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

Legend

- GeoPrecision Sensor
- UTL Sensor
- iButton (0.5-1.5 year data)

2013

iButton

Universal Temp. logger
Yala, Langtang

2014

GeoPrecision
Simple

Legend
- GeoPrecision Sensor
- UTL Sensor
- iButton (0.5-1.5 year data)

GeoPrecision Rock
Yala, Langtang

Legend

- GeoPrecision Sensor
- UTL Sensor
- iButton (0.5-1.5 year data)

GeoPrecision Simple

GeoPrecision Rock

2016
Yala, Langtang

2021

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

Legend

- GeoPrecision Sensor
- UTL Sensor
- iButton (0.5-1.5 year data)
- PF station
- TidBit
Surface characterization

Possibilities of permafrost in the region
Different temperature profile of rock and debris
Temp data of rock can be used to monitor the frost cracking
### Surface characterization

#### Temperature in °C

<table>
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<tr>
<th>ID</th>
<th>Elevation [m a.s.l.]</th>
<th>2017 RD</th>
<th>2017 MD</th>
<th>2017 MAGST</th>
<th>2018 RD</th>
<th>2018 MD</th>
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#### Heterogeneous melting timing

- GeoPrecision Sensor
- UTL Sensor
- iButton (0.5-1.5 year data)
Data sharing

Steiner et al, 2021
Thank you
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

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