

# Cryosphere Service Function

# WMO Global Cryosphere Watch

WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU



**WMO OMM**

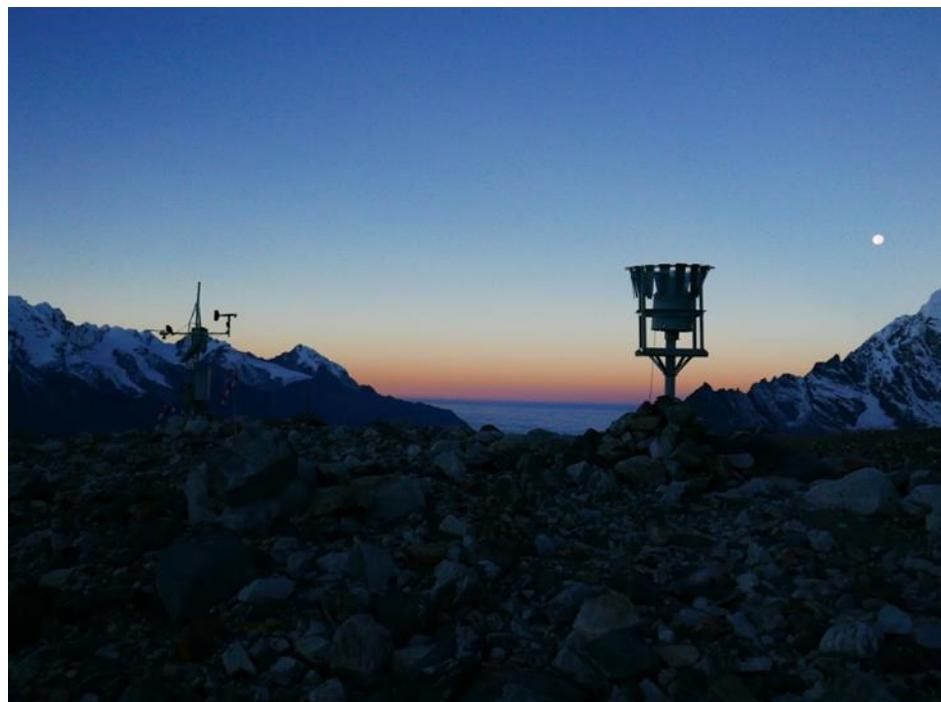
World Meteorological Organization  
Organisation météorologique mondiale

South Asia HYDROMET FORUM  
19 September 2018

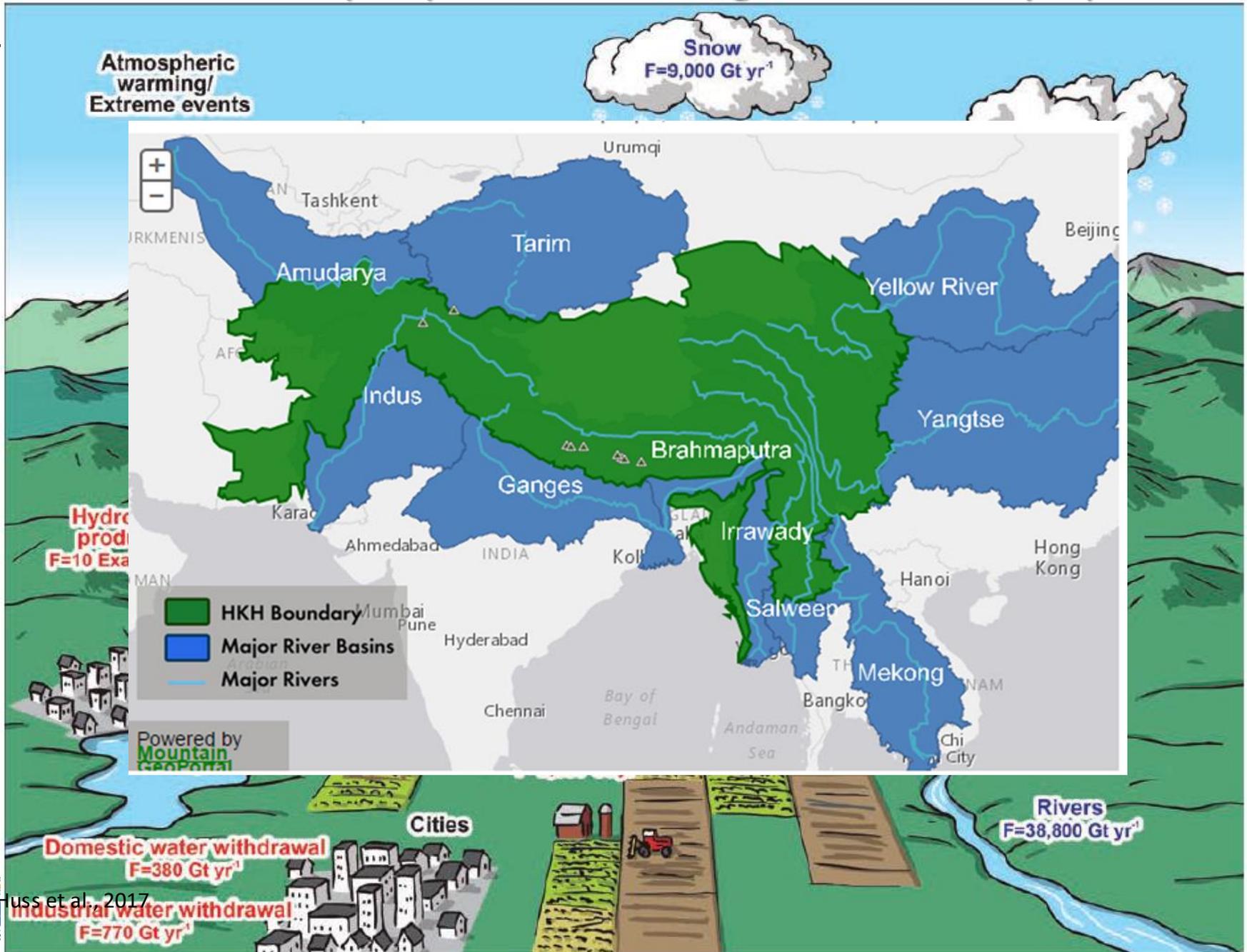
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Project Manager, Global Cryosphere Watch  
WMO

# Key messages

- Data as a measure of success;
- Partnerships on snow, glaciers, permafrost information.
- WMO initiatives (GCW, TP-RCC, High Mountain Summit)



# Service connection perspective of the High Mountain Cryosphere



# Impacts of climate change on cryospheric processes

- *Shift of all components to higher altitudes and latitudes*
- *Decreasing area, volume and duration of snow and ice*
- *Less inter-seasonal water storage capacity*

## Glaciers

## Snow

## Permafrost

Short-term runoff increase, medium-long-term decrease

Shift of melting season

Reduced runoff buffer

Increase of active layer

Thaw/thermal alterations at depth

More variable flow, increased risk of hydrological extremes (floods/droughts)

Increased sediment transport, and extreme events

Increased hillslope instabilities and erosion

Altered soil moisture regime

Geo-hydrological effects

Decreasing biodiversity in glacier-fed rivers and lakes

Ecological changes in systems that require winter snow

Reduced/more variable water availability for domestic, agricultural and industrial use

Ecological and societal effects

Loss of cultural and recreational value

Monitoring and early warning systems

Water, energy and ecosystem conservation

Multi-purpose water storage strategies

Water allocation and legislation, capacity building

Adaptation and management strategies

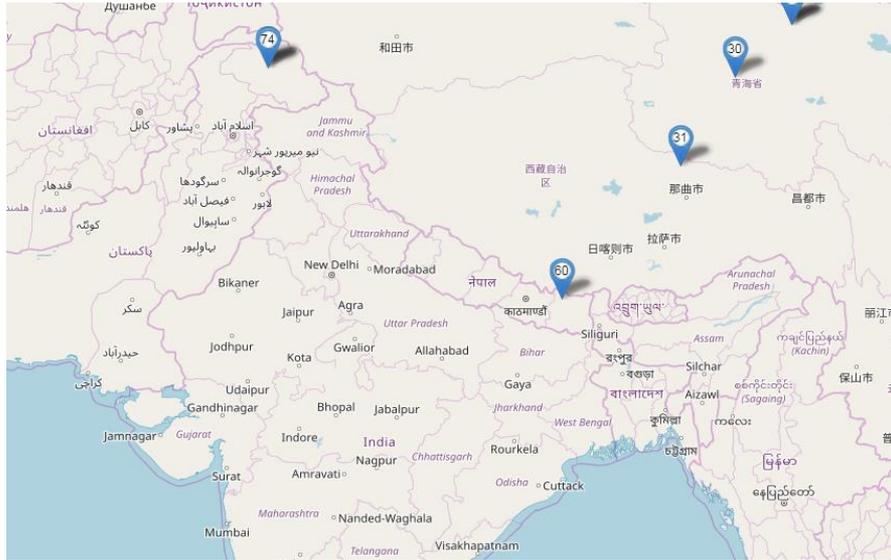
# Current baseline of cryosphere service functions

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Important limitations, at local to national levels:

- Scarce Cryospheric data resources;
- Most of cryosphere are research driven (e.g. permafrost);
- Issues:
  - Feasibility, access, and use of existing research data;
- **Observations → .... → Data**  
**Observations → power, telecom, processing → Data**

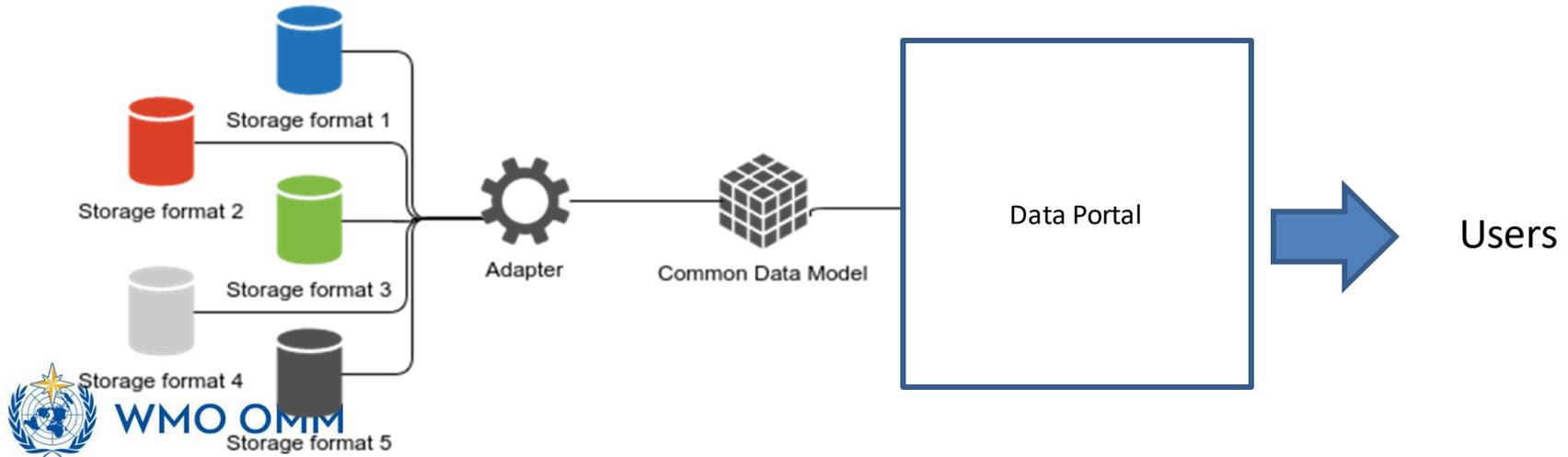




GCW is a mechanism of WMO:

- addressing emerging needs in polar and high mountain regions, e.g.
  - observations gaps,
  - data and information,
  - engagements between scientific and operational communities.
  
- to facilitate the provision of data, information, and analyses on the state of the cryosphere: e.g. Third Pole Regional Climate Centre Network

## GCW Data Portal



# Partnerships

- Interagency (national, regional);
- Significant research interest in the high mountain regions of Asia;
- Harvest innovation, data, and expertise from existing research projects, active in each country (build capacity):
  - GCW: broker between research and operational agencies;
  - Nationally: Sustain existing observations through joint proposals and commitments (maintenance)



# Key needs to enhance cryosphere service function

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- Users (e.g. economic sectors) need to receive tailor made data and information

## Third Pole Regional Climate Centre

| WMO's requirement for RCC      | Mandatory functions of AHM-PRCC  |
|--------------------------------|--|
| Operational Activities for LRF | Generation of tailored regional specific products                          |
|                                | Interpretation and assessment LRF products                                 |
|                                | Generate consensus statement on regional warning, forecast, and prediction |

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### Recommended products for AHM-PRCC

| ground-based | space-based |
|--------------|-------------|
|--------------|-------------|

**Warning:** snow avalanche, glacier surging, GLOF, snowstorm, gale/gust

**Forecast:** precipitation (snowfall), snowstorm, gale, cold wave, sandstorm

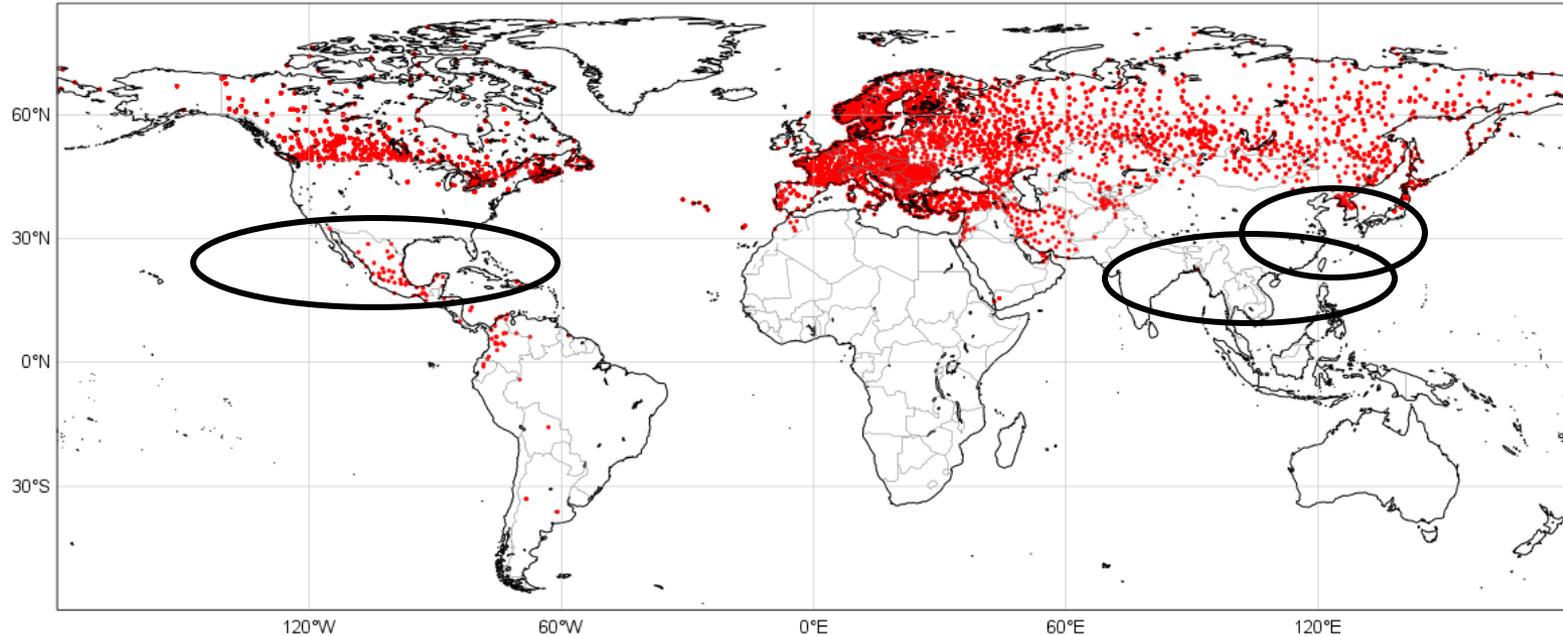
**Prediction:** air temperature, precipitation, first frost date, frequency and strength of cold air, forest fire, grassland fire, sand-dust

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# Leadership on Data exchange: Snow depth observations

SYNOP TAC + SYNOP BUFR + national BUFR data

Status on 5 February 2017



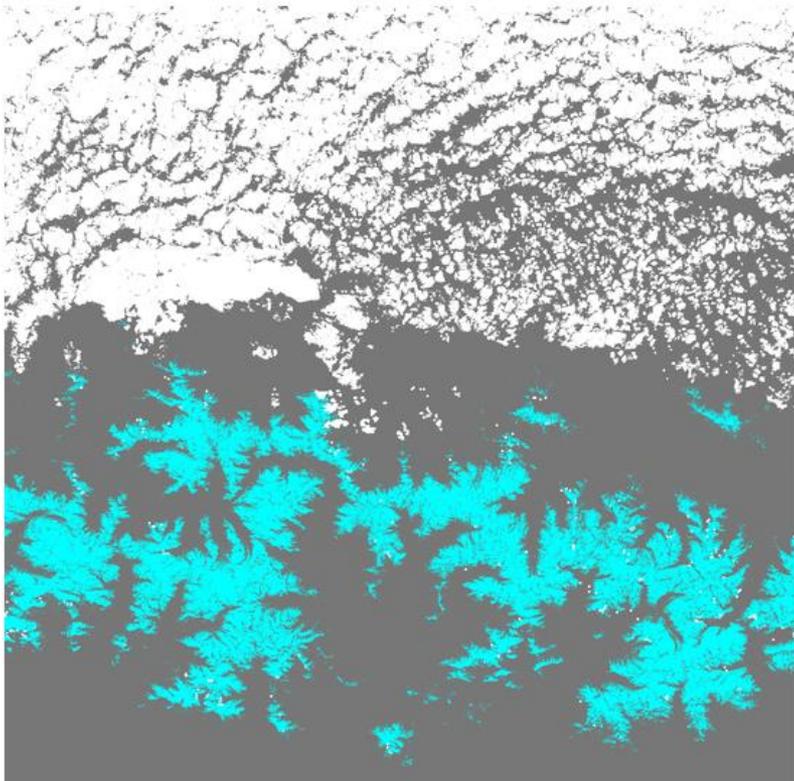
- Gaps in USA, China and southern hemisphere
- NRT data exist and is available (more than 20000 station in the USA), but it is not on the GTS for NWP applications.

# WMO Polar Space Task Group:

Theia Alpine Snow Product

From: <http://theia.cnes.fr>

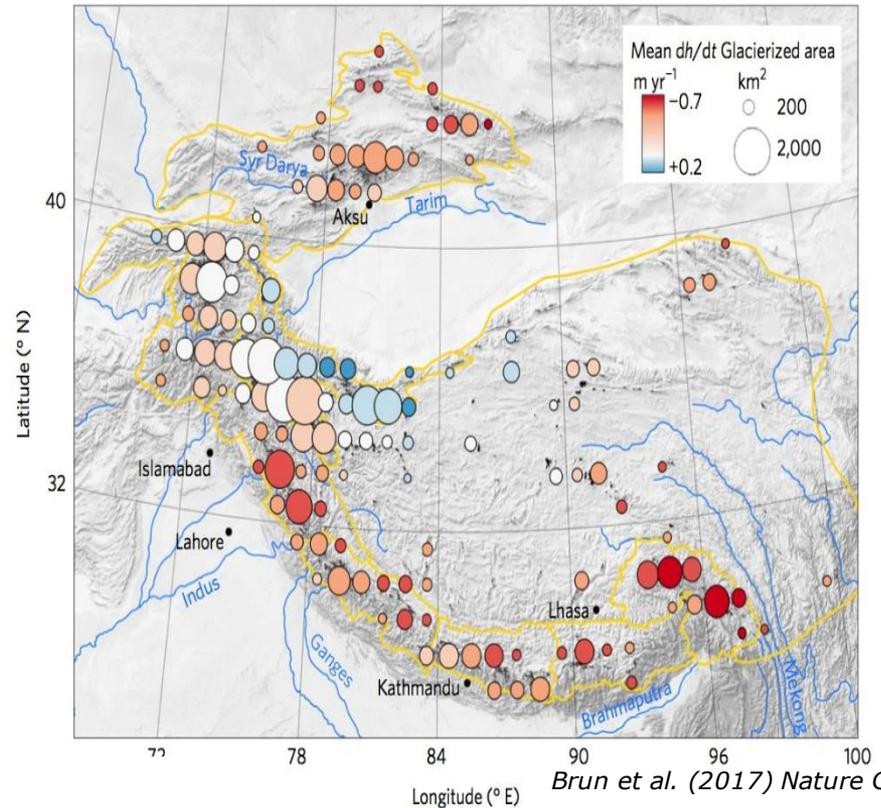
2017-04-16



Maps of the snow cover area  
at 20 m spatial resolution  
Every 5 days in near-real time,

## A spatially resolved estimate of High Mountain Asia glacier mass balances from 2000 to 2016

Fanny Brun<sup>1,2\*</sup>, Etienne Berthier<sup>2</sup>, Patrick Wagnon<sup>1</sup>, Andreas Käab<sup>3</sup> and Désirée Treichler<sup>3</sup>



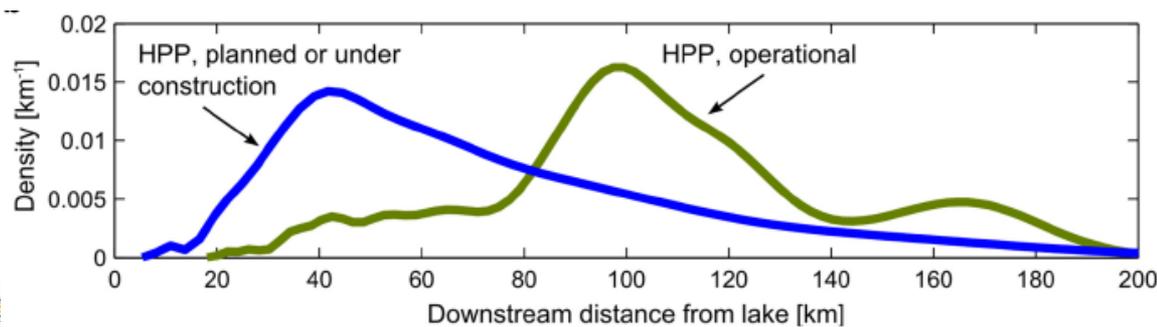
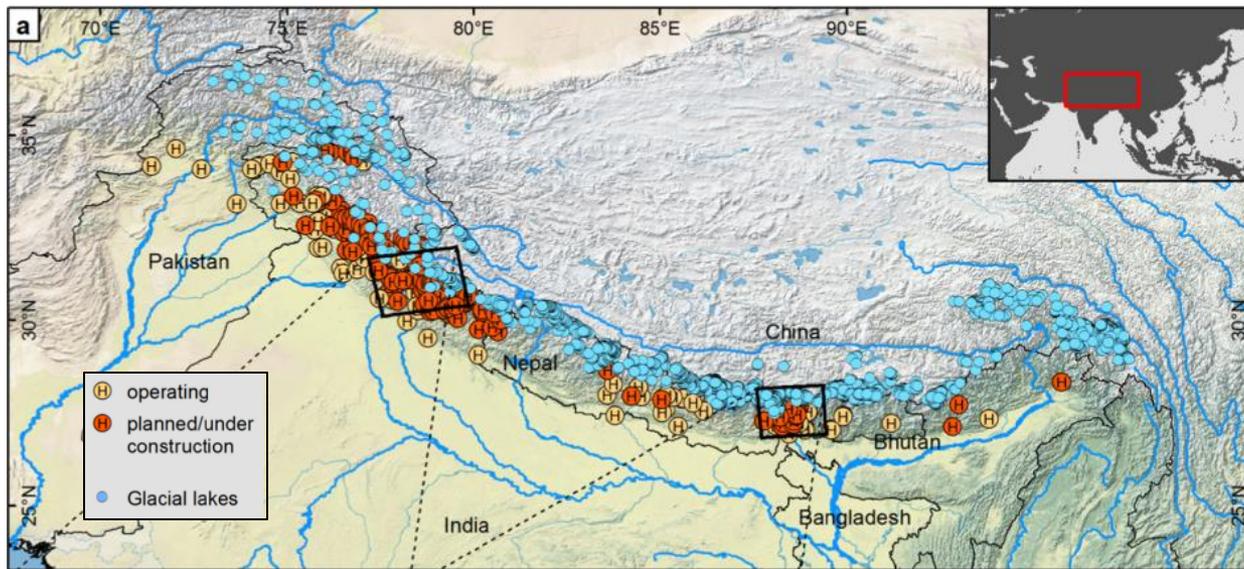


# High Mountain Summit

- 25-27 February 2019, Geneva
- WMO, WBG-GFDRR, UNESCO, FAO, MRI, MPI, ....
- Foster collaboration for integrated hydro-meteorological and climate service delivery functions;
- Address the need for accessible, reliable, and policy and decision-relevant information on water resources, natural hazard management, linked to accelerated changes in high mountain cryosphere and ecosystems

# Changing hazards and risks from the HMC

Hydropower structures moving closer to hazardous glacier lakes, yet largely unprepared for this type of hazard. Risk of enormous financial losses.



# Thank you Merci



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