Upper Indus Basin Network

Country progress report

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Yunnan University

1. UIBN-CN framework

Kickoff meeting of the UIBN-CN

UIBN-CN kickoff meeting was held during 15-16 July 2019, Kunming, China.



UIB-N China Chapter

Chair of the scientific steering committee：QIN Dahe

Advisor CN：	**Prof. DENG Wei, IMHE/SCNU**
Coordinator：	**Prof. HE Daming, YNU**
Co-coordinator:	**Prof. DING Yongjian, NIEER**
	Prof. CHENXi, XIEG
	Prof. NI Guangheng, Qsinghua U
	Prof. LIU Yansui, IGSNRR
	Prof. WANG Naiang, LZU
Joint office：	**Prof. LIU Shiyin, YNU**
	Prof. WU Yanhong, IMHE

Working group

TWG	TWGs Names	Coordinator/Coodinator
Group 1	Framework of data collection, quality and standardization	YANG Kun (Qsinghua U) ; LI Xing , ITPCAS; Bao Anming, IAP
Group 2:	Climate change, air pollution variability and black carbon	TIAN Lide, YNU; SU Buda, CCCC; JIANG Dabang, IAP
Group 3:	Cryosphere monitoring and modelling	ZHANG Yinsheng, ITPCAS; LIU Shiyin, YNU; KANG Shichang, NIEER
Group 4:	Surface and groundwater hydrology, water availability and demand	CHEN Xi, XIEG; YANG Dawen, QsinghuaU; LUO Yi, IGSNNR
Group 5:	Understanding and managing hazards and risks	CHEN Ningsheng, IMHE; DI Baofeng, SCU; Meng Xingming, LZU
Group 6:	Managing gendered socioeconomic impacts through adaptation measures	WANG Zhuo, SCU; FENG Yan, YNU; FANG Yiping, IMHE

Four keynote sperkers were invited to give the presentations

2. Progress of the 6 Technical working groups

2.1 Progress of the Institute of Tibetan Plateau Research, CAS

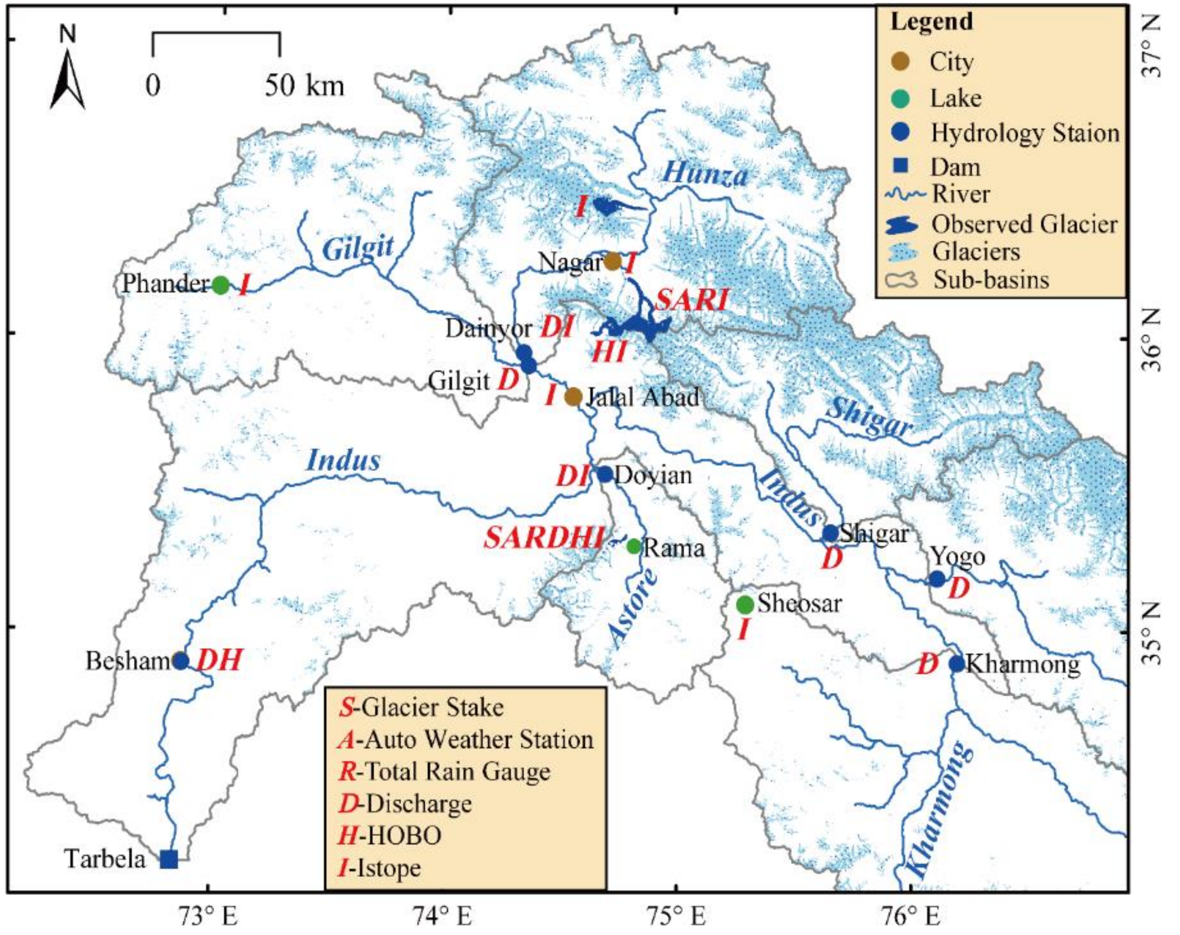


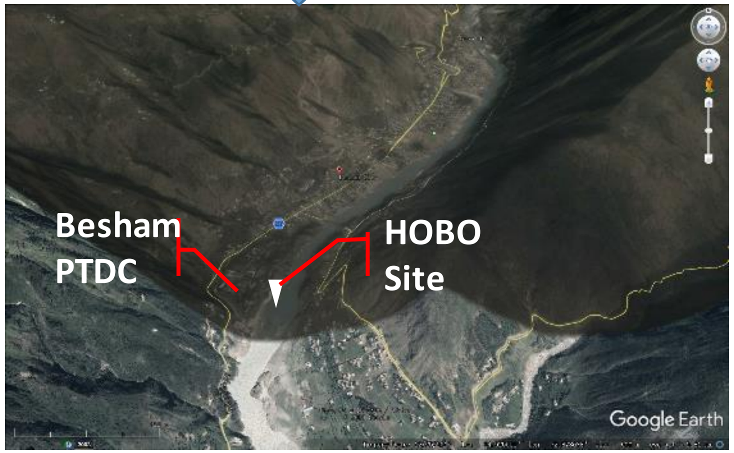
Figure 1. Schematic diagram of UIBN

Table 1. The observation items of UIBN in 2019

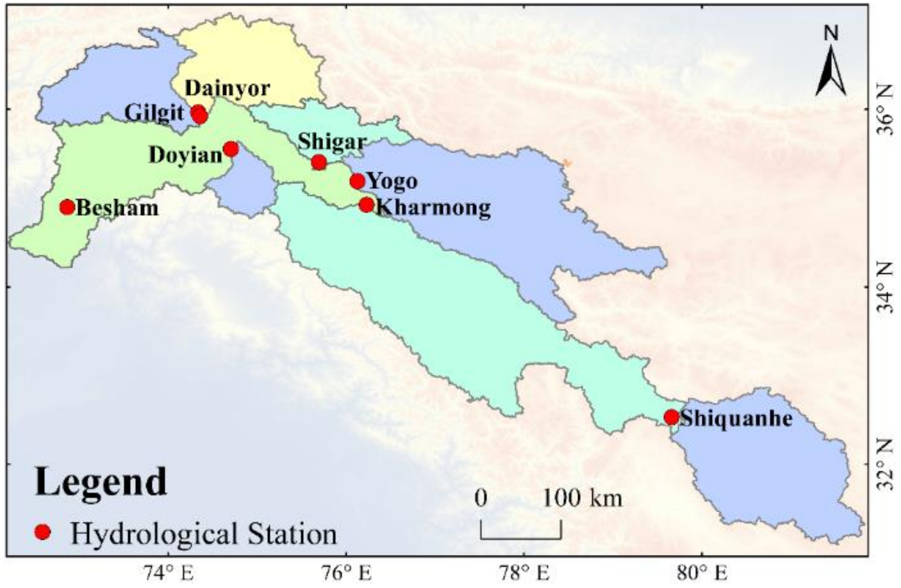
Sr.	Site	Glacier Melting	Glacier Meteorological		Hydrology		Isotope
		Stakes	AWS	Total Rain Gauge	Discharge	HOBO	
1	Gharko					√	√
2	Barpu	√	√	√			√
3	Sachen	√	√	√	√	√	√
4	Rama Lake					√	
5	Sheosar Lake					√	
6	Pasu						√
7	Nagar						√
8	Jalal Abad						√
9	Normal						√
10	Doyian						√
11	Besham				√	√	

1. Glacier Stakes | **2. Glacier Meteorology** | **3. Glacier Discharge** | **4. HOBO Observation**

1. 17 stakes installed on Barpu glacier, and stakes on Sachen glacier;
2. 1 AWS and 4 Precipitation TRG on Barpu glacier;
3. Water table and flowmeter for Sachen glacier;
4. HOBO water table for Besham river section



5. Hydrological station data



6. Isotope collected data

Table 2 Status of isotope water samples in Northern Pakistan during 2018-2019

Site	Category	Number	Date Period
Hoper(Barpu)	Rain	72	20181017-20191018
	Glacier	12	20181031-20190930
Pasu Glacier	Snow	21	20190108-20190603
	Rain	7	20190604-20190814
Bagrote Village	River	54	20181022-20191027
	Rain	62	20181101-20191018
	Snow	33	20181210-20190313
	PMD Station River	45	20181022-20191027
Nagar	River	58	20181030-20191103
Jalal Abad	River	50	20181111-20191020
Doyan	River	53	20181019-20191025
Sachen	Snow	26	20181102-20190519
	Rain	32	20181101-20190621
	River	43	20181026-20190816
Nomal	River	51	20181105-20191021
Phander Lake	Disconnected		

Sr.	Sub-basin	Station	Longtitude (°E)	Latitude (°N)	Area (km^2)	Period
1	Shiquanhe	Shiquanhe	79.76	32.46	24870	1994-2000_Yearly
2	Kharmong	Kharmong	76.23	34.93	70030	1982-2012_ Daily
3	Shigar	Shigar	75.67	35.35	6994	1985-2001_Daily
4	Shyok	Yogo	76.13	35.19	33157	1974-2017_Daily
5	Hunza	Daniyor	74.34	35.97	13717	1966-2012_Daily
6	Gilgit	Gilgit	74.36	35.92	12671	1970-2016_Daily
7	Astore	Doyian	74.70	35.55	3990	1974-2017_Daily
8	UIB_D	**Besham**	72.86	34.90	164867	1980-2017_Daily

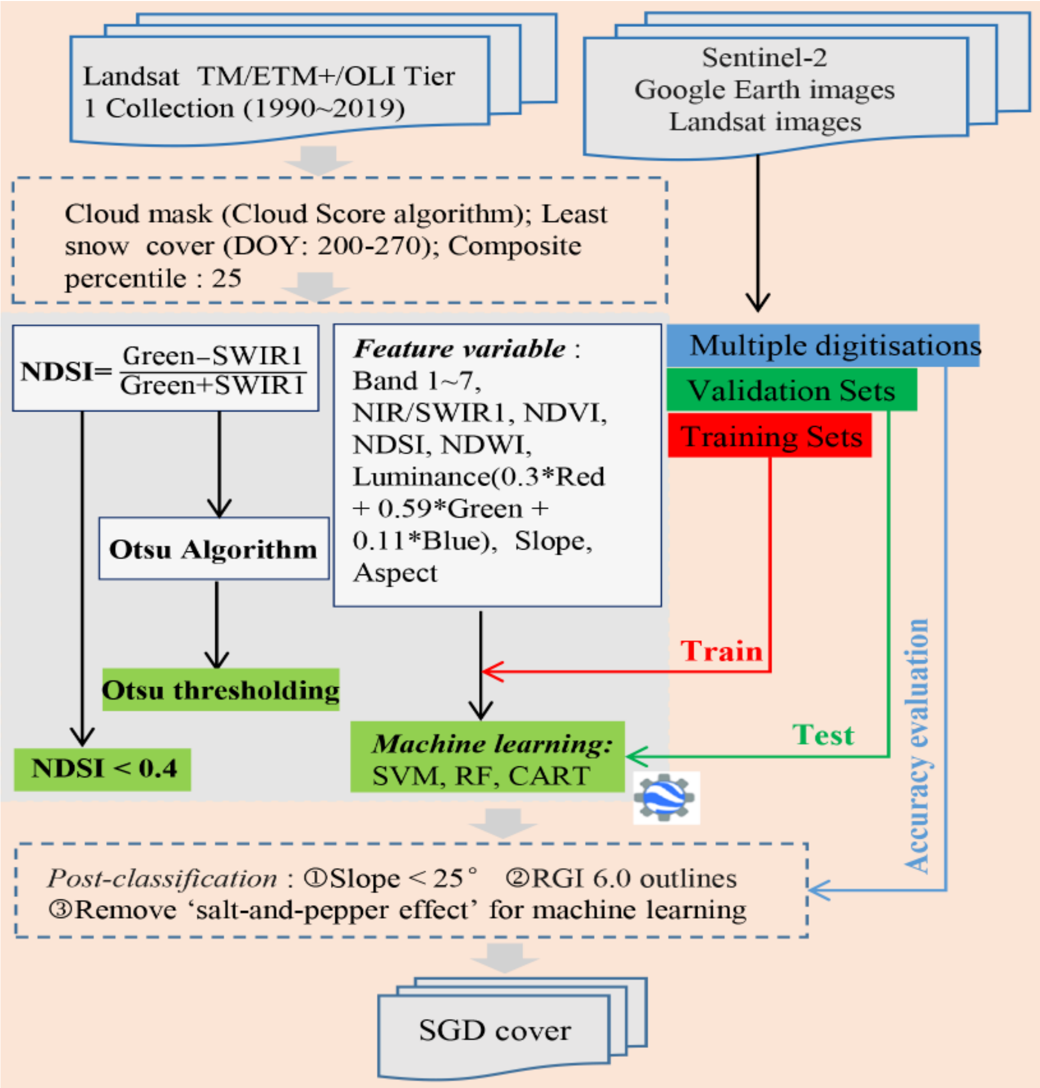
5. Update of the hydrostations at 8 UIB sub-basins;
6. Water sampling for isotope at UIB WAPDA stations

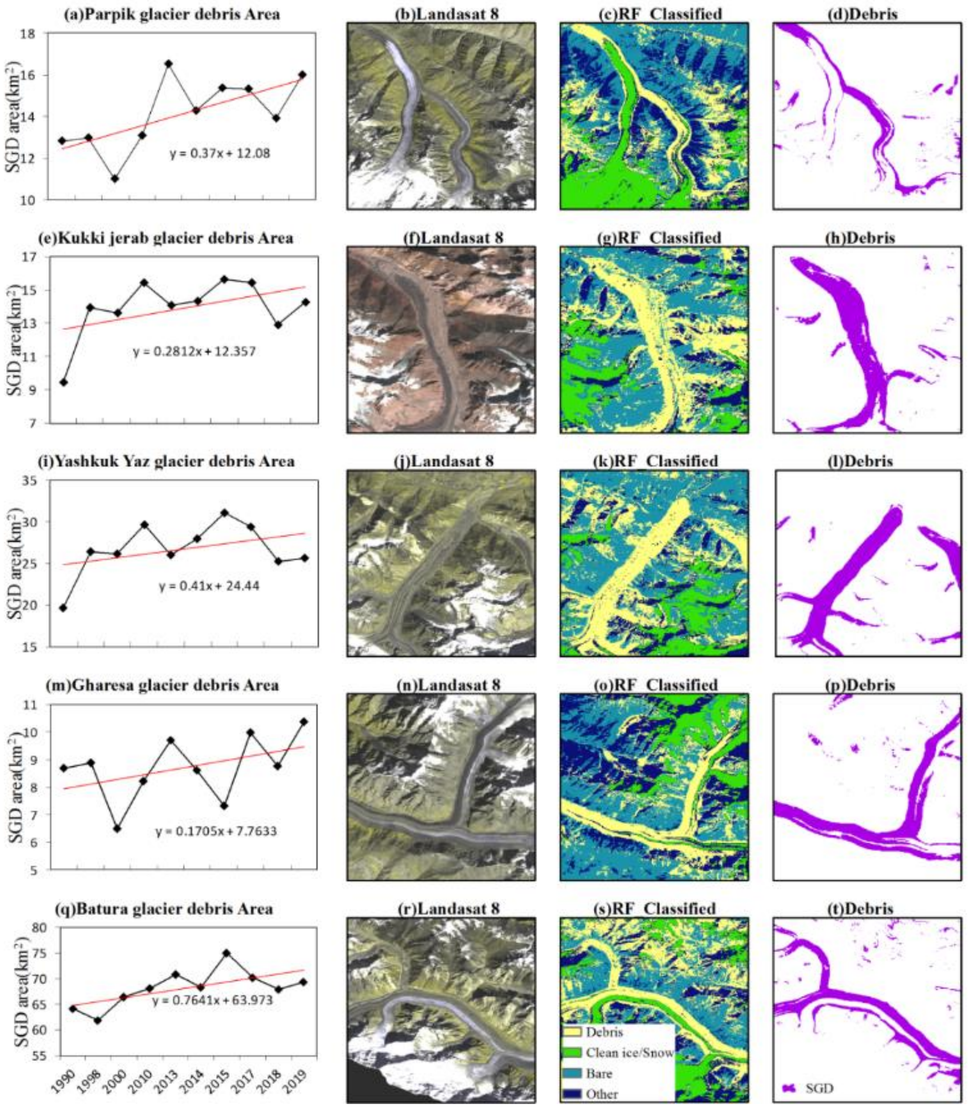
2.2 Progress from Yunnan University

Installation of 1 met-station and 1 stream flowmeter at Batura Glacier

Mapping the debris cover of glaciers in Hunza Valley

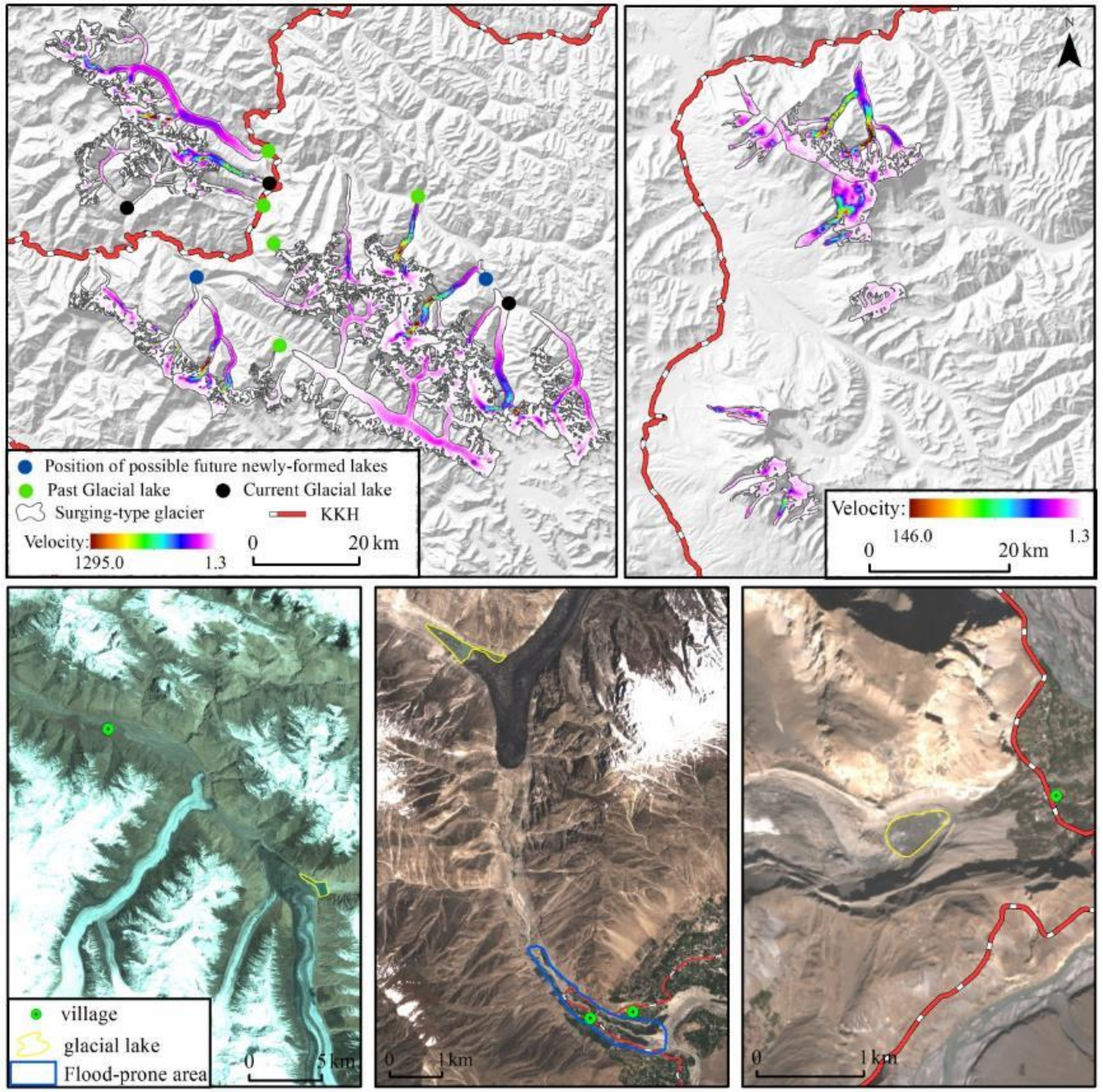
Debris cover tended to increase in area in Hunza





Review of the glacial hazards in Hunza Valley

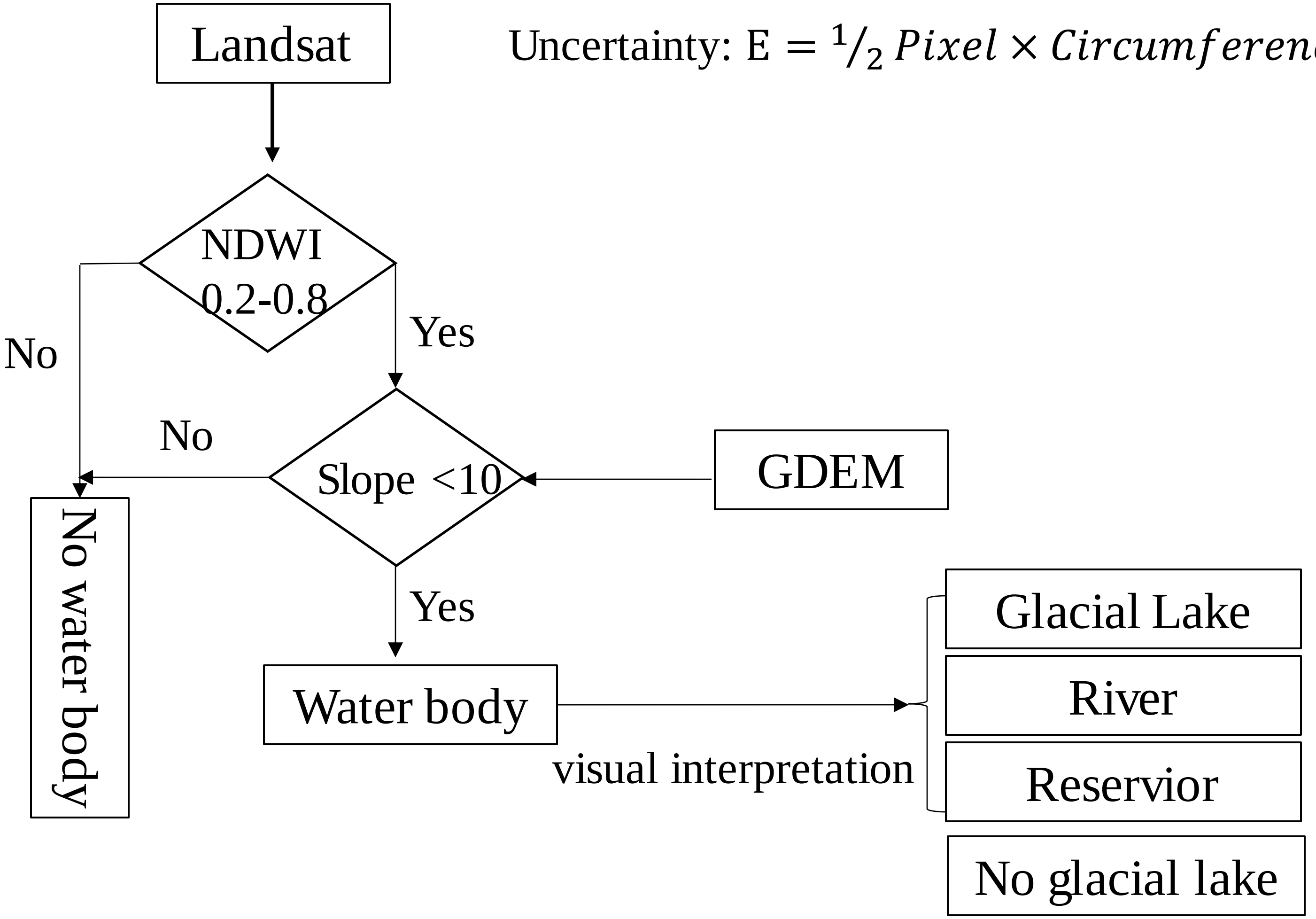
Surface velocity of surging glaciers, lake outburst floods in Hunza Valley: disaster triggered by periodic surges and outburst floods

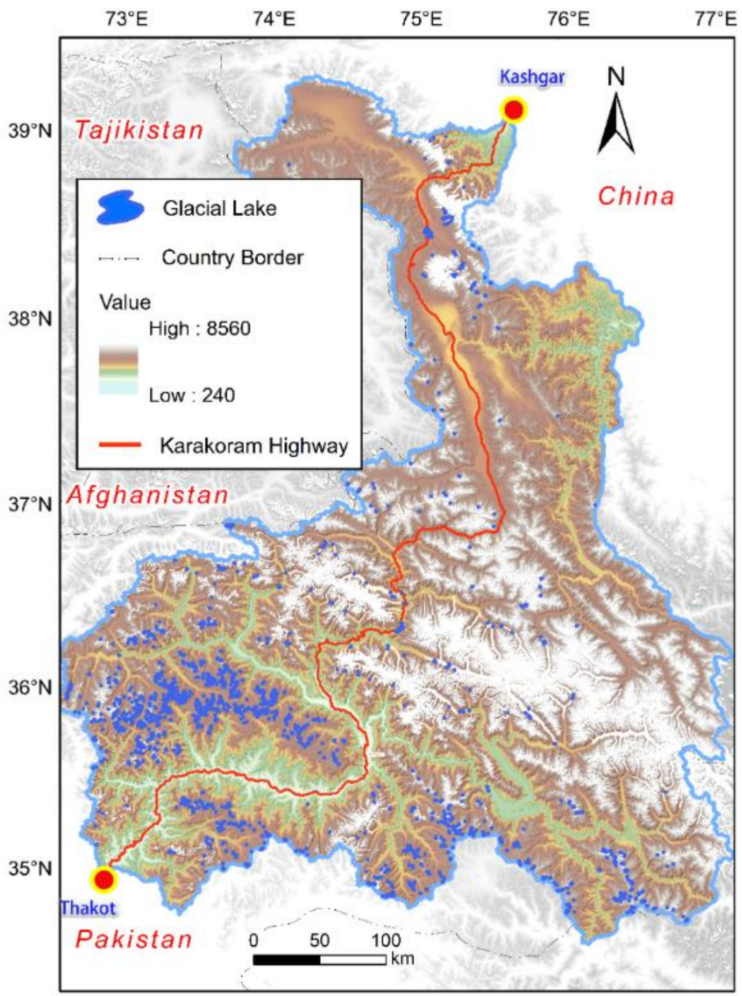


2.3 Progress of the Northwest Institute of Eco-environment and Resource, CAS

Glacier Lake Inventory in CPEC

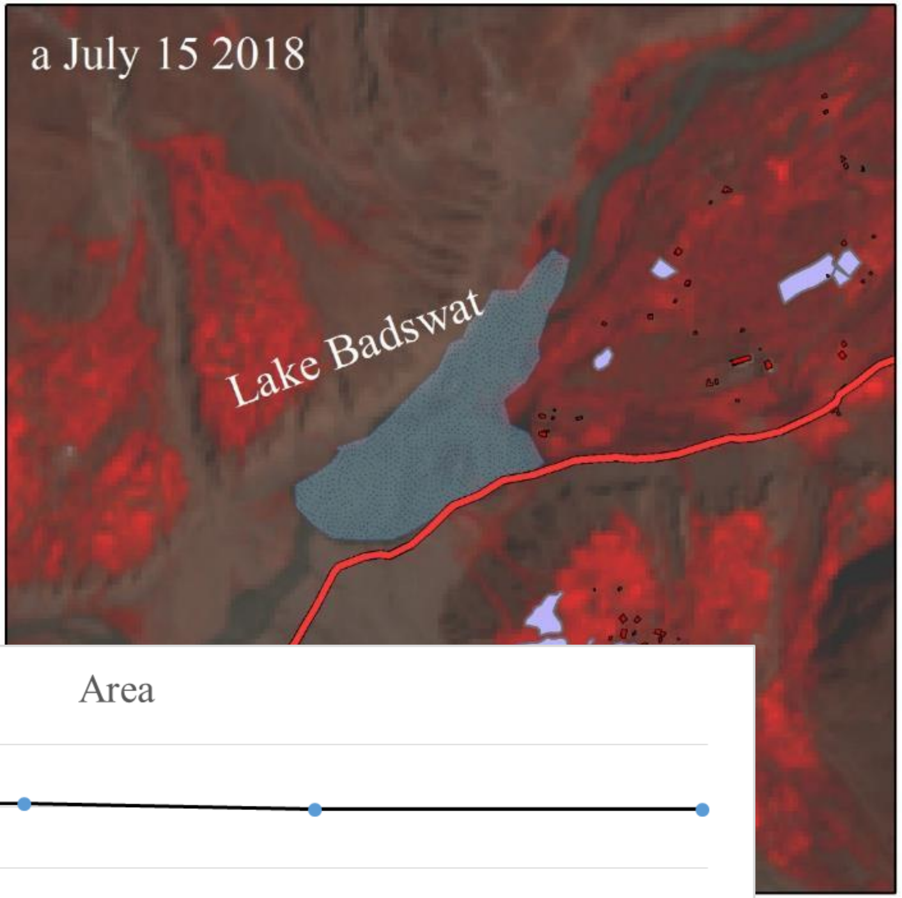
Uncertainty: $E = {}^{1}/_{2}\, Pixel \times Circumference$

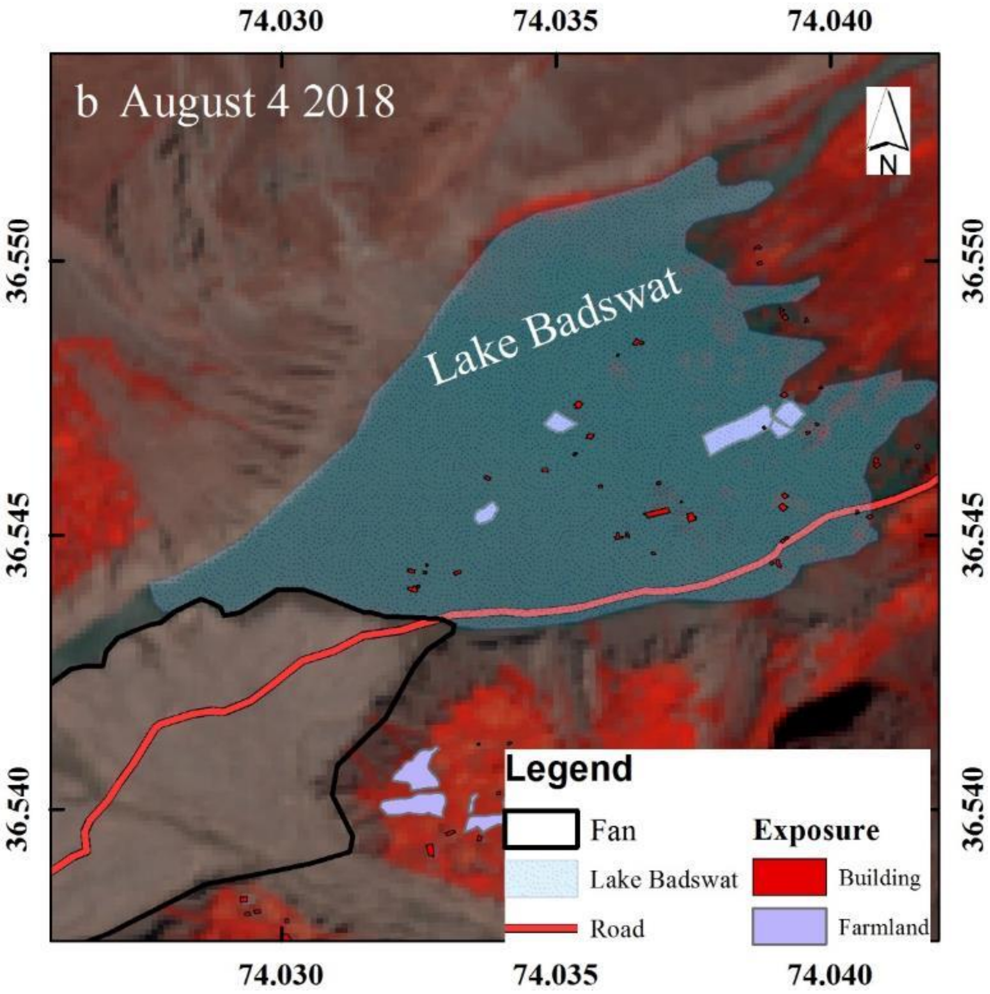


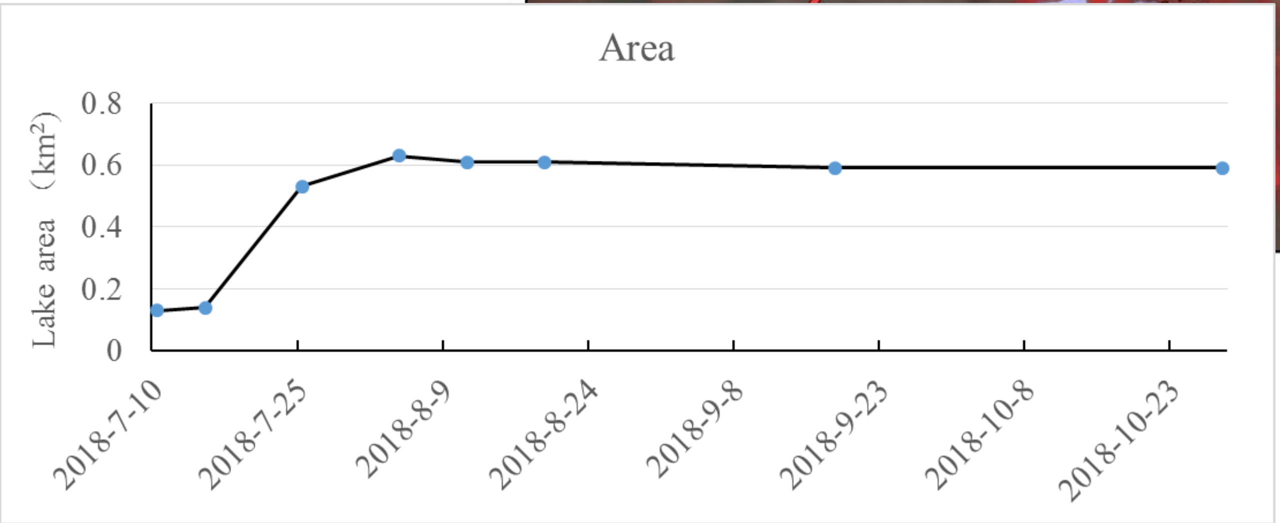


1341 glacial Lakes with a total area of 109.76（±9.82）km² in 2018， 9 glacial lakes larger than 1.00 km² and Lake Kelakuri is the biggest of 7.20 km²。

Lake Badswat area-expanding and outburst



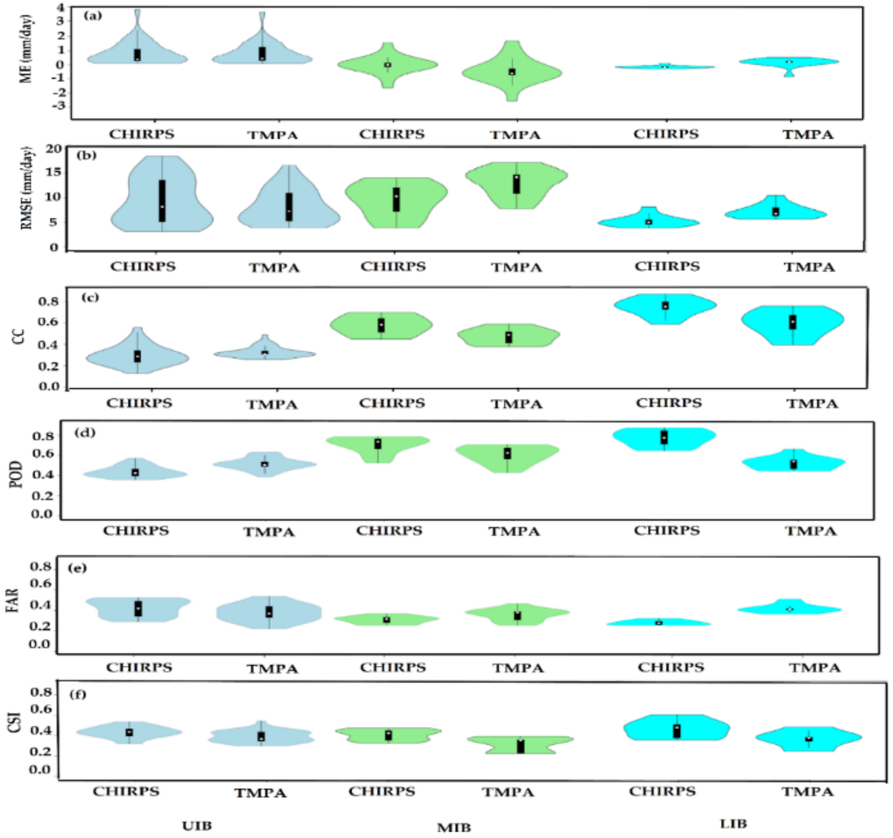


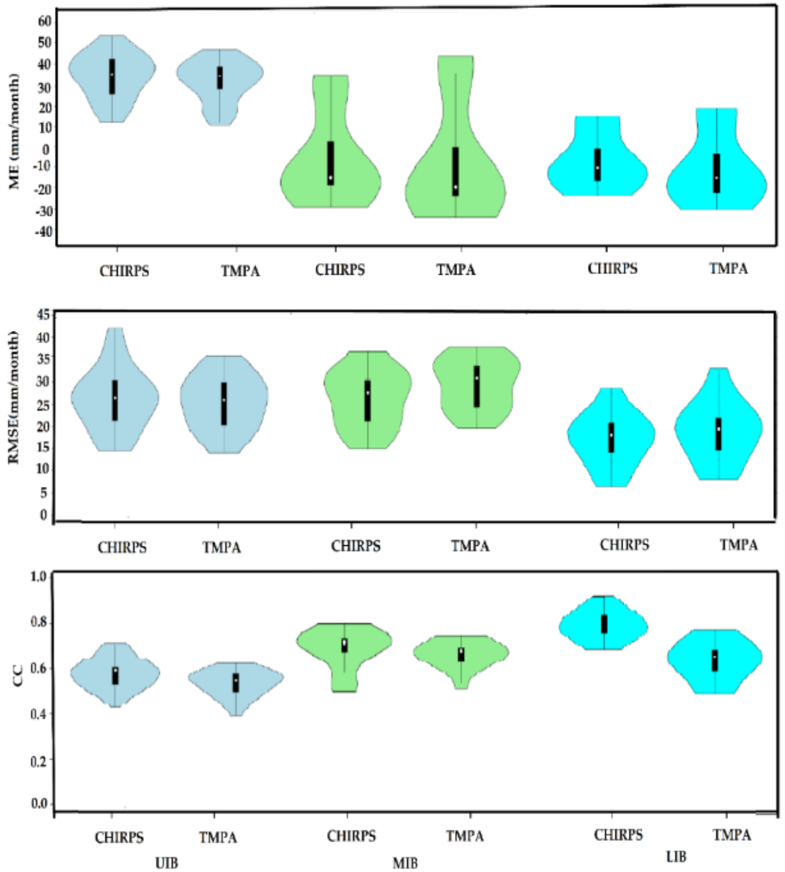


2.4 Progress of Tsinghua University

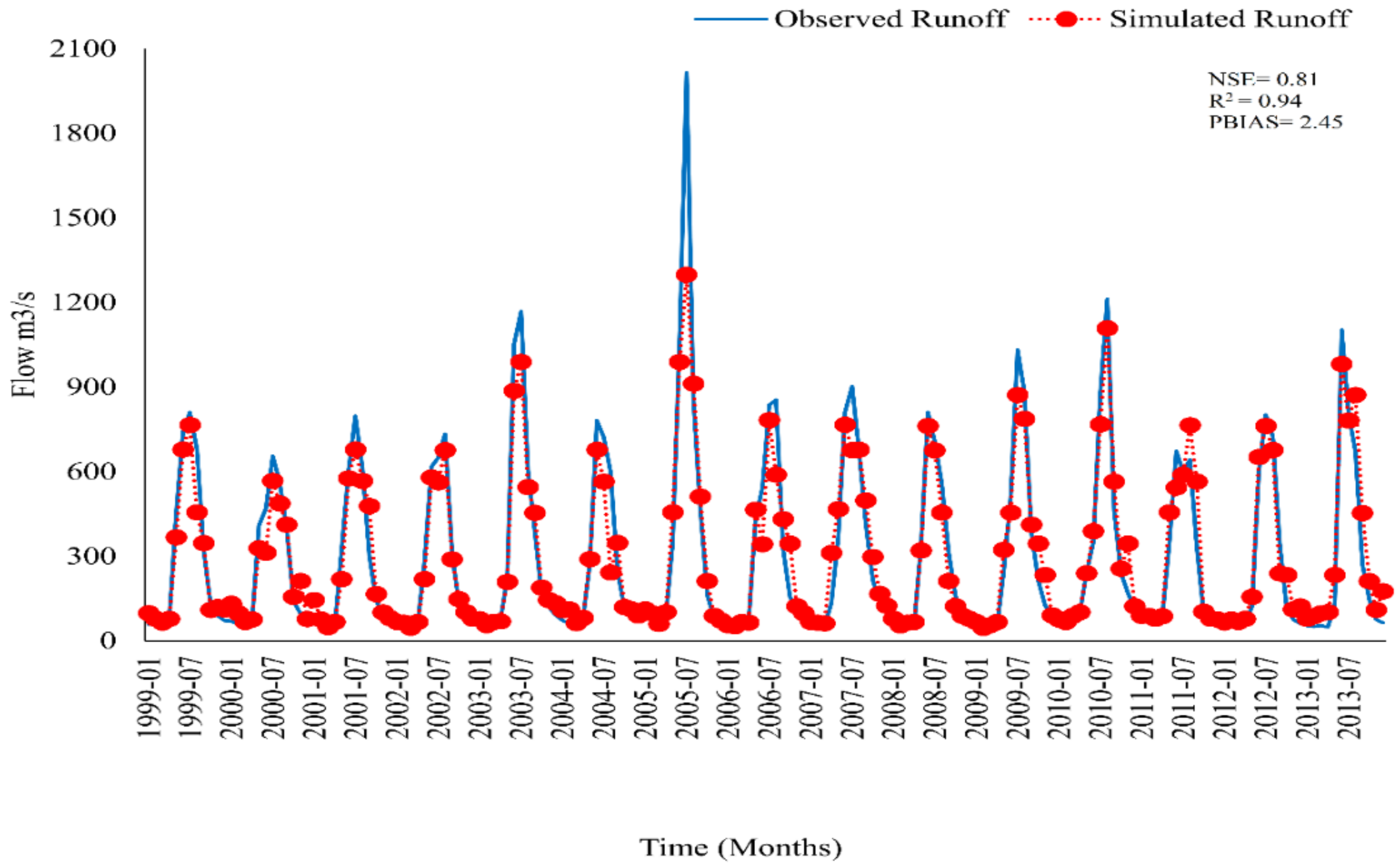
1) Hydrological modeling for UIB based on SWAT

Precipitation data: Climate Hazards Group Infrared Precipitation Satellite (CHIRPS), TRMM Multi-Satellite Precipitation Analysis (TMPA) , The Climate Forecast System Re-analysis (CFSR)

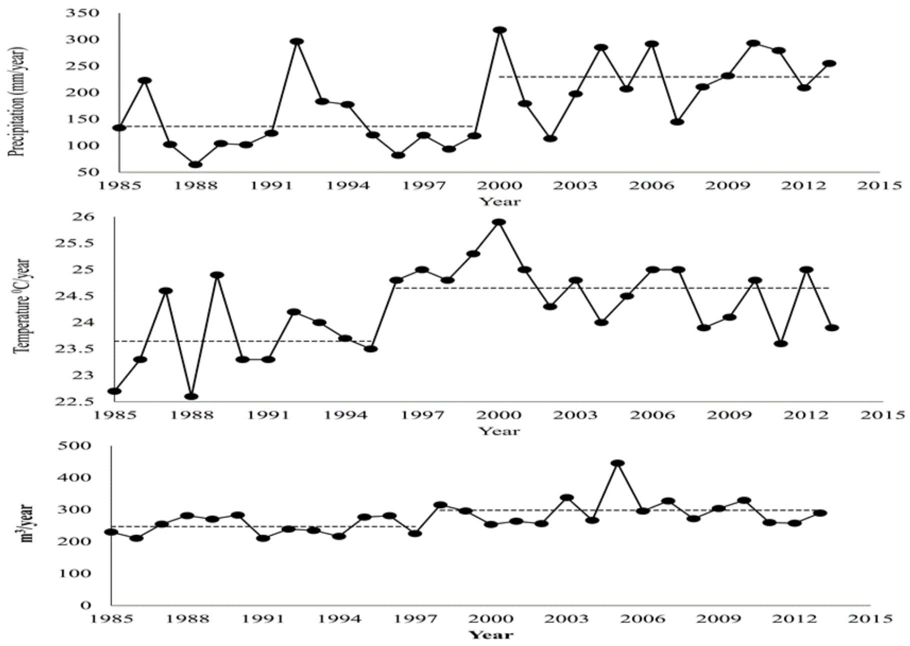




CHIRPS has bad performance in UIB as compared to TMPA but good in low (LIB) and middle (MIB) reaches of Indus Basin



SWAT simulation for UIB, CHIRPS demonstrates better for runoff generation in Gilgit



Increased precipitation and weak change in air temperature controlled the mild fluctuation of the runoff in UIB

2) Evaluation of precipitation data in western Tibetan Plateau

Fusion data

Satellite data

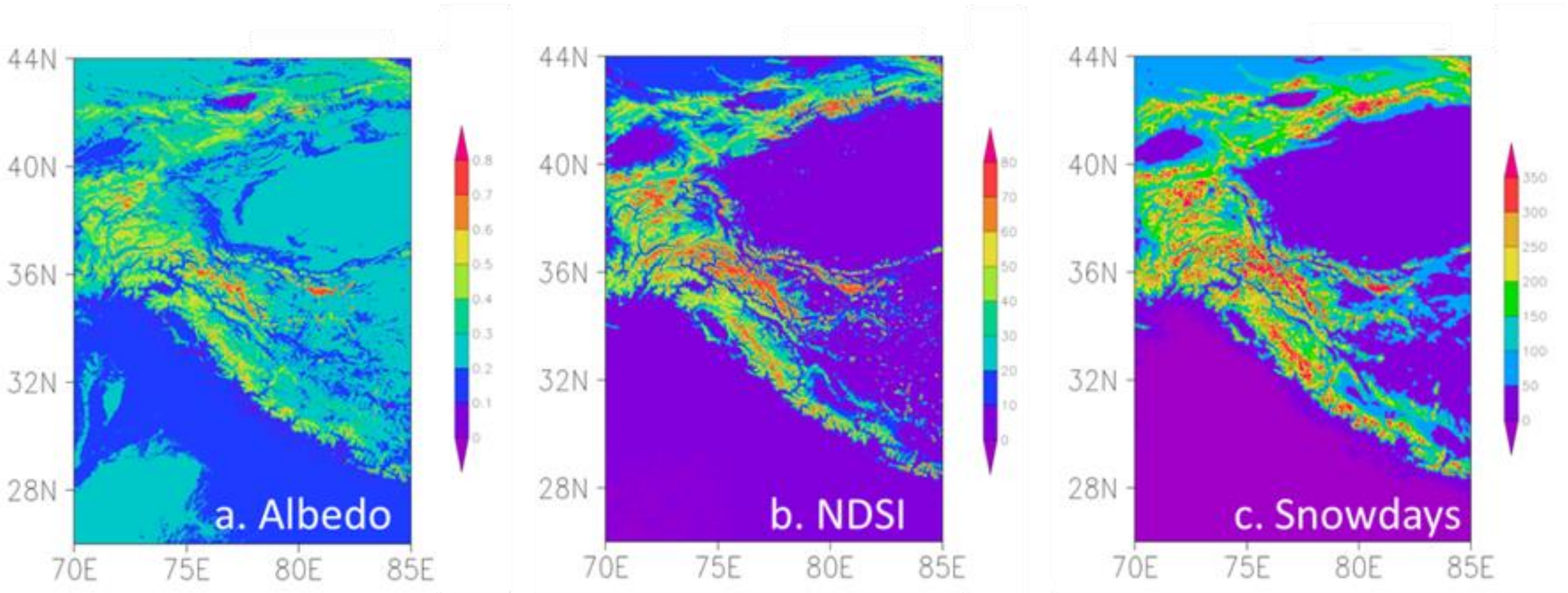
Reanalysis data

High-res WRF simulation

TABLE 1 Information on the nine gridded precipitation data sets used in the study

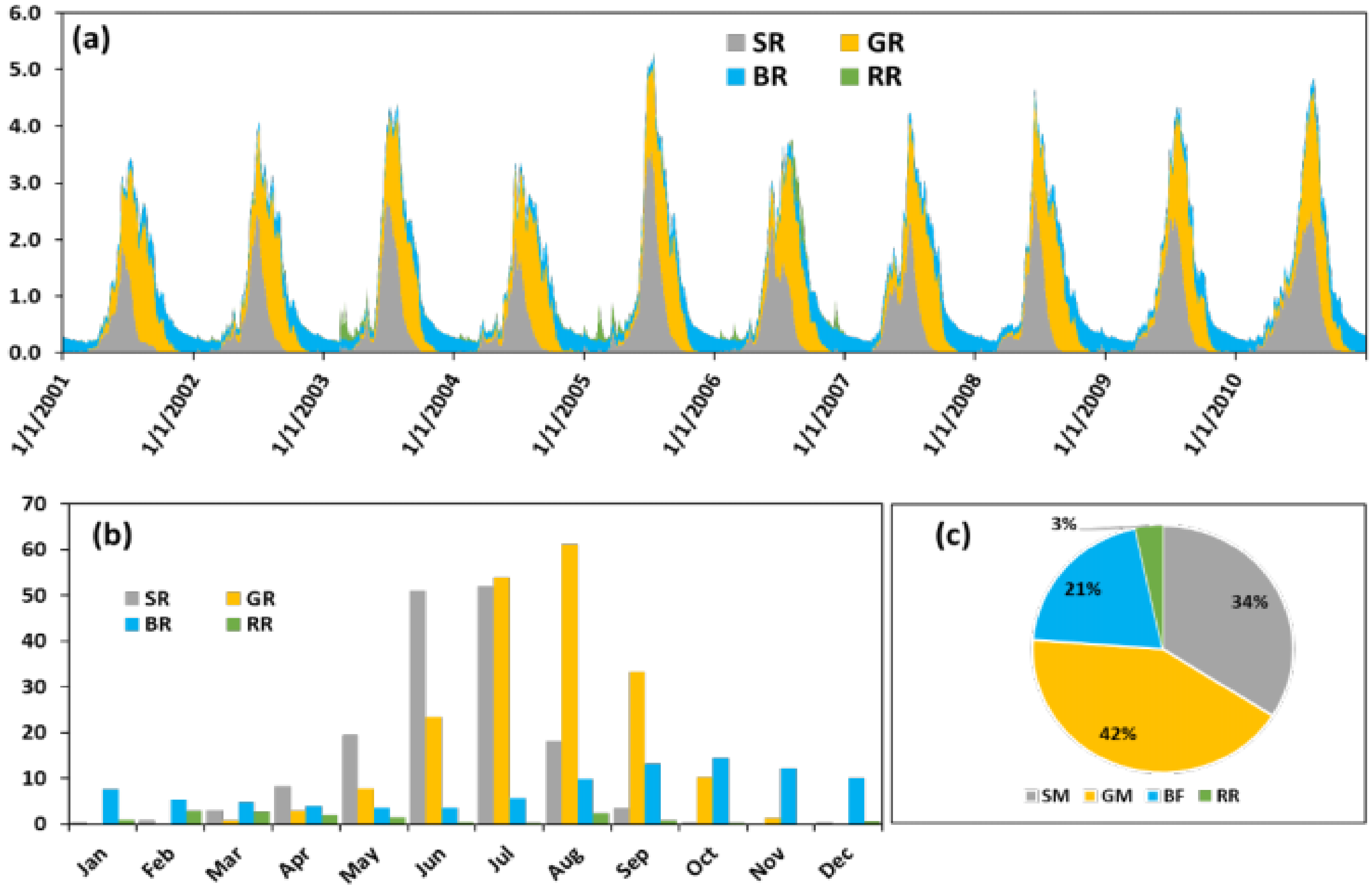
Data sets	Method and input data sources	Spatial resolution	Analysed period	References
APHRODITE	Original rain-gauge data, individually collected from local organizations.	0.25°	2001–2013	Yatagai *et al*. (2008), Yatagai *et al*., 2012)
GPCC	Near real-time GTS database updated monthly, non-real time data updated occasionally, available global and regional collections of climate data.	0.5°	2001–2013	Becker *et al*. (2013)
TRMM	TMI merged with other microwave satellite data (SSM/I, AMSU-B and AMSR-E), infrared data from GEO satellites and GPCC & CAMS gauge estimates.	0.25°	2001–2013	Huffman *et al*. (2007)
GPM	GMI, AMSR-2, SSMIS, MADRAS, MHS, advanced technology microwave sounder.	0.1°	2015–2017	Hou *et al*. (2014)
ERA5	Produced using 4D-Var data assimilation in CY41R2 of ECMWF's integrated forecast system (IFS).	0.25°	2001–2013	Hersbach *et al*. (2018)
ERA-interim	Model output assimilated with satellite observations	0.75°	2001–2013	Dee *et al*. (2011)
JRA-55	Produced with the low-resolution (TL319) version of JMA's operational data assimilation system.	1.25°	2001–2013	Kobayashi *et al*. (2015)
HAR10	Generated by dynamical downscaling of global analysis data (FNL) using the WRF model	10 km	2001–2013	Maussion *et al*. (2010), Maussion *et al*., 2014)
HAR30	Generated by dynamical downscaling of global analysis data (FNL) using the WRF model	30 km	2001–2013	Maussion *et al*. (2010), Maussion *et al*., 2014)

frequent snowfall events identified by MODIS albedo and SCF and IMS snow cover days , close to HAR10



2.5 Progress from Institute of Geographical Science and Natural Resource Research, CAS

Hydro-glacier modeling-SPHY model: glacier and snowmelt dominate the river runoff in UIB



gure 5.8. The distribution of total runoff components at (a) daily and (b) monthly time es. (c) average contributions of runoff components to total runoff at annual scale in UIB n 2001 to 2010. Here, SR = Snowmelt runoff; GR = Glacier melt runoff; BR = Baseflow runoff; RR = Rainfall-runoff.

By 2061-2070, the UIB will see an increase in snowmelt and decrease in glacier runoff.

SSP126 : snowmelt, -15±10%, glacial melt, 17±8%, baseflow, -26±9%, and rain runoff, 85±11%

SSP245 : 6±11%, -7±9%, -27±7%, and 181±33%

SSP585 : 8±10%, -13±12%, -55±7%, and 416±44%

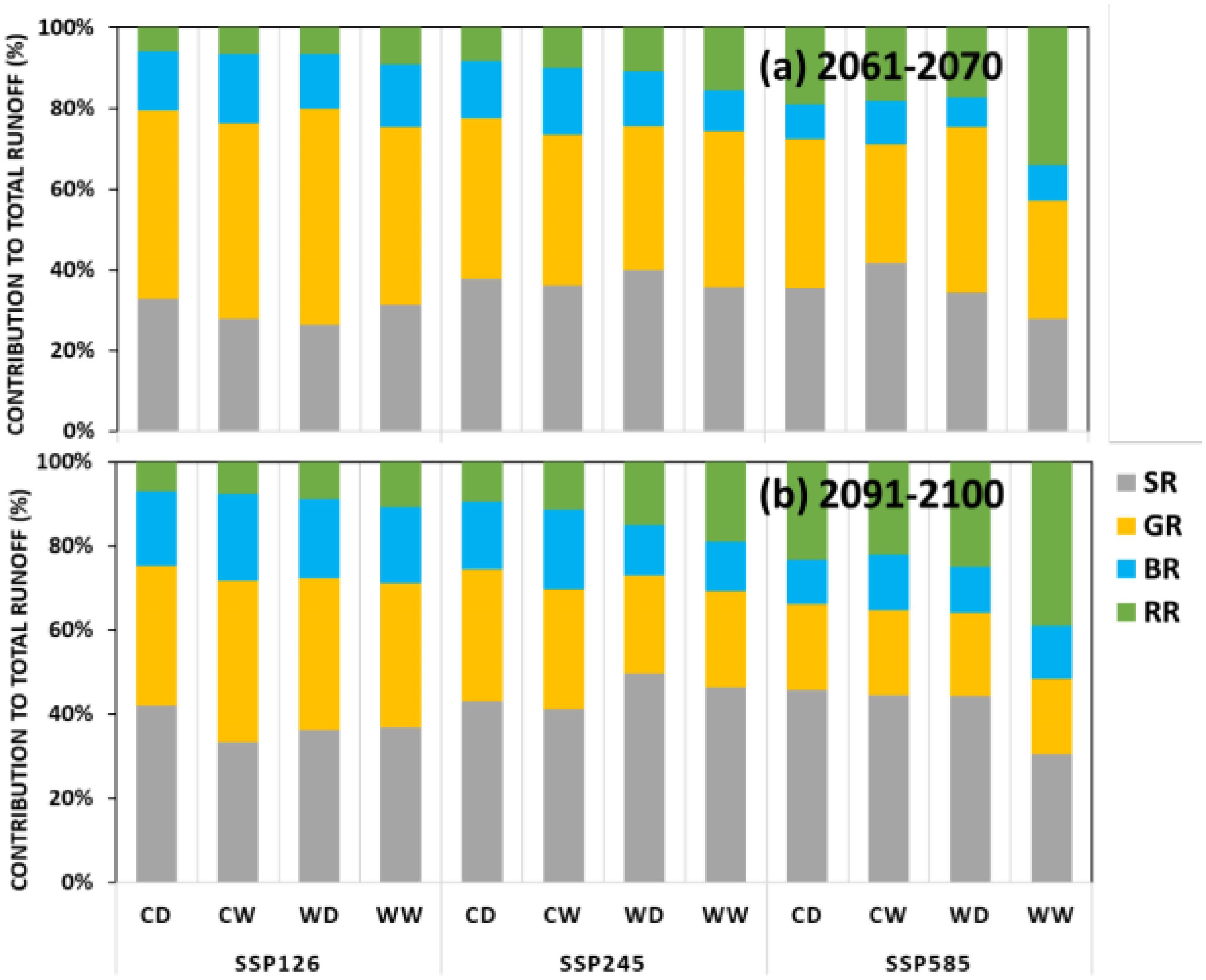


Figure 6.2 Average future contributions to total annual runoff under different scenarios for (a) 2061−2070 and (b) 2091−2100 in UIB.

3. Projects related to UIB researches

Projects from NSFC

1. ZHANG Yinsheng, ITPCAS, On the interactive between westerlies and Indian Monsoon and their impact on water resource,2016.11-2019.10
2. YANG Weikang, XIEG， Assessment of Ovis Ammon Polii to its environment under a changing climate and the identification of it transboundary migration，2017.1-2019.12
3. XU Jianchu, Kunming Institute of Botany, CAS, Ecological Callendar and its climate adaptation in Pamir Plateau, 2016.4-2.19.3
4. MENG Xinming, Lanzhou University, Monitoring of land surface deformation and the assessment of related hazards along CPEC based on sequential InSAR technique, 2017.1-2019.12
5. CHEN Xiaochen, IMHE，Identification of major geological Hazards and the risk assessment along CPEC,,2016.11-2019.10
6. SU Buda，Projection and attribution of streamflow composition at mountain rivers in China and Pakistan,2016. 11-2019.10
7. LIU Shiyin, Yunnan University, Glacier changes and their hydrological impact under warming climate along the CPEC，2018.1-2020.12

Project from Chinese Academy of Sciences

8. ZHANG Yinsheng. ITPCAS, Level A of the Strategic Priority Research Program of CAS

4. Education and human resource development related to UIB researches

- 2 postdoc candidates (YNU) and 1 doctor candidate (IGSNRR) from Pakistan working for UIB
- Training courses for graduates from Pakistan and Nepal sponsored by ITPCAS

5. Future plans for the country chapter

① Continuous observations of the existing network in UIB.
② New project submission to NSFC for UIB
③ New postdoc and doctor candidates from Pakistan and Nepal
④ Online courses for UIB graduates
⑤ End of 2020 for UIBN-CN meeting

ICIMOD