



Cryosphere and related hazards in High Mountain Asia in a changing climate

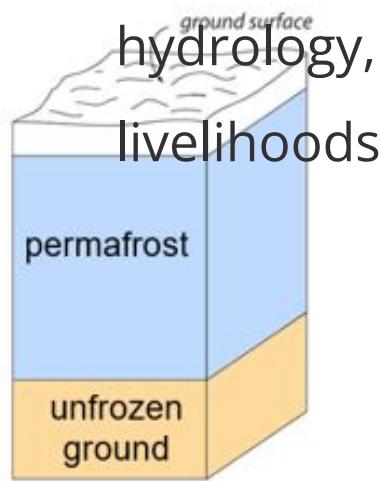
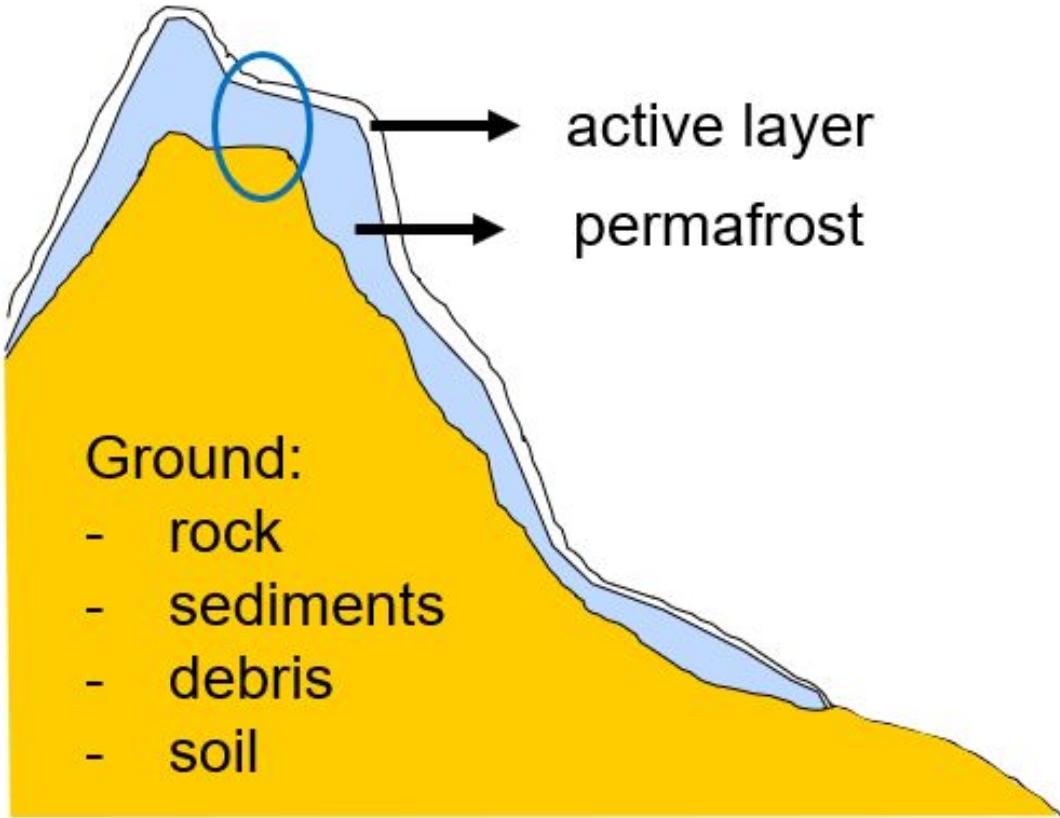
1–4 November 2022 | Almaty, Kazakhstan

Presenter(s): TR Gurung, J Steiner, P Baral, J Fiddes

Date: 3 November 2022

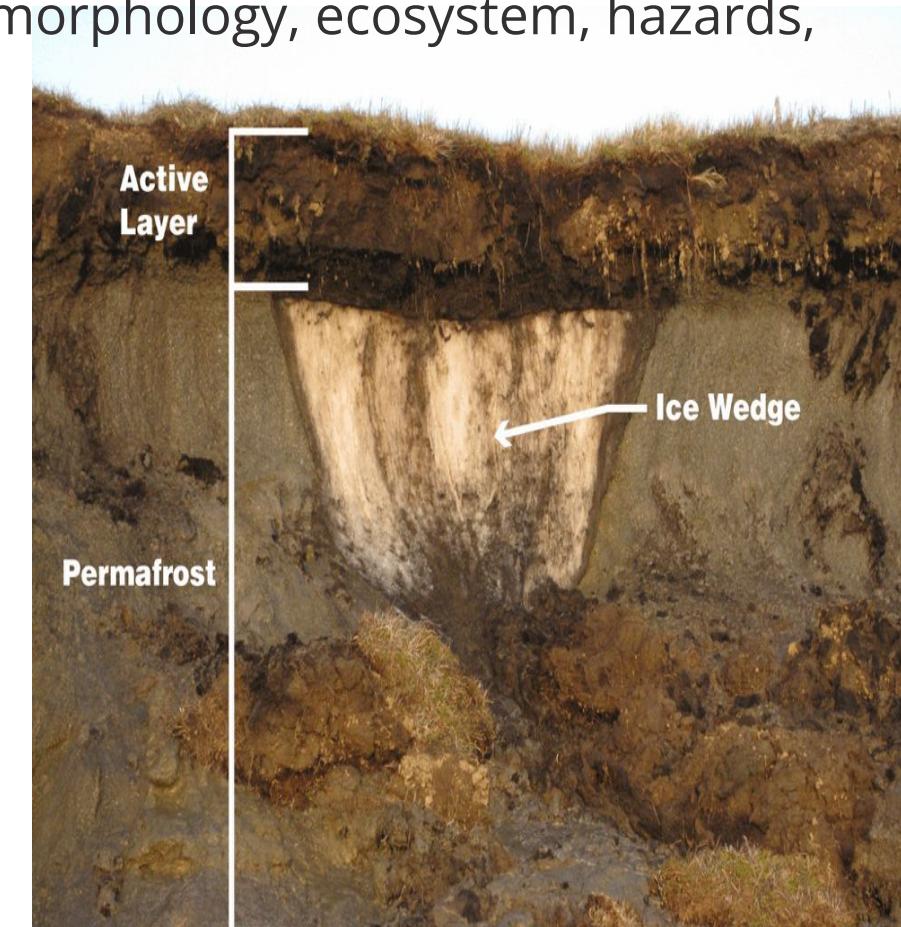
Thermal regime monitoring of the ground surface temperature to understand the permafrost distribution with temperatures loggers

What is Permafrost?



Permafrost is a thermal subsurface condition of the ground and considered as a climatic phenomenon
Essential climate variable (ECV) of the cryosphere by WMO

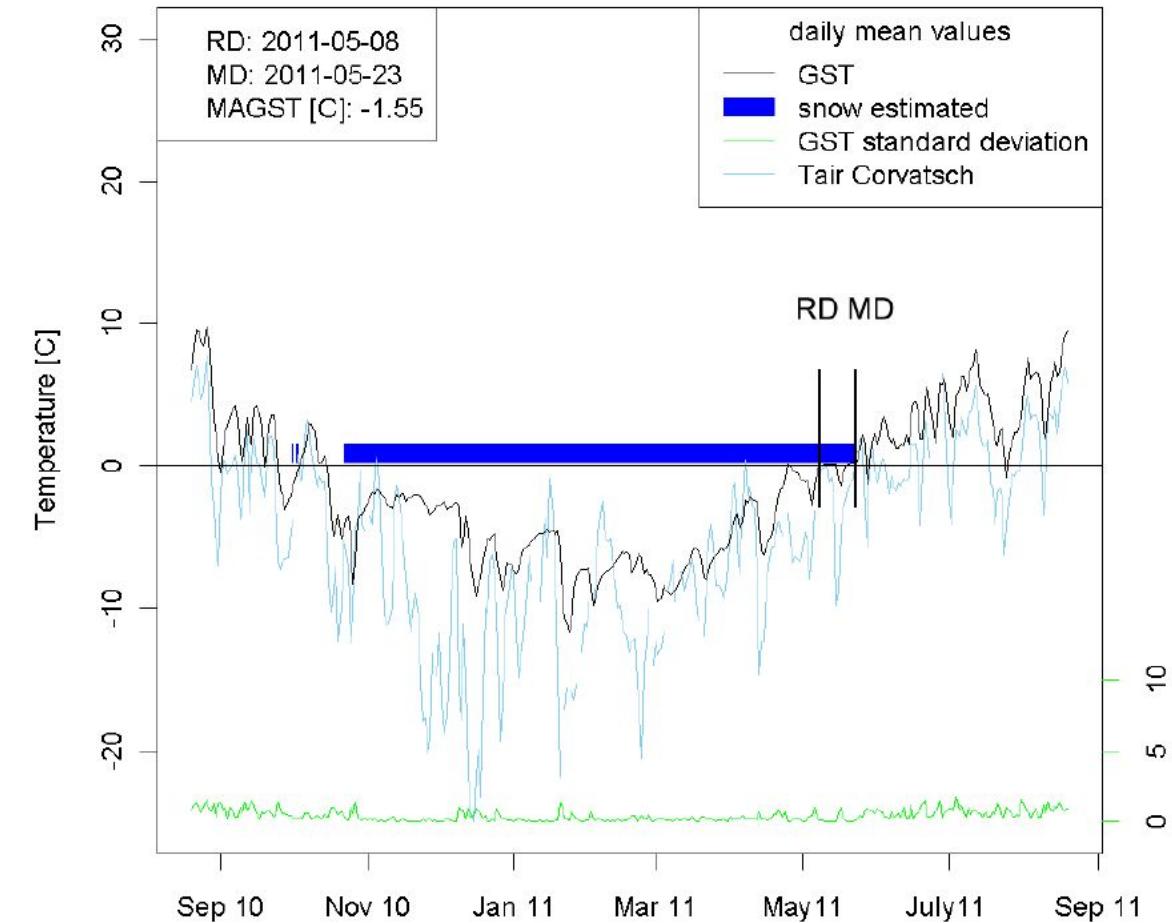
Impact on geomorphology, ecosystem, hazards,



- Seasonal frozen ground
- Snow cover can be estimated
- Ripening and melt-out date observed
- MAGST below 0°C



Melting characteristics in the Alps

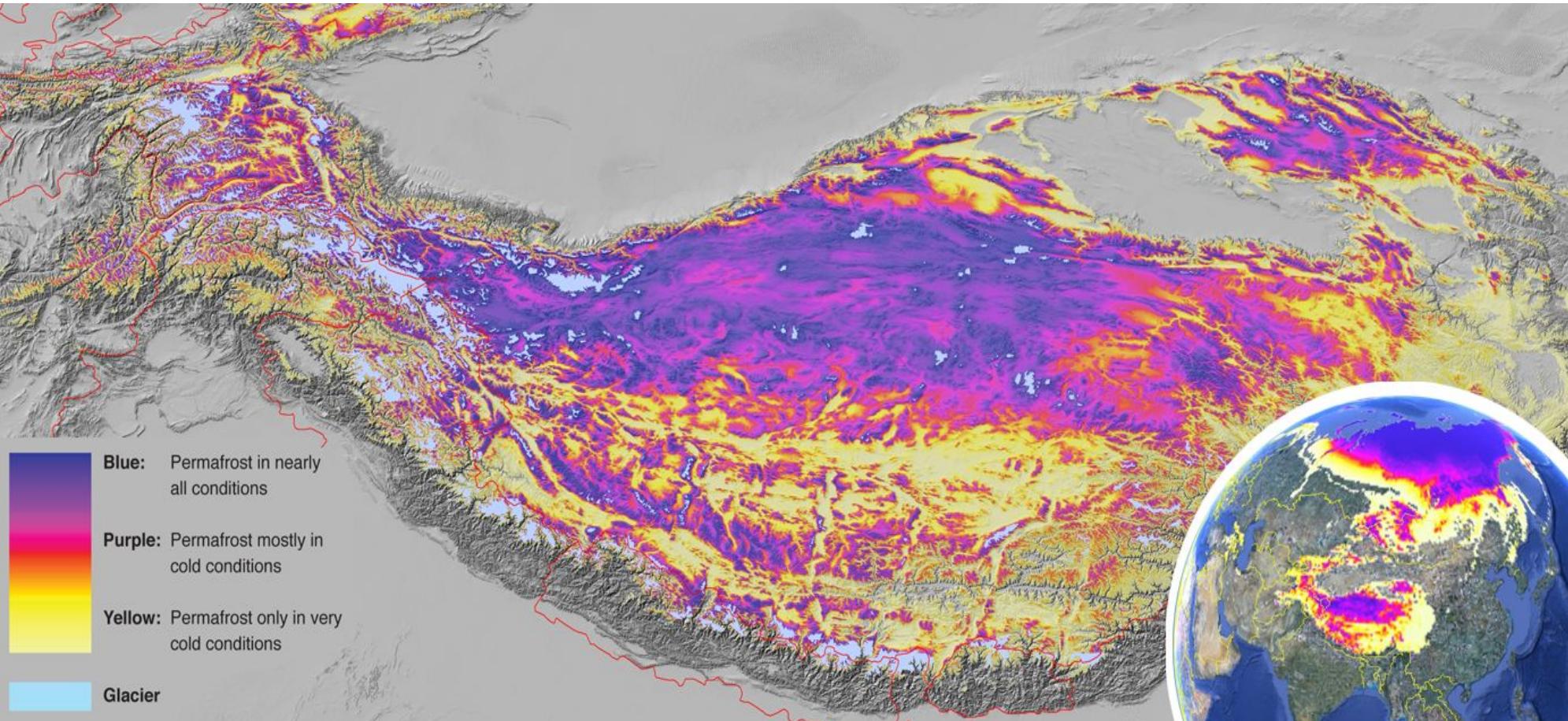


Schmid et al, 2012

Permafrost distribution in HKH

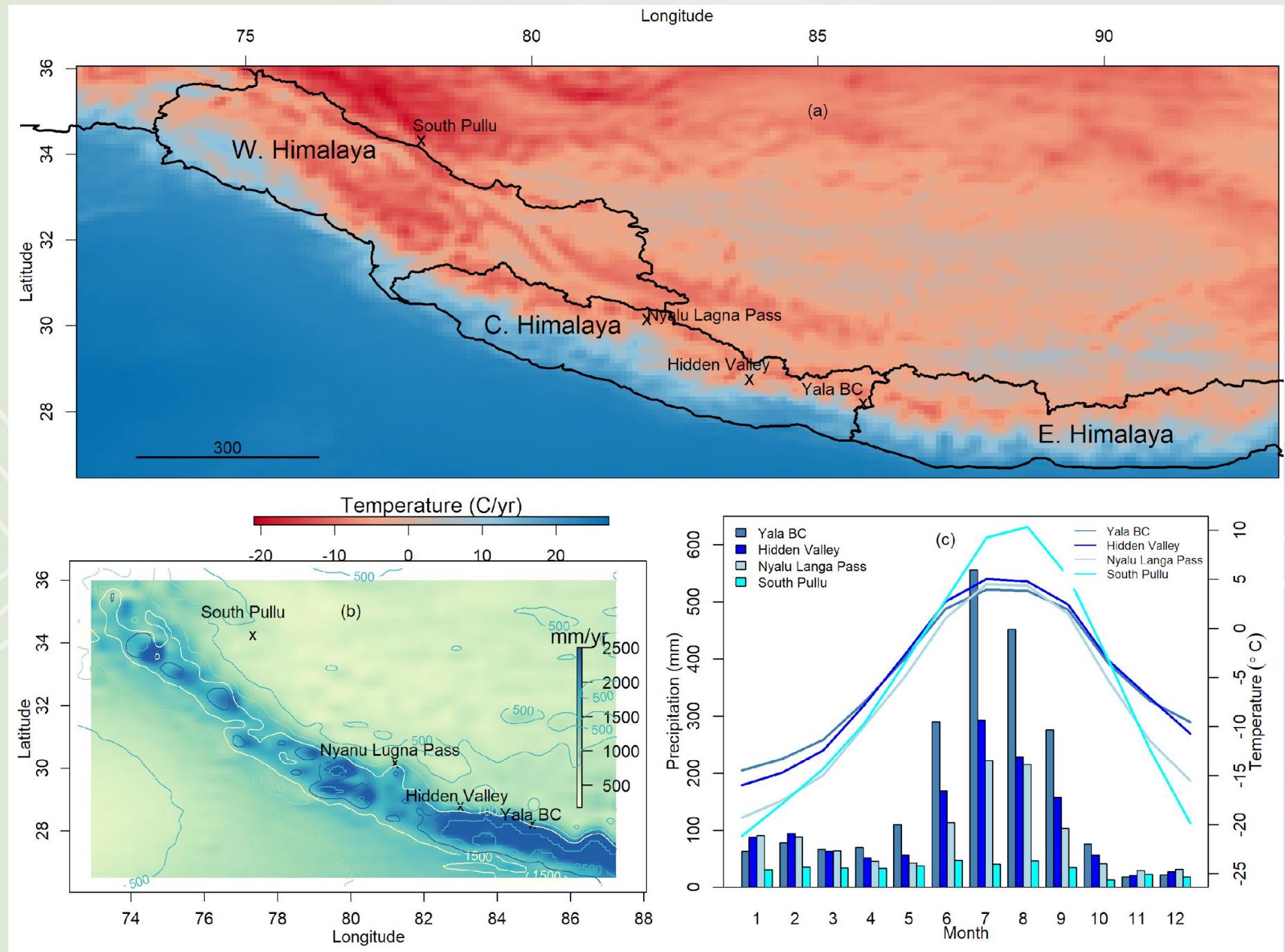
A large proportion of the global permafrost in mountains region

Little known from HKH: distribution of PF, characteristics and change



Gruber et al, 2017

Permafrost monitoring sites



Permafrost features in Himalaya

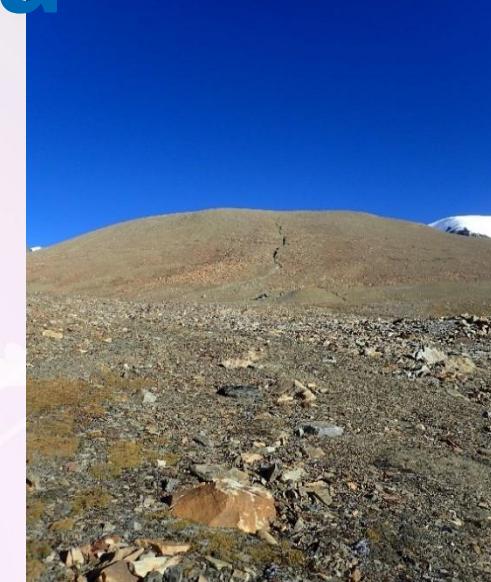
Patterned ground



Frost cracking



Debris flows emanating from likely permafrost degradation



Evidence of superficial permafrost degradation



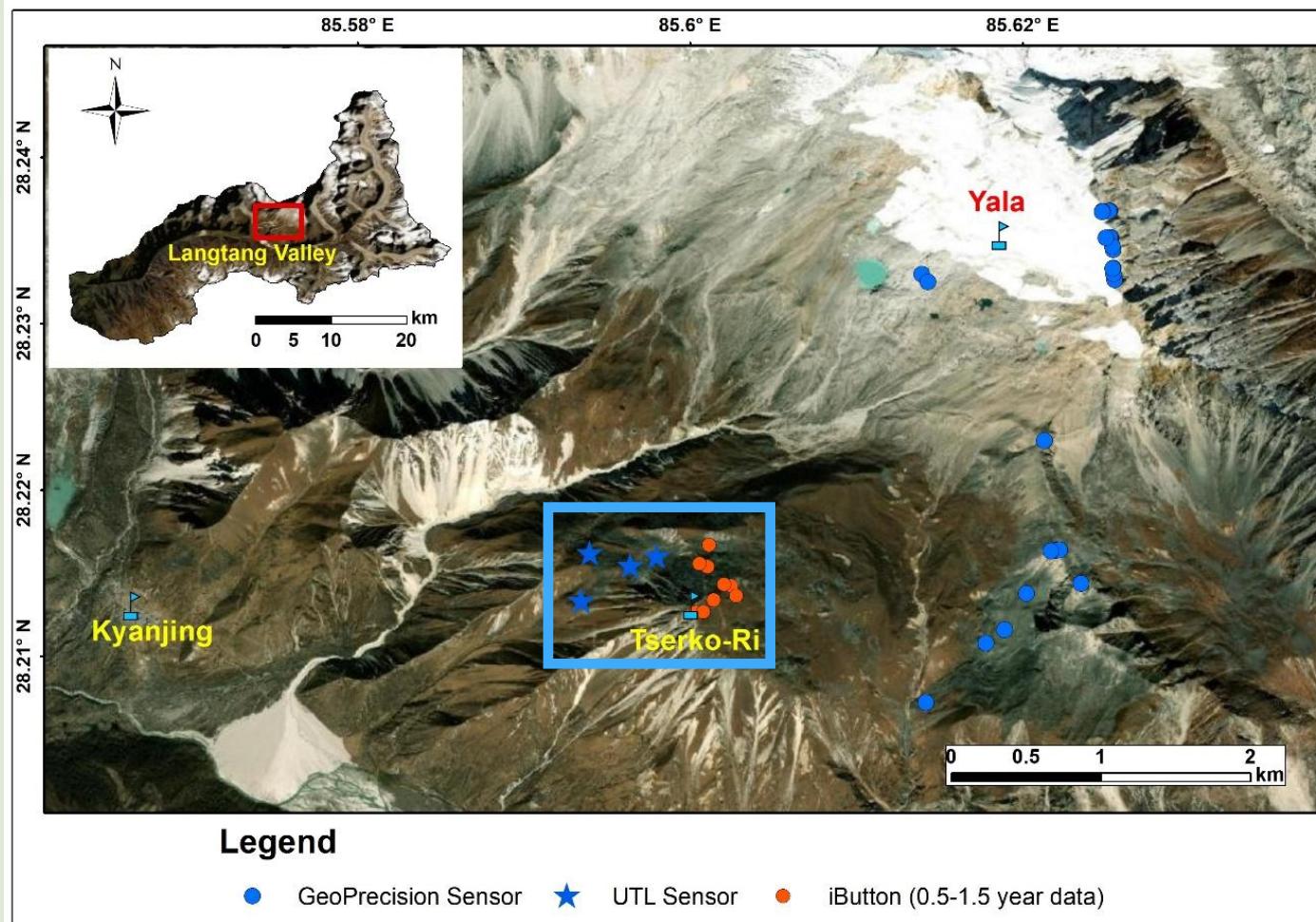
Blisters



Slope failure

Yala, Langtang

2013



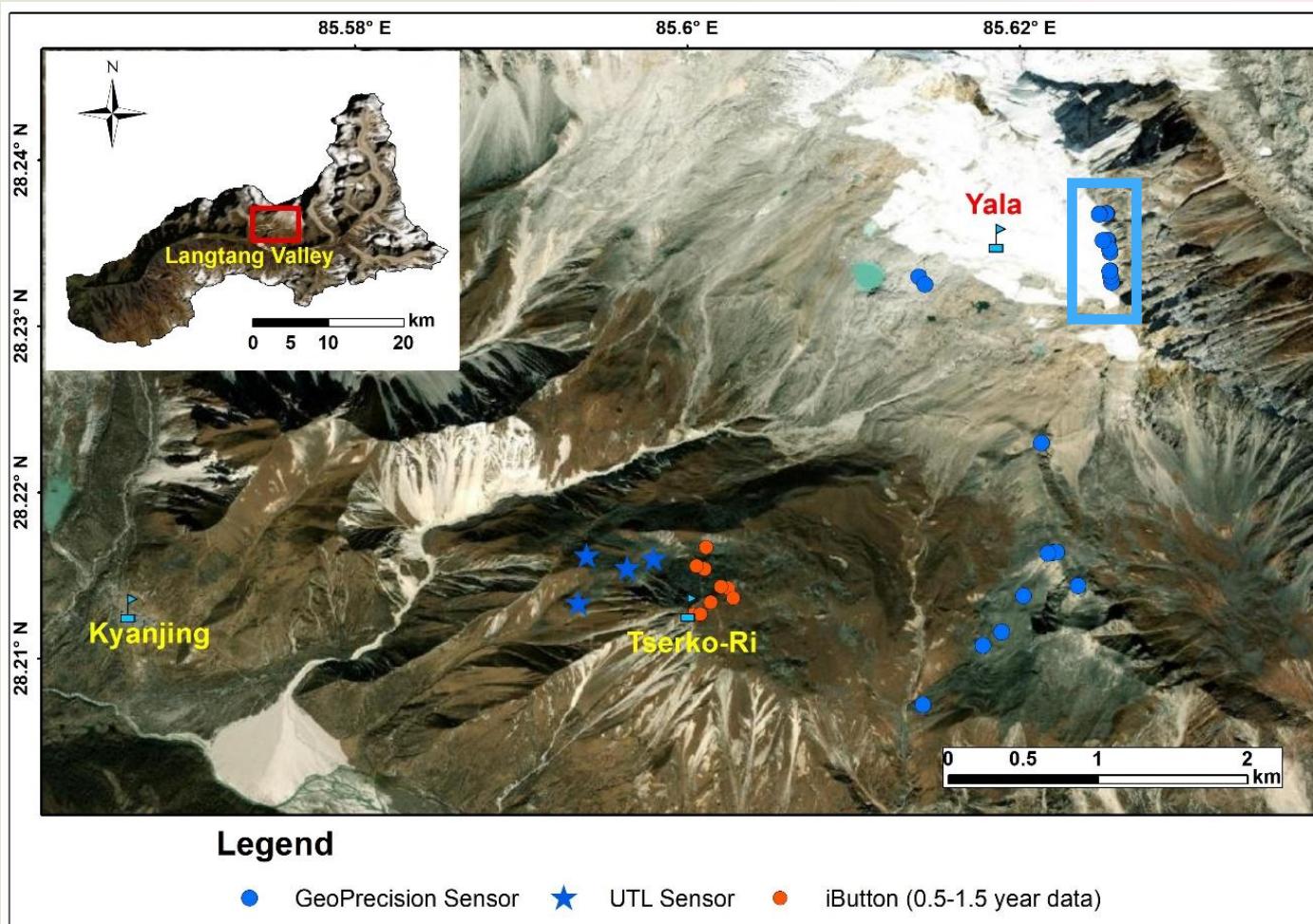
iButton



Universal Temp. logger

Yala, Langtang

2014



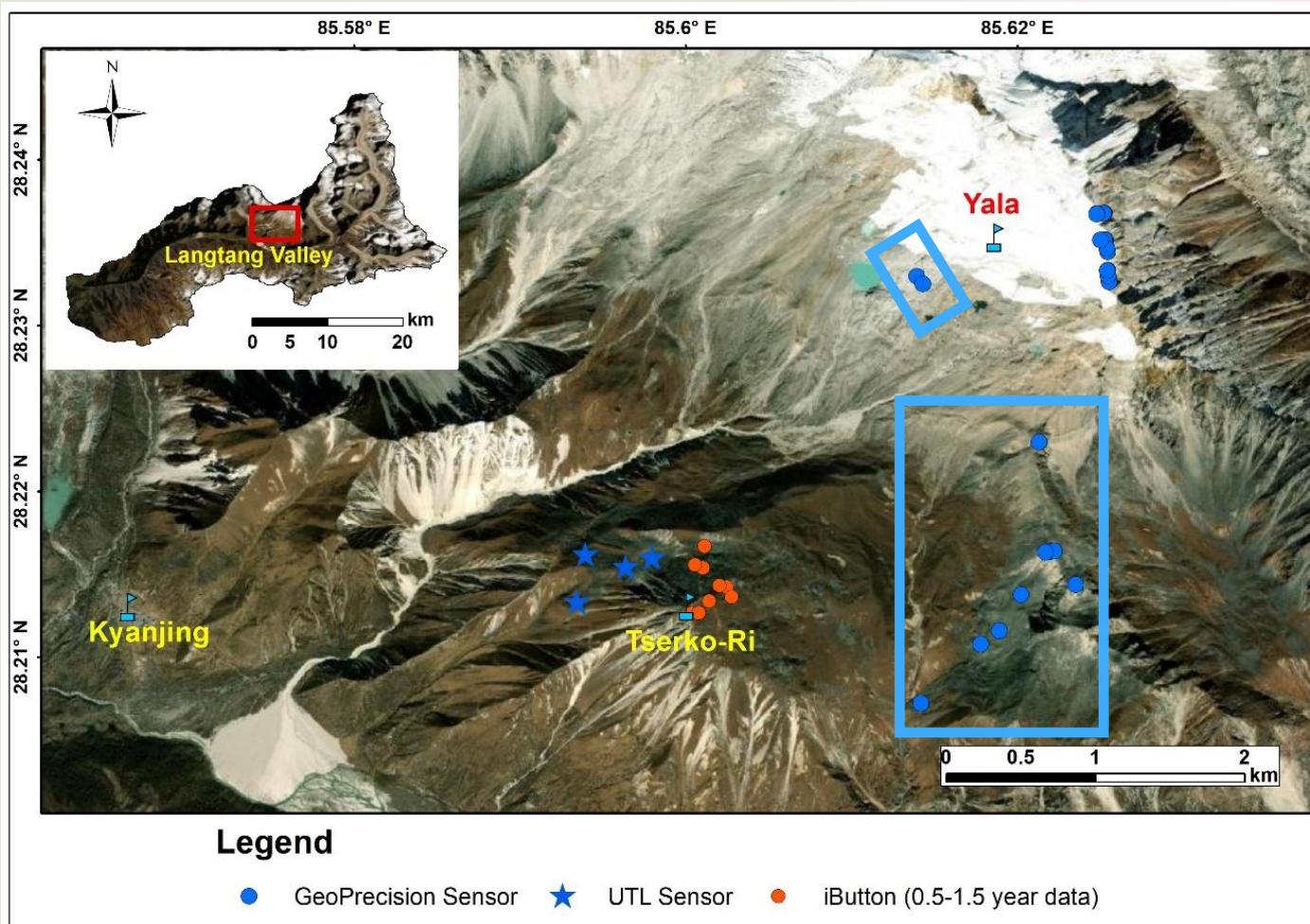
GeoPrecision
Simple



GeoPrecision Rock

Yala, Langtang

2016



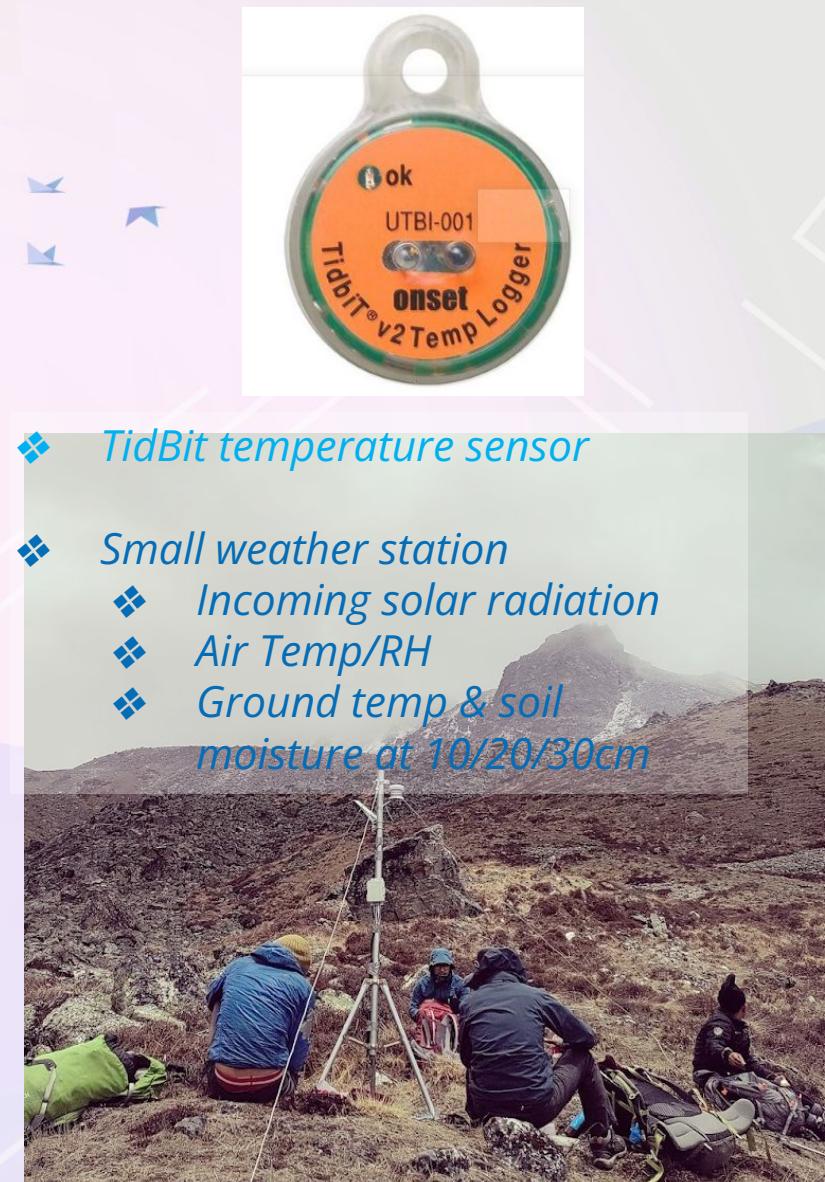
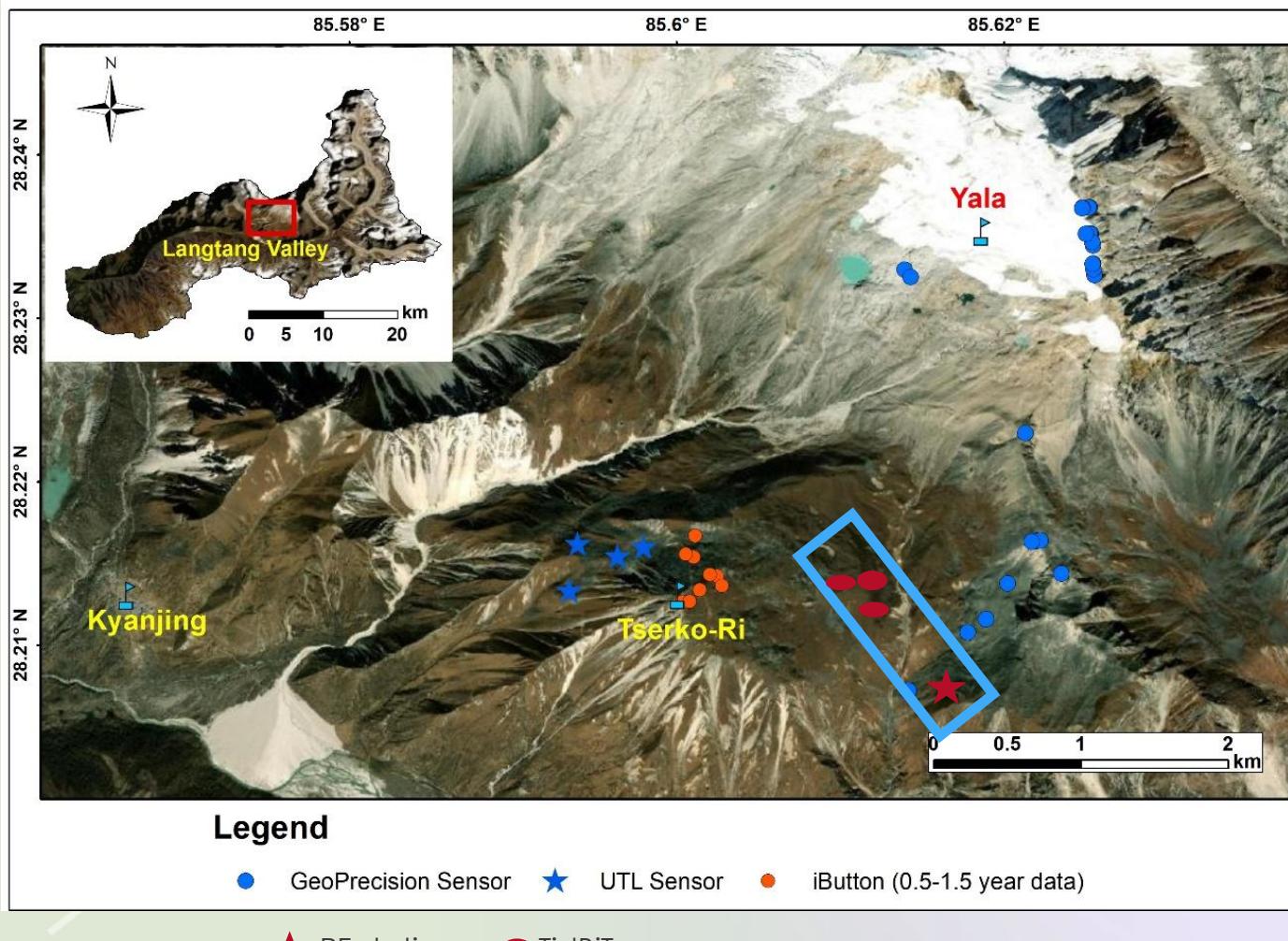
GeoPrecision
Simple



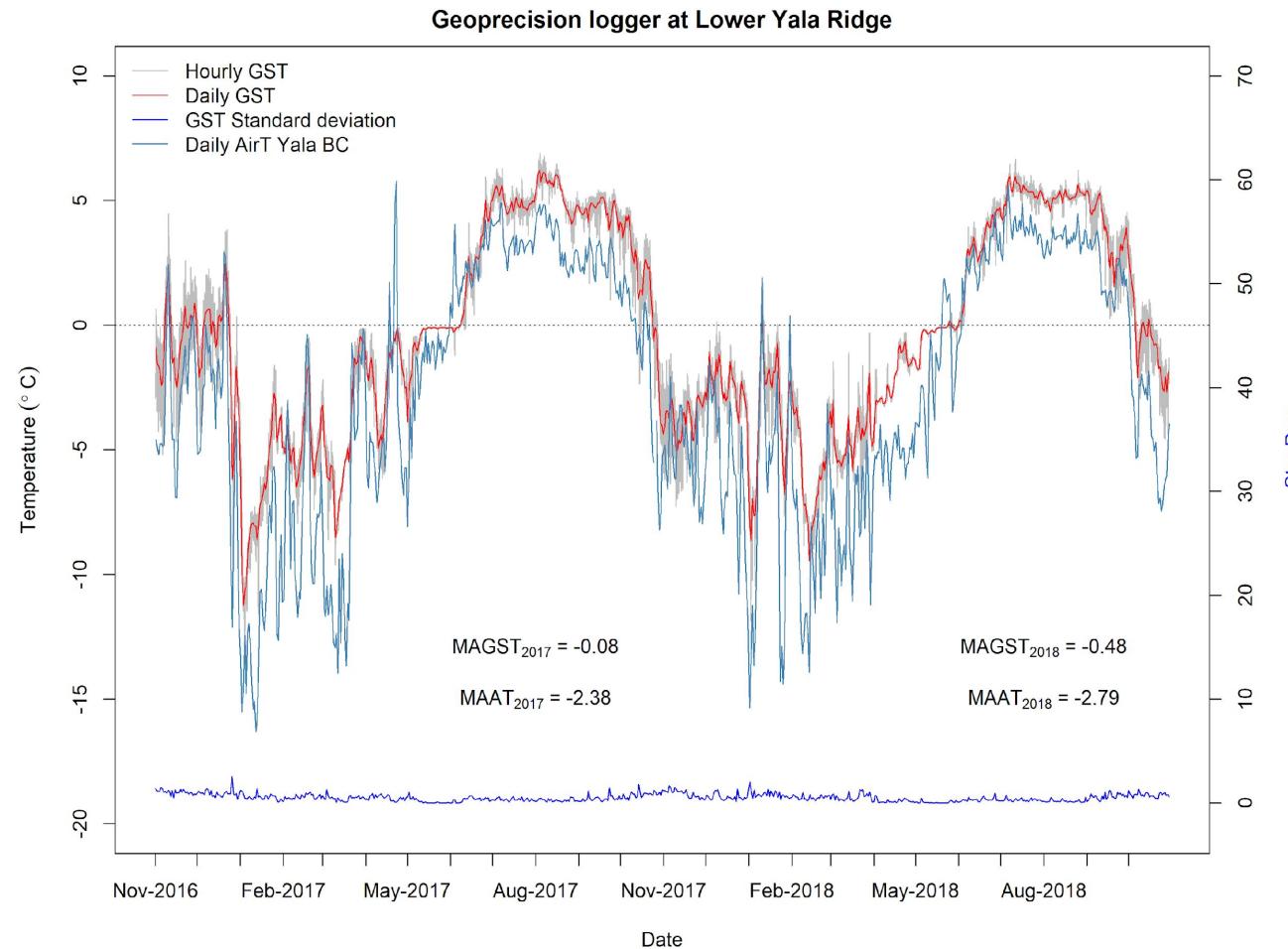
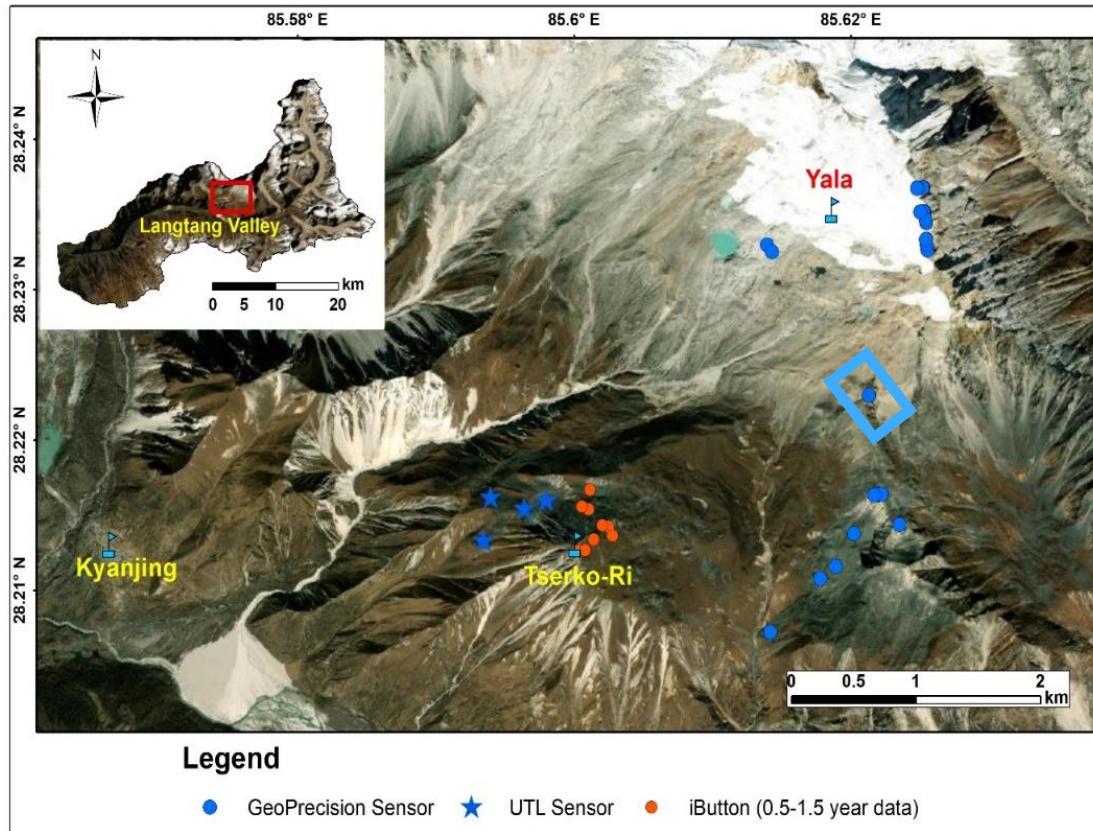
GeoPrecision Rock

Yala, Langtang

2021

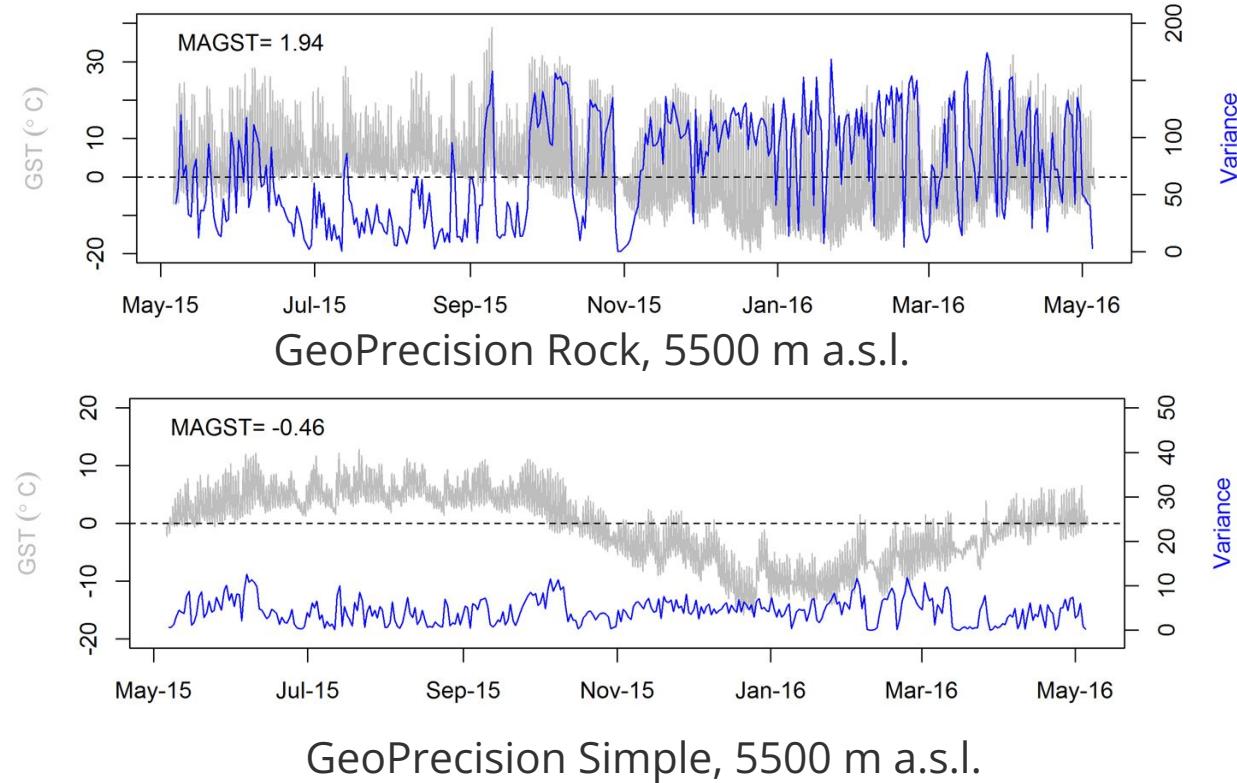
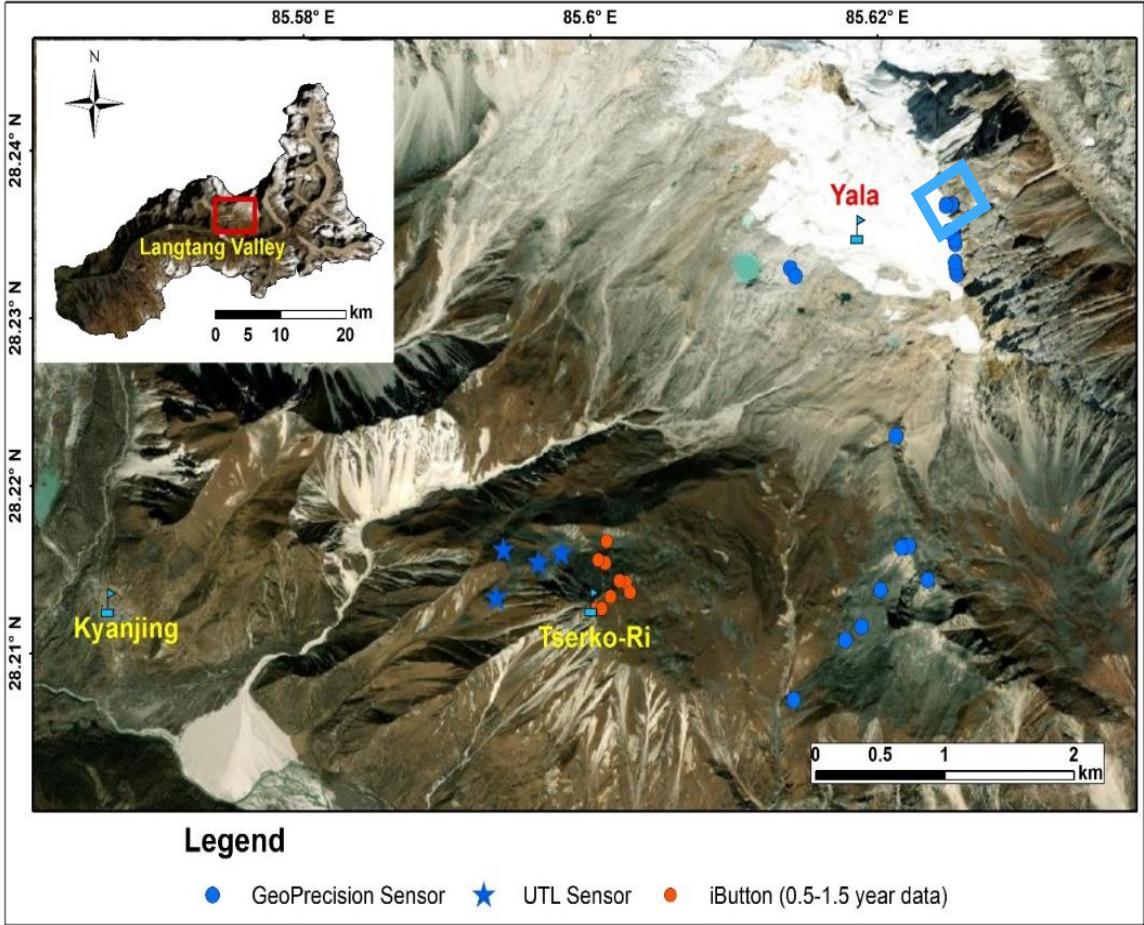


Surface characterization



Possibilities of permafrost in the region

Surface characterization

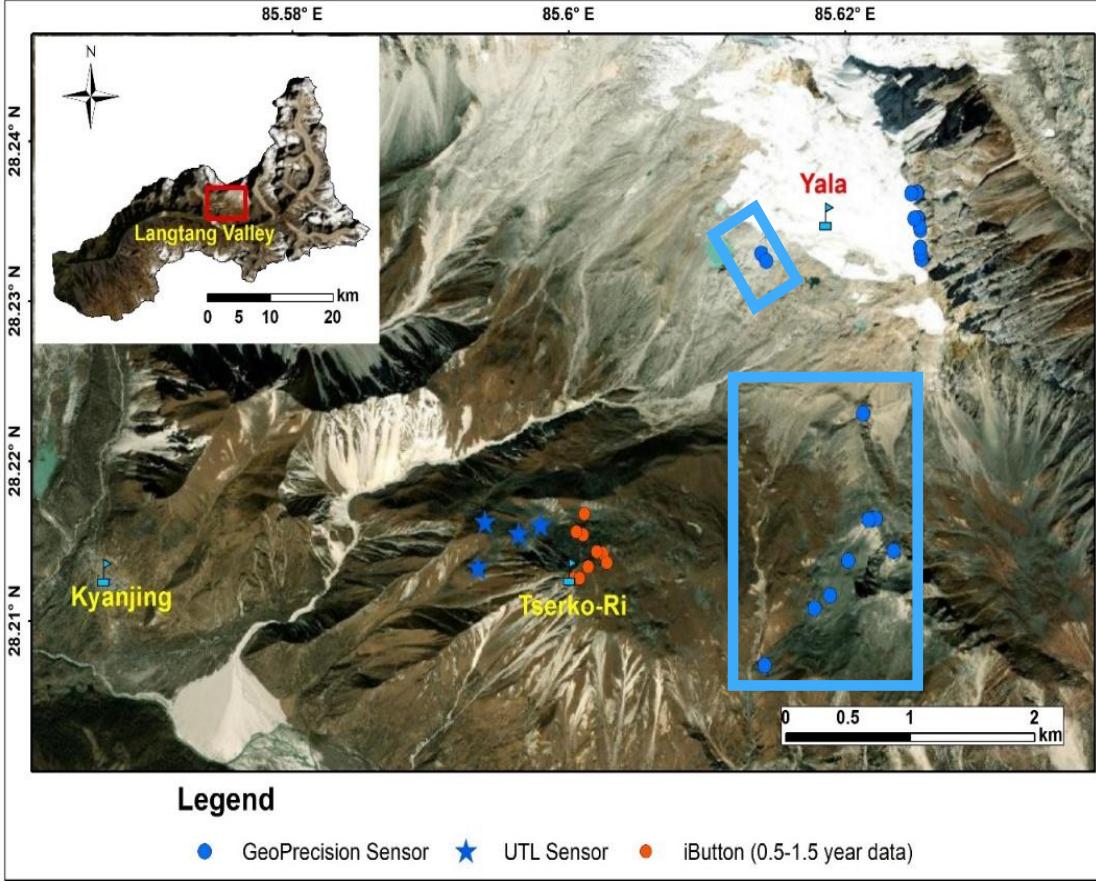


Different temperature profile of rock and debris
Temp data of rock can be used to monitor the frost cracking

Surface characterization

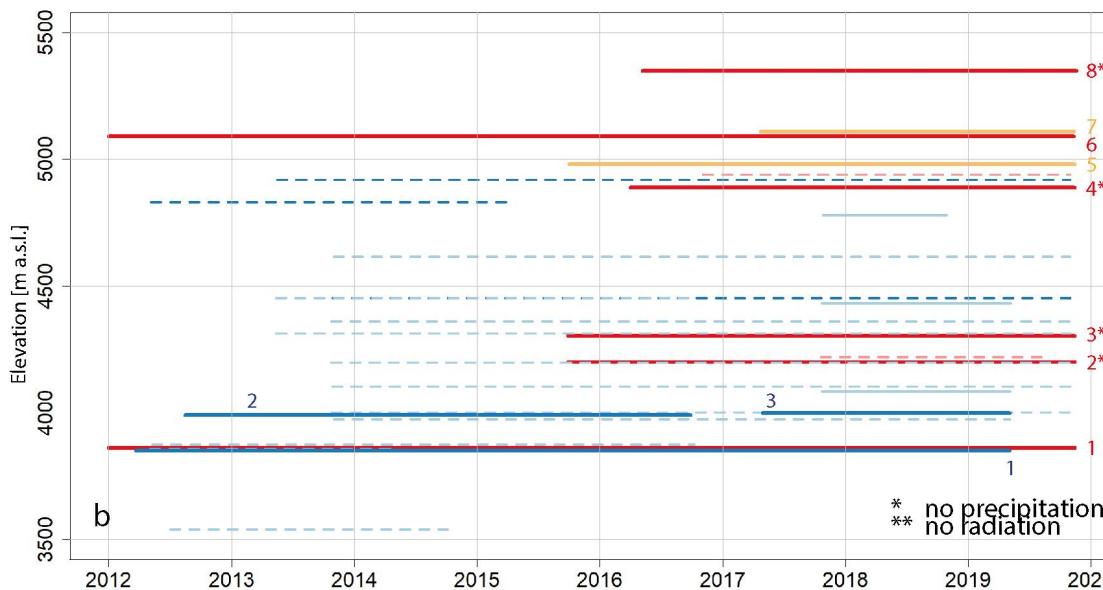
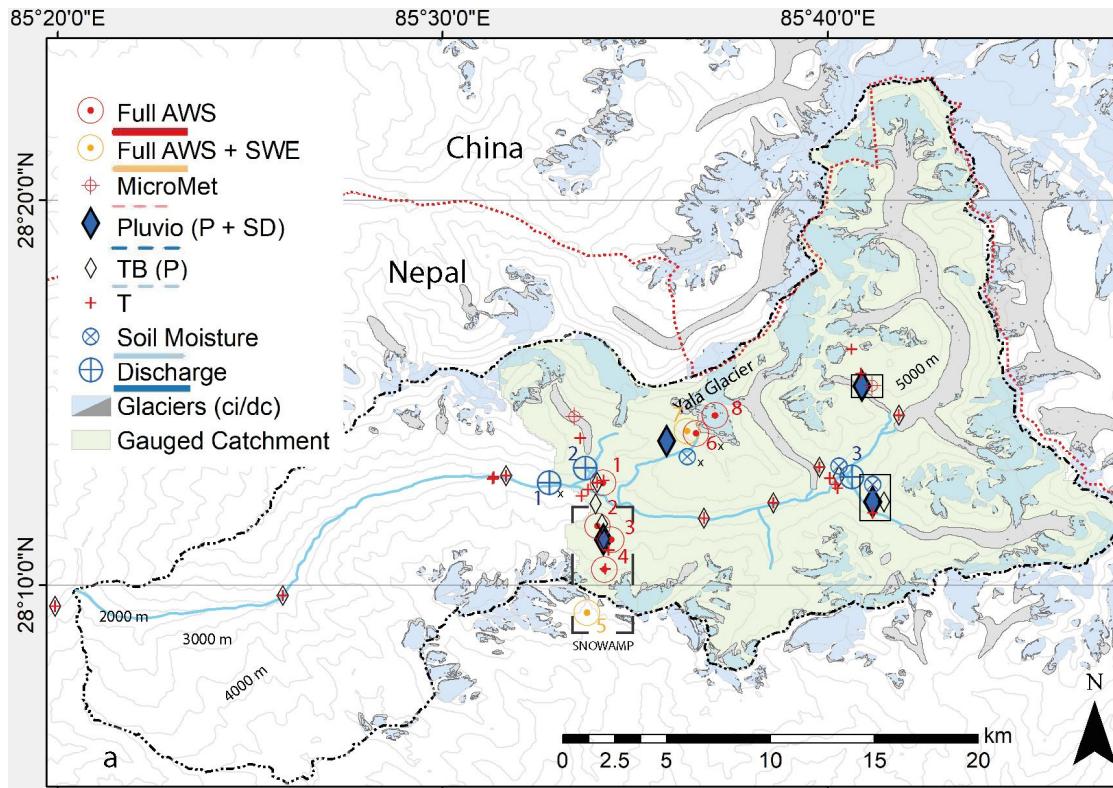
MAGST, RD, MD

Temperature in °C



ID	Elevation [m a.s.l.]	2017		2018			
		RD	MD	MAGST	RD	MD	MAGST
D16	5052	4/21/2017	5/15/2017	-1.44NA		5/15/2018	-2.02
D17	5041	5/24/2017	6/9/2017	-0.08	5/17/2018	5/25/2018	-0.48
D19	5158	5/24/2017	6/3/2017	-0.15	5/18/2018	6/6/2018	-0.36
D21	4792	6/4/2017	6/4/2017	0.01NA		6/2/2018	-0.35
D22	4841	5/12/2017	6/6/2017	-0.28NA		5/25/2018	-0.55
D23	4892	5/15/2017	6/12/2017	-0.53	5/18/2018	6/6/2018	-0.77
D26	4520	5/12/2017	5/31/2017	-0.28	5/25/2018	5/25/2018	-0.31
R13	5070	NA	NA	7.13NA	NA		6.77
R14	5084	NA	NA	2.96NA	NA		2.76
R15	5055	NA	NA	3.70NA	NA		3.14
R18	5103	NA	NA	2.13NA	NA		1.63
R20	5157	NA	NA	7.93NA	NA		7.70
R24	5494	NA	NA	-3.70NA	NA		-4.17
R25	5171	NA	NA	7.23NA	NA		6.83

Heterogeneous melting timing



Steiner et al, 2021

Data sharing



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GST (Ground surface temperature) loggers Langtang Valley

UPDATED DATE: 3/31/2021 11:59:38 AM

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Collection of ground surface temperature loggers (39) placed on the Yala Plateau on different surface types.



Schema

iso19139



NORWEGIAN MINISTRY
OF FOREIGN AFFAIRS



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC

Thank you



unesco



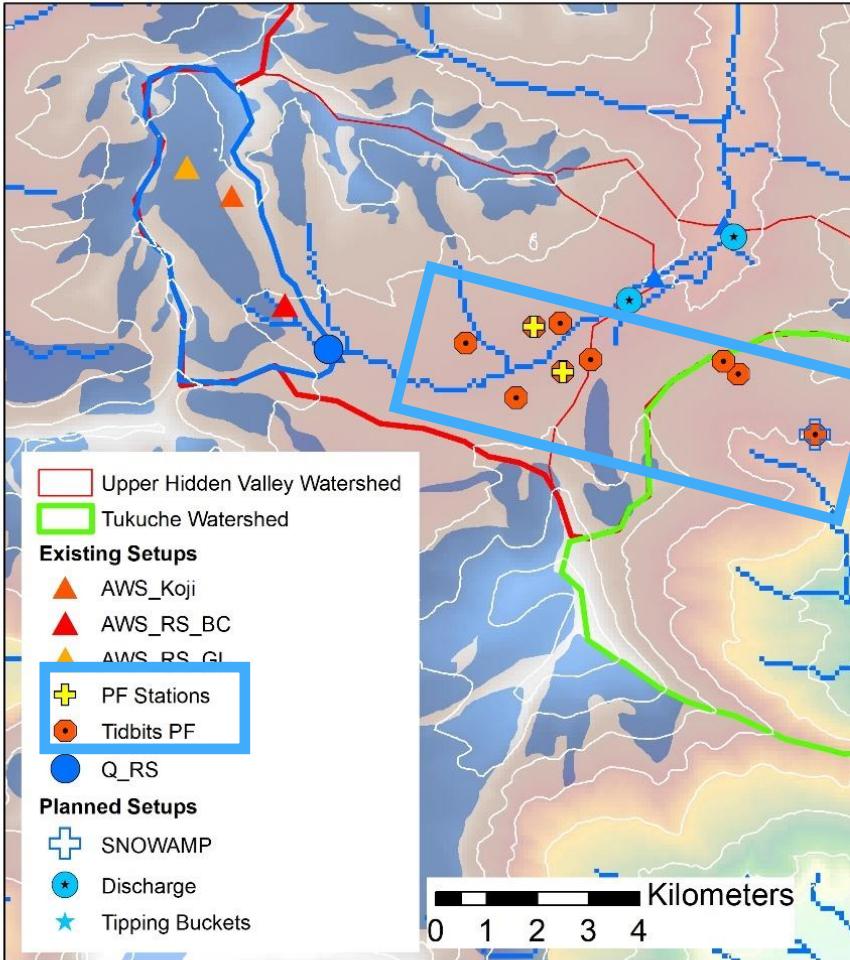
Aga Khan Agency for Habitat

ICIMOD



ADAPTATION FUND

Hidden Valley

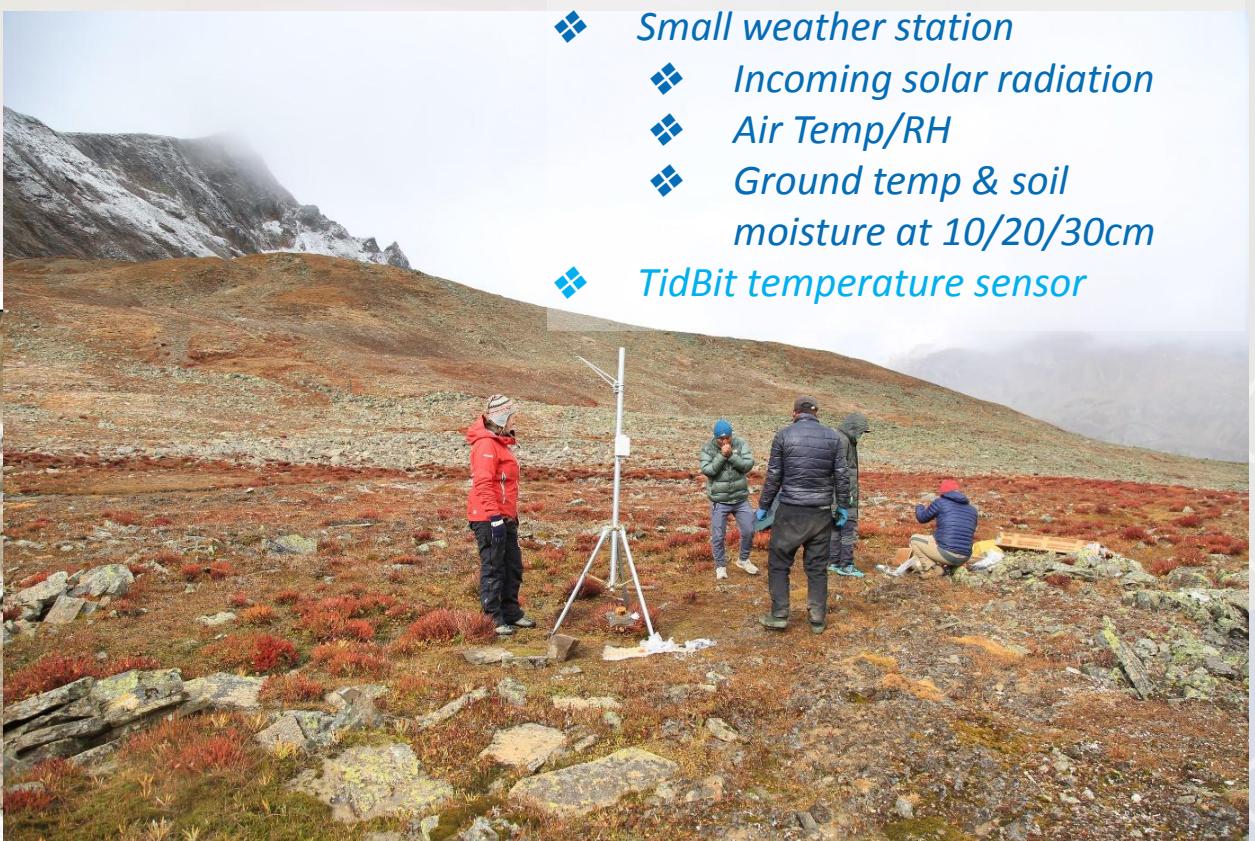


South & North face, Hidden Valley

- ❖ Small weather station
 - ❖ Incoming solar radiation
 - ❖ Air Temp/RH
 - ❖ Ground temp & soil moisture at 10/20/30cm
- ❖ TidBit temperature sensor



Nyalu Lagna pass



- Small weather station
- Incoming solar radiation
- Air Temp/RH
- Ground temp & soil moisture at 10/20/30cm
- TidBit temperature sensor

