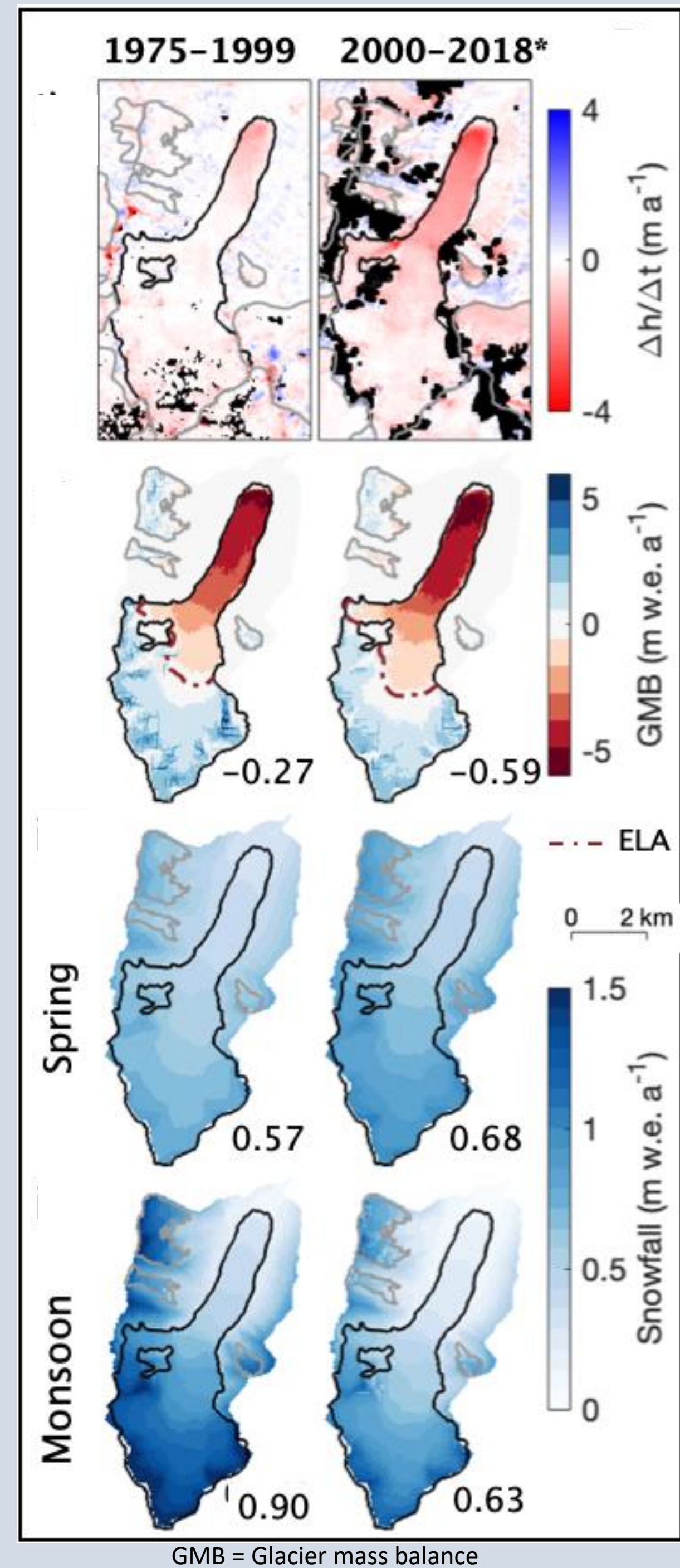


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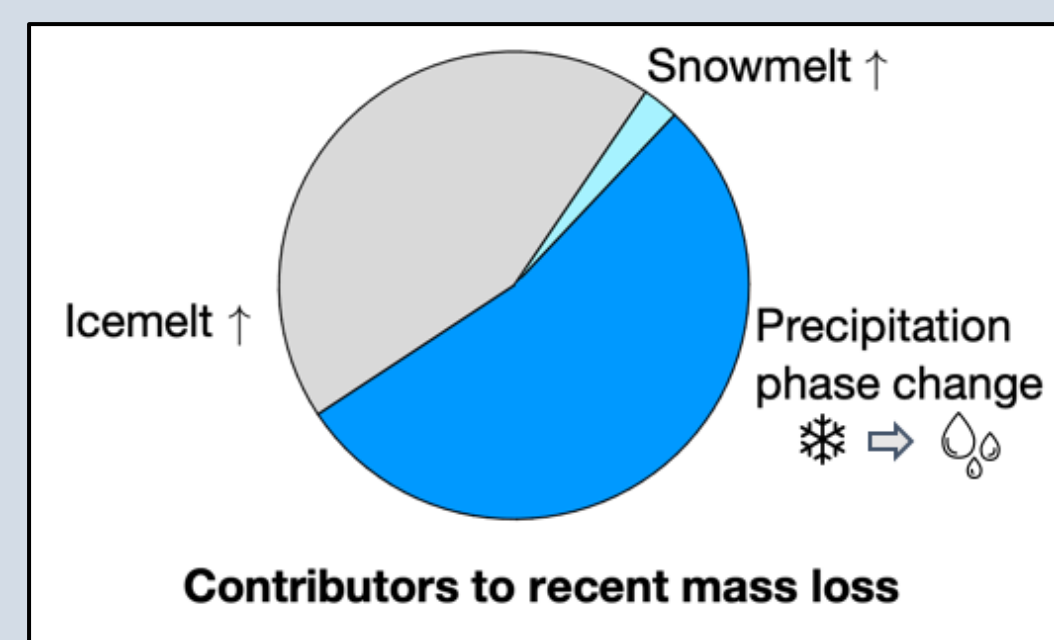
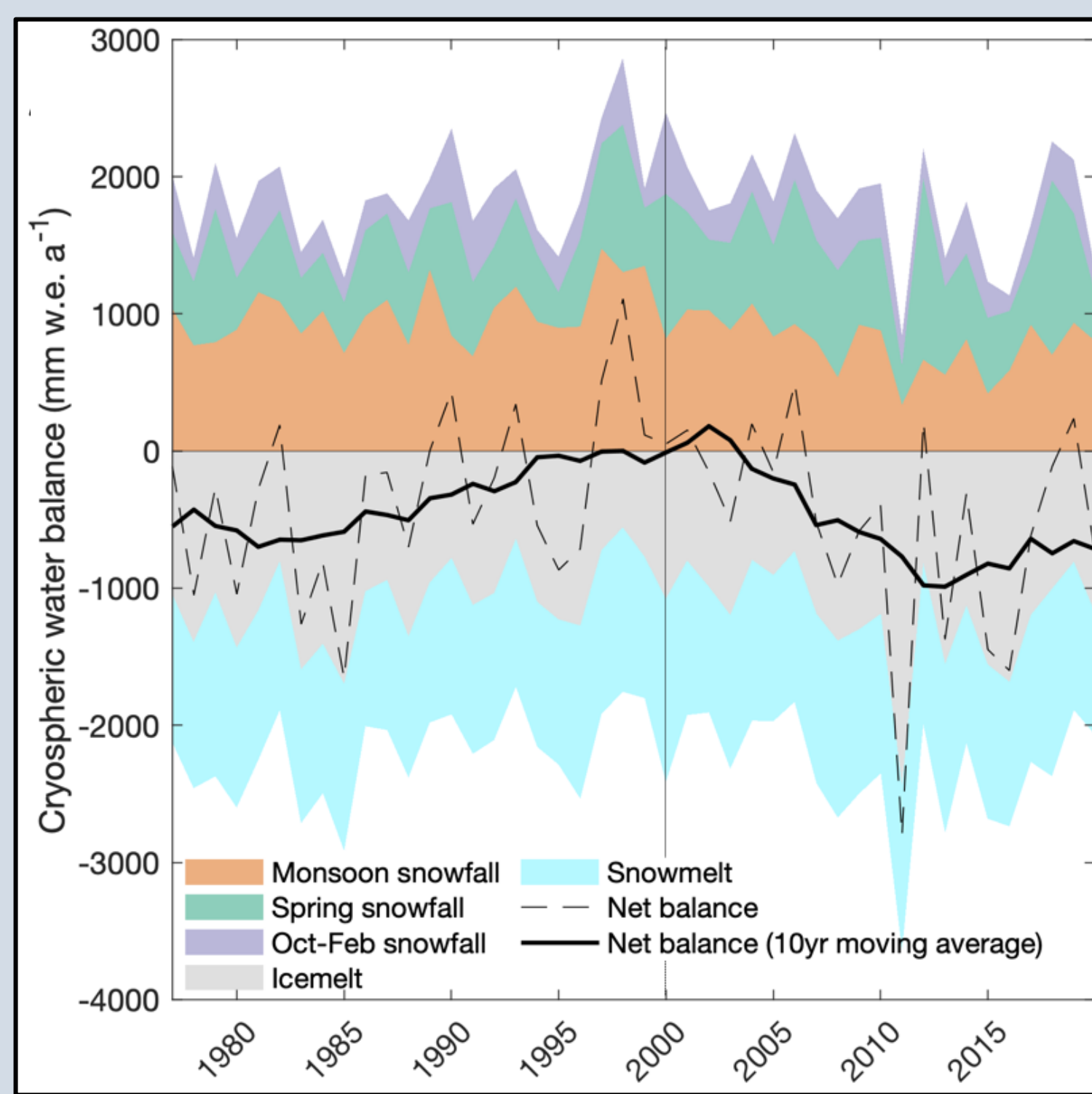
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## Motivations:

Precipitation phase change has exacerbated glacier mass loss in High-Mountain-Asia (HMA)<sup>1</sup> and will continue to do so in the future.

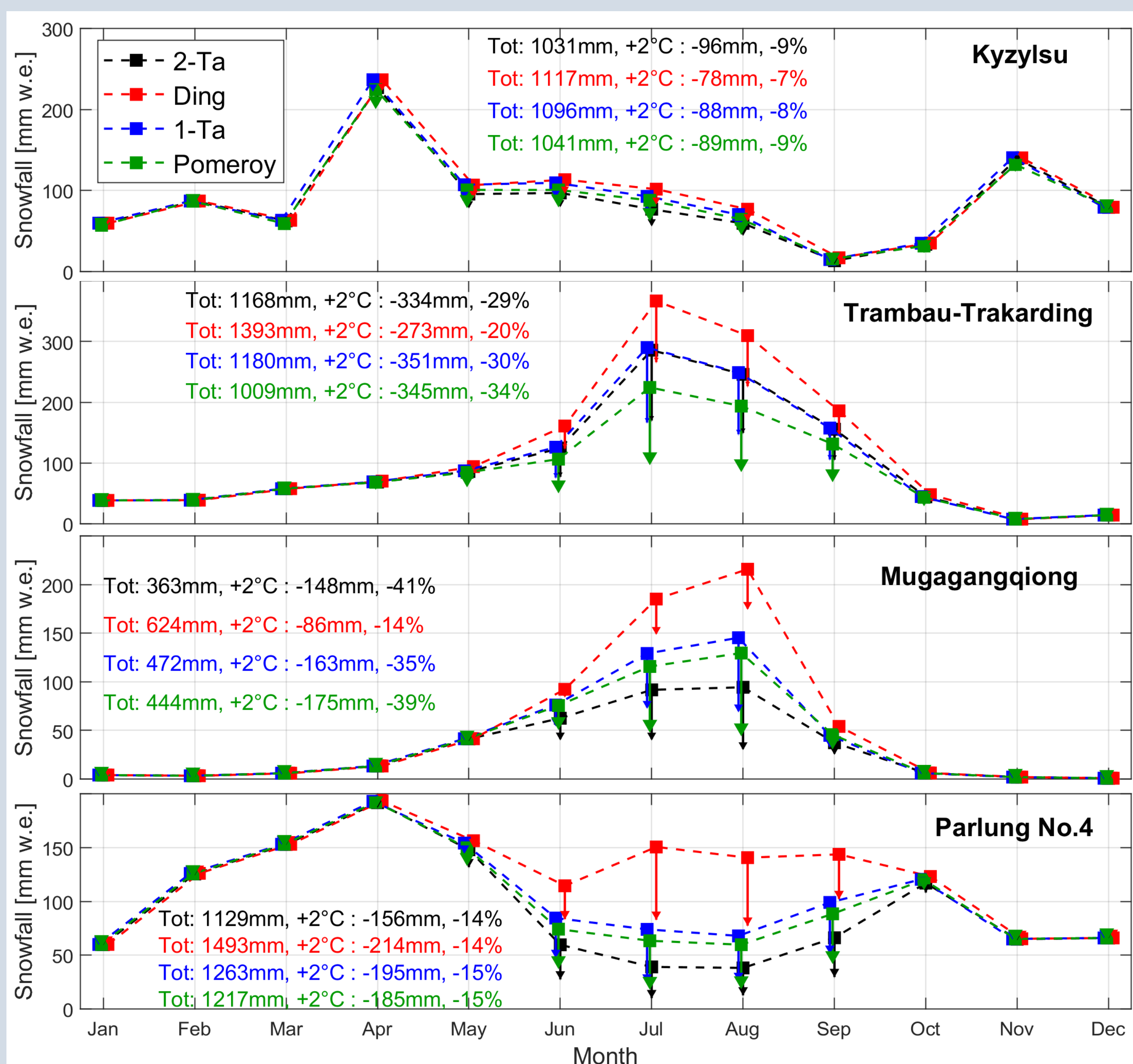


Recent glacier mass loss in the Southeastern Tibetan Plateau was attributed to a change in precipitation phase during the monsoon months<sup>1</sup>.



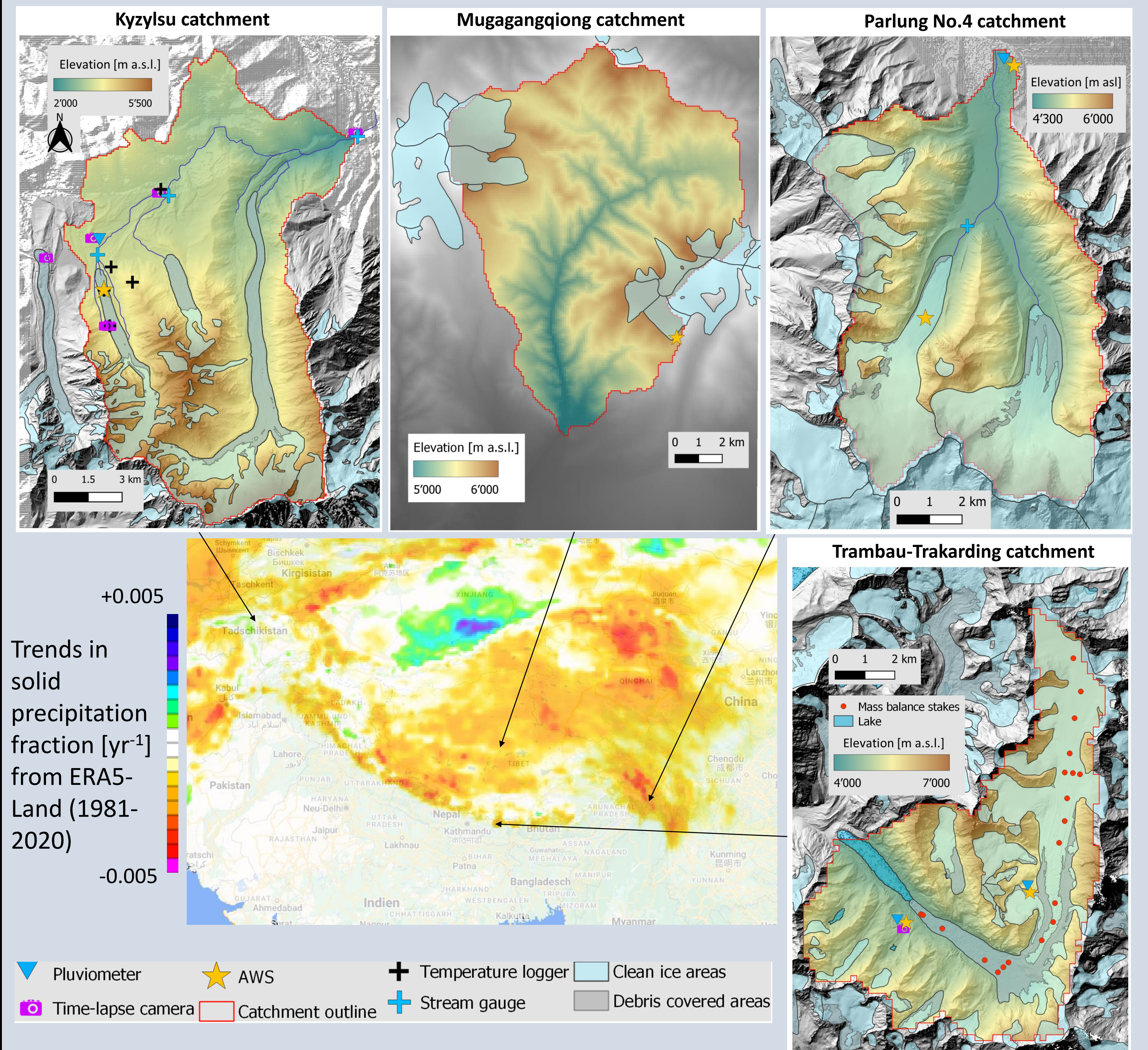
Snowfall amounts strongly control glacier mass balance<sup>2</sup>, and their estimate depend on the representation of precipitation phase.

## Snowfall seasonality and sensitivity to warming:



- The winter-accumulation regime glacier (Kyzylsu) is less sensitive to the parametrization's choice as well as to a 2°C degree warming.
- The summer accumulation-type glacier (Trakarding-Trambau) is most sensitive to +2°C warming.

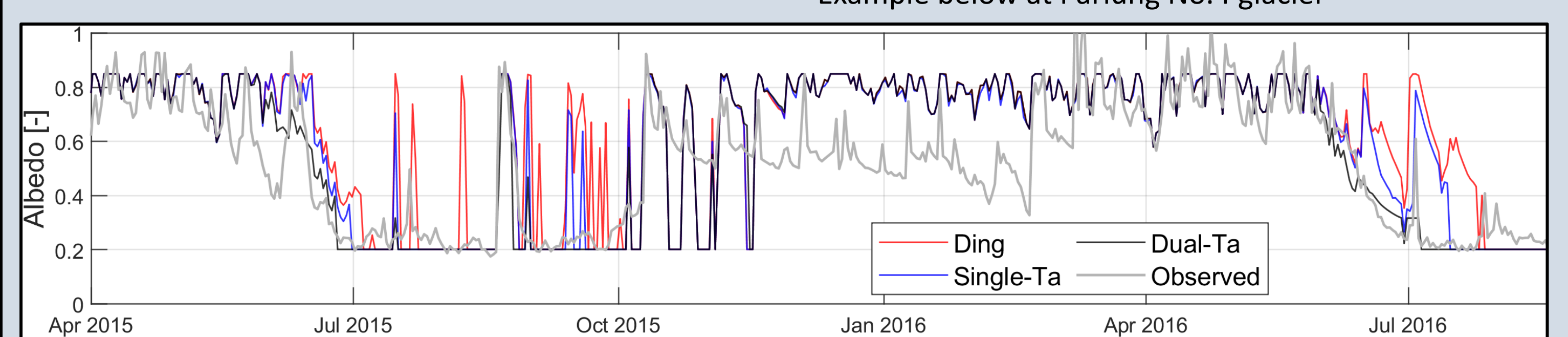
## Study sites:



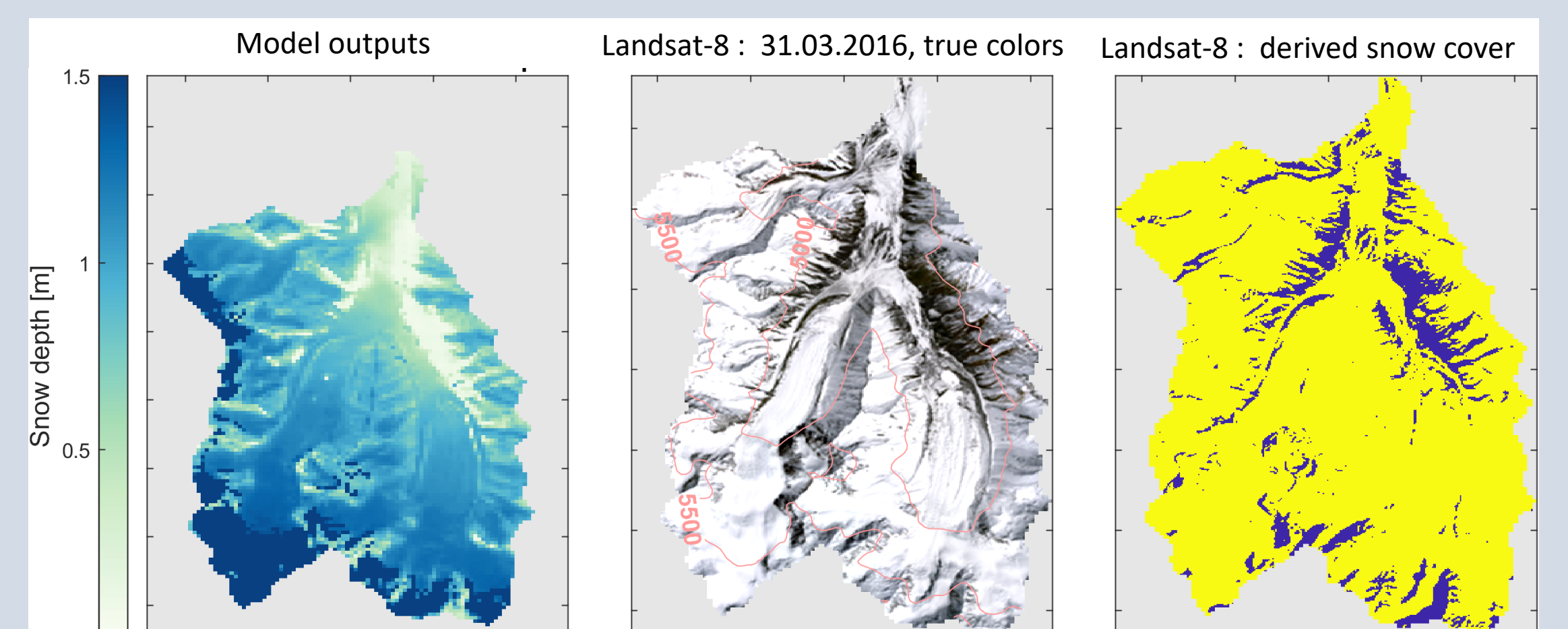
## Methods:

- Downscaled and bias-corrected ERA5-Land reanalysis (100m, hourly) at three catchments in HMA.
- Land-surface model T&C simulates glacier and snowpack dynamics using an energy-balance approach.
- Four precipitation phase parametrizations tested:
  - Single-Ta threshold ('Ta' = 2m air temperature [°C])
  - Dual-Ta threshold
  - Dynamic-Ta thresholds (Ding parametrization<sup>3</sup>)
  - Psychrometric energy balance (Pomeroy et al. 2013)

**Perspective:** Validating a precipitation partitioning scheme at high altitudes is difficult due to the lack of direct measurements, but can be constrained with more commonly measured variables (e.g. surface albedo, precipitation, snow depth).



High-resolution optical imagery allows detailed validation of simulated snow dynamics



## Main references

<sup>1</sup>Jouberton et al. 2022, Warming-induced monsoon precipitation phase change intensifies glacier mass loss in the southeastern Tibetan Plateau, PNAS. <sup>2</sup>Kumer et al. 2019, Snowfall Variability Dictates Glacier Mass Balance Variability in Himalaya-Karakoram, Sci. Rep. <sup>3</sup>Ding et al. 2014, The dependence of precipitation types on surface elevation and meteorological conditions and its parameterization, J.o.H.

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