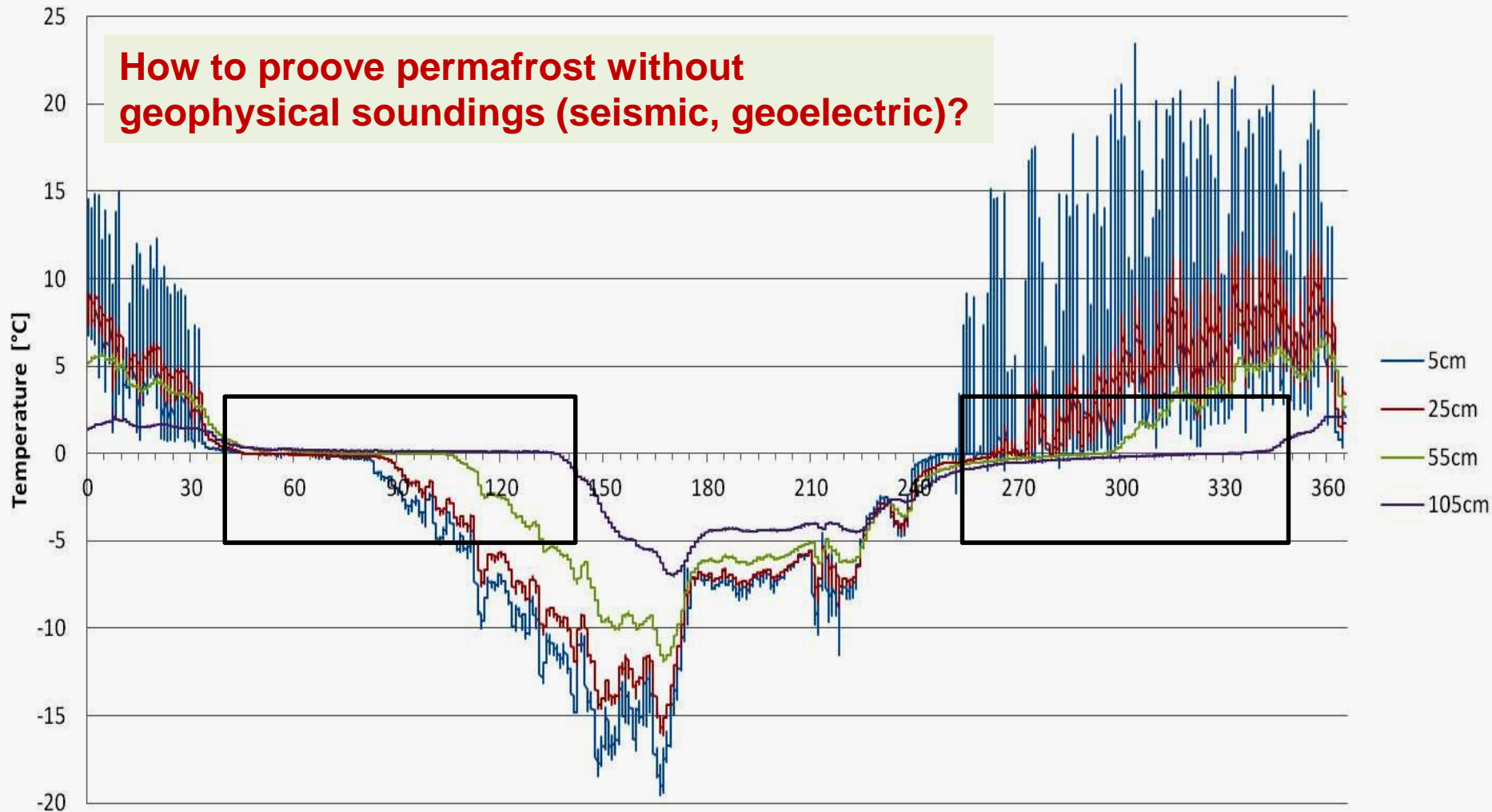
Studies continued 2011 and 2012 in Kyrgyzstan



Stone stripes

**Zero curtain effect: Freezing and melting releases / needs energy
-> Zero curtain is an indicator for massive subsurface ice**

Ground temperature (A1022B 14.08.2010 - 13.08.2011)



Permafrost distribution model

(may be used in other areas)

$$MAGST = -0.005909 * altitude + 9.065E - 07 * PISR + 0.02787 * NDVI + 18.33$$

	MAGST	Altitude	PISR
NDVI	0.45	-0.47	0.08

$$MAGST = -0.006227 * altitude + 9.418E - 07 * PISR + 19.23$$

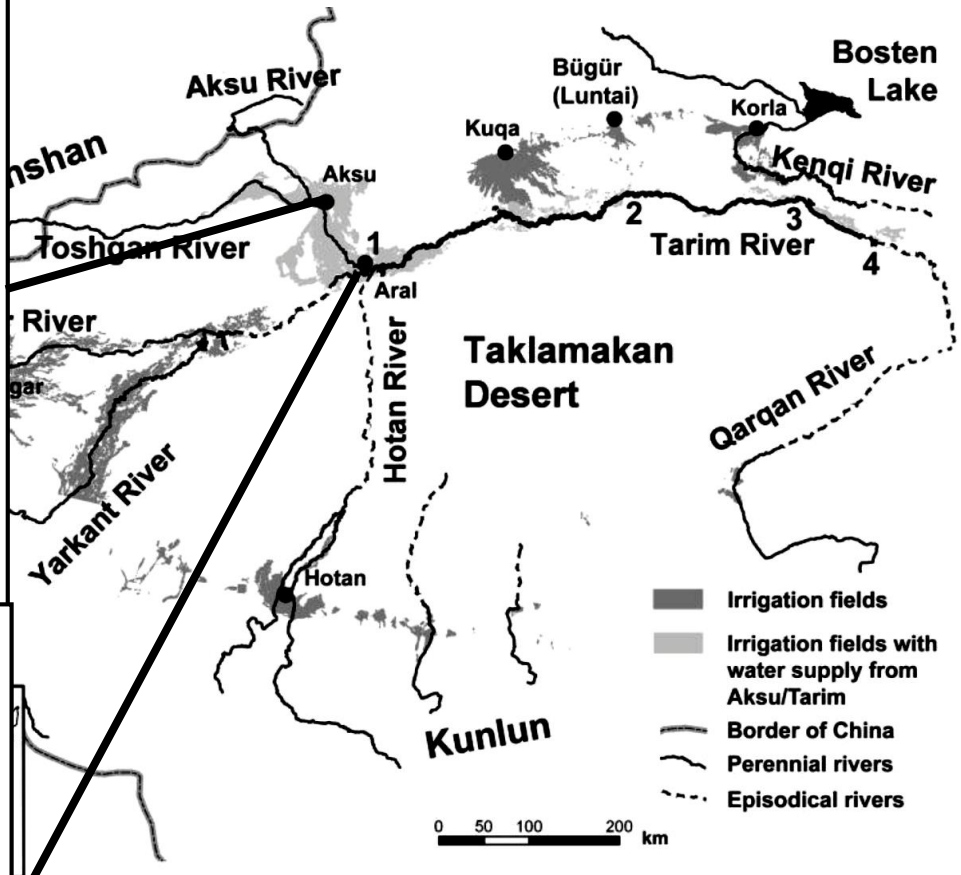
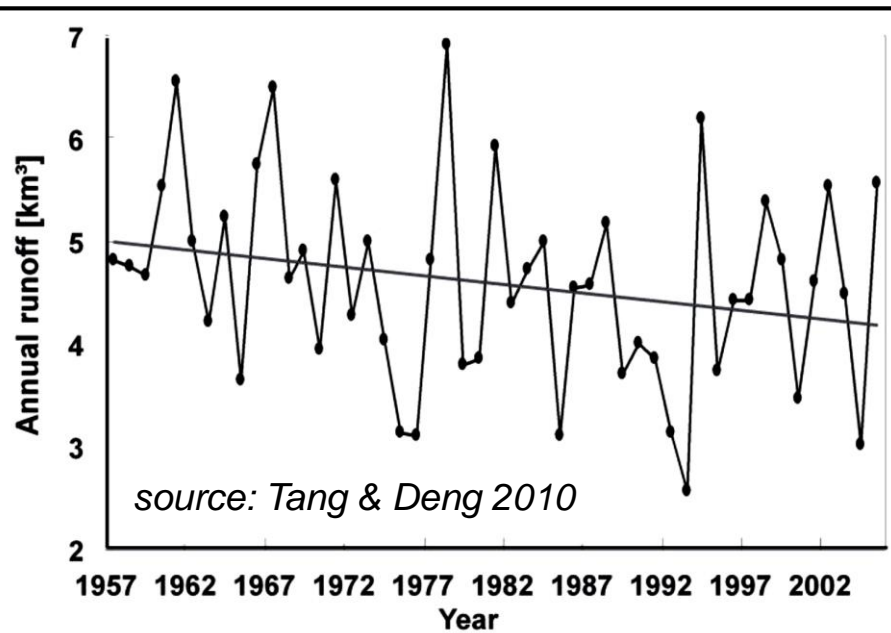
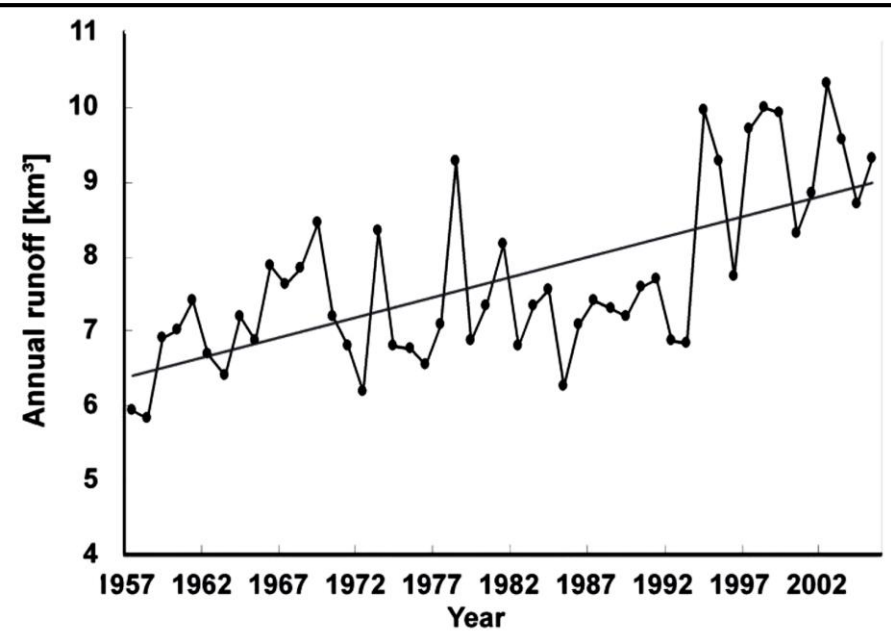
permafrost presence:

MAGST < -2 °C medium certainty; -2 °C < MAGST < 0 °C low certainty

permafrost absence:

0 °C < MAGST < 2 °C low certainty; MAGST > 2 °C medium certainty

Longterm consequences concerning run-off

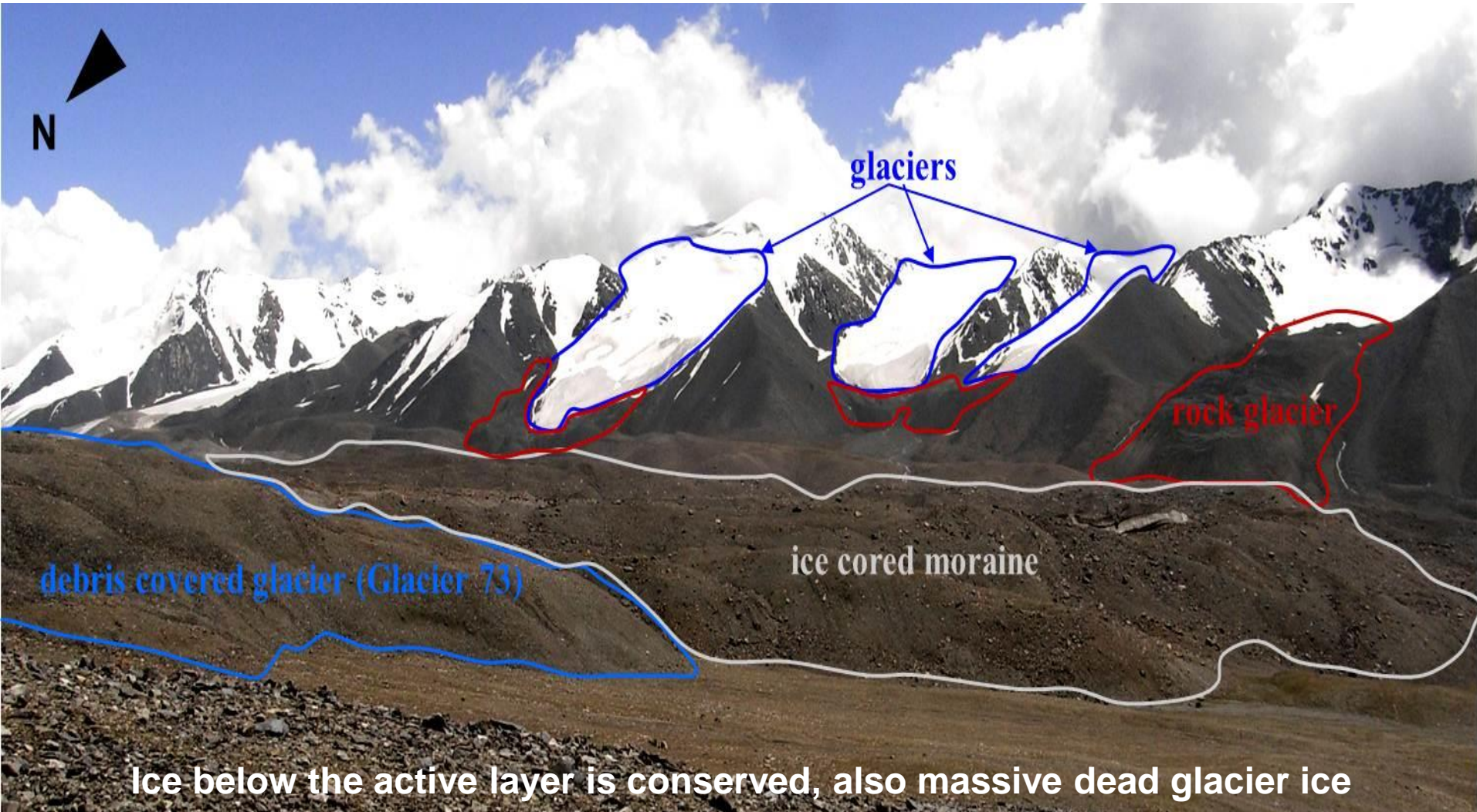


source: Thevs 2011

Little effect of permafrost melt on run-off

**Glaciers and permafrost:
Danger of Hazards, e.g. floods.**

Glaciers, Moraines and Rock Glaciers (Permafrost Conditions)



Ice below the active layer is conserved, also massive dead glacier ice

Gukur area, 2010 (not to scale)

Imbery, Stephan (2014): „**Permafrost distribution modelling in the Aksu catchment, Central Tian Shan**“

PhD thesis, JLU Giessen, 98 pp.

<http://geb.uni-giessen.de/geb/volltexte/2014/10973>

**Results — Glacier, Permafrost
and Climate as a Geohazards
(GLOFs)**

**Presentation on Saturday,
December 13, 2015**





Cold and Arid Regions Environmental and Engineering
Research Institute, Chinese Academy of Sciences

謝謝

Thank you !



AKSU-TARIM
阿克苏市 - تارىم دەرياسى

