Combining high resolution atmospheric simulations and land-surface modelling to understand high elevation snow processes in an Himalayan catchment

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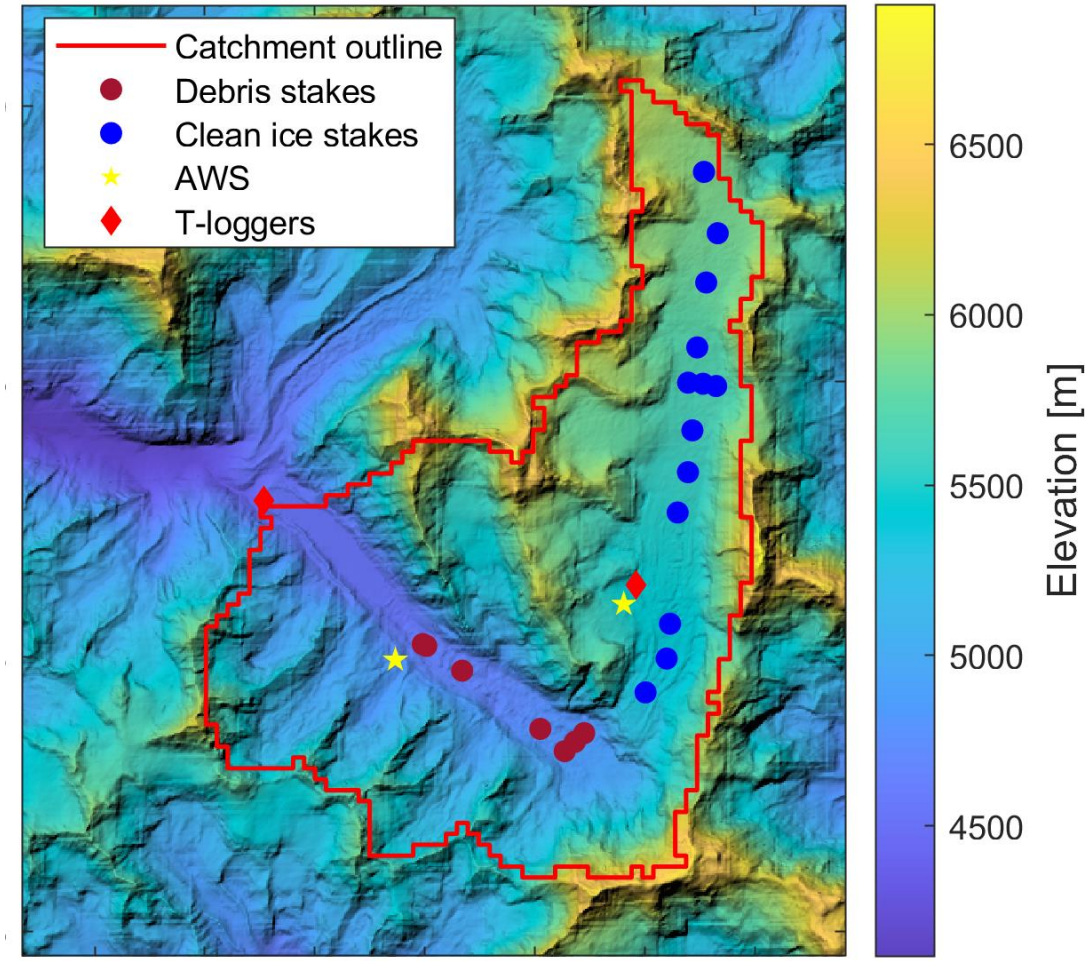
Study site

Trakarding–Trambau Glacier system in Nepalese Himalaya

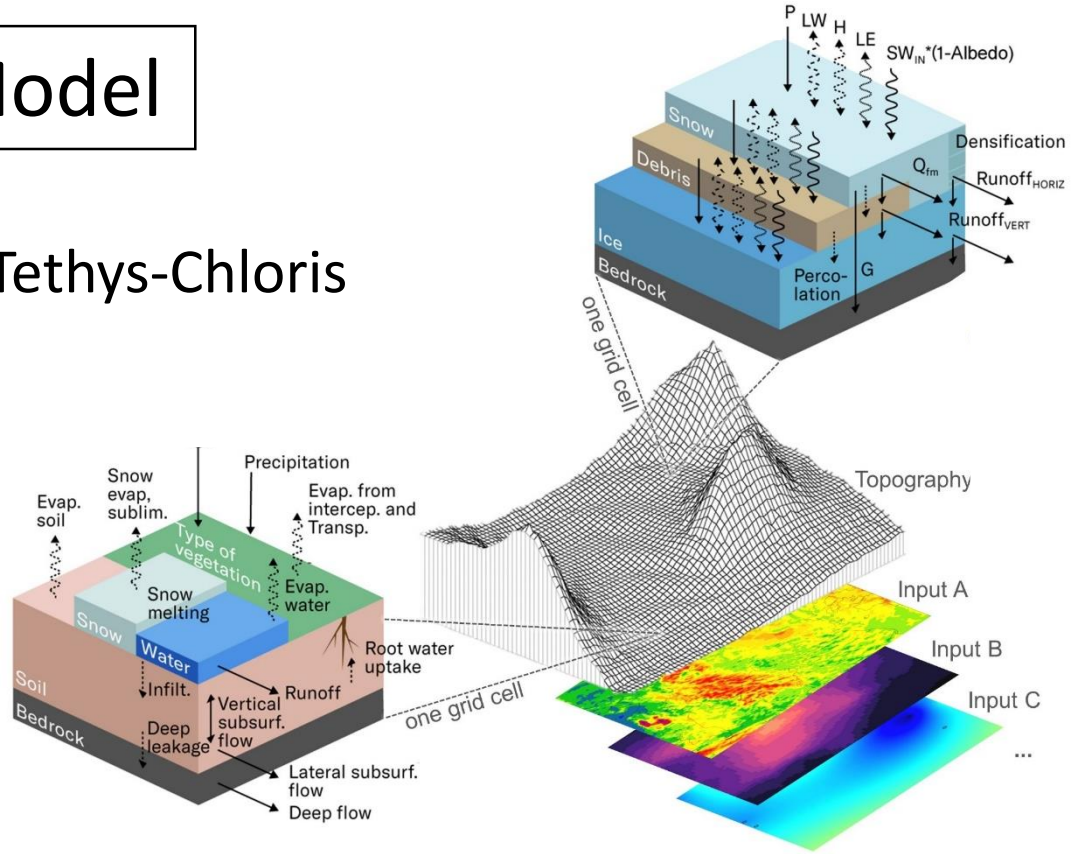


Catchment area: ~ 77 km^2

Elevation range: 4500 – 6700m a.sl.l

Model

Tethys-Chloris



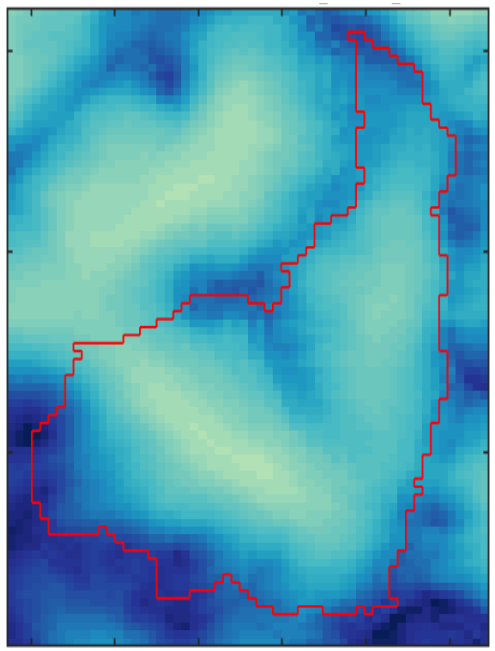
Simulation period: Oct 2018 – Sep 2019

<u>No model calibration has been done</u>

Question

Can high resolution atmospheric simulations unravel the spatial and seasonal snow dynamics of high elevation catchments?

Input



NHM

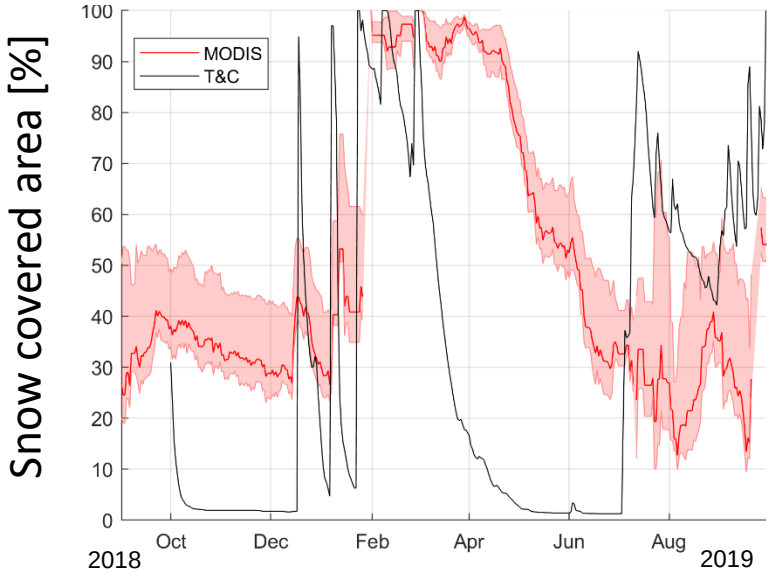
- 200m resolution
- Hourly
- Basin coverage
- 2018-2019

ERA5-Land

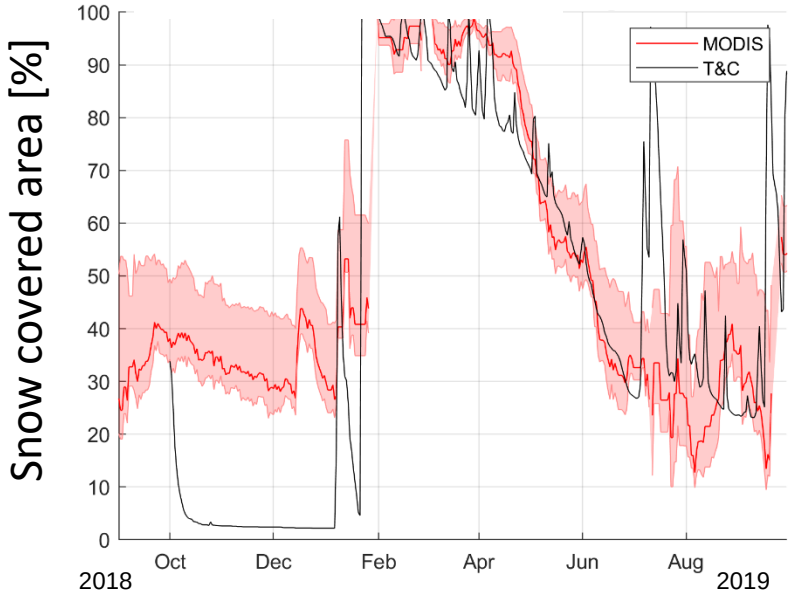
- 9km resolution
- ➢ downscaled to 200m
- Hourly
- Global coverage
- 1950-present

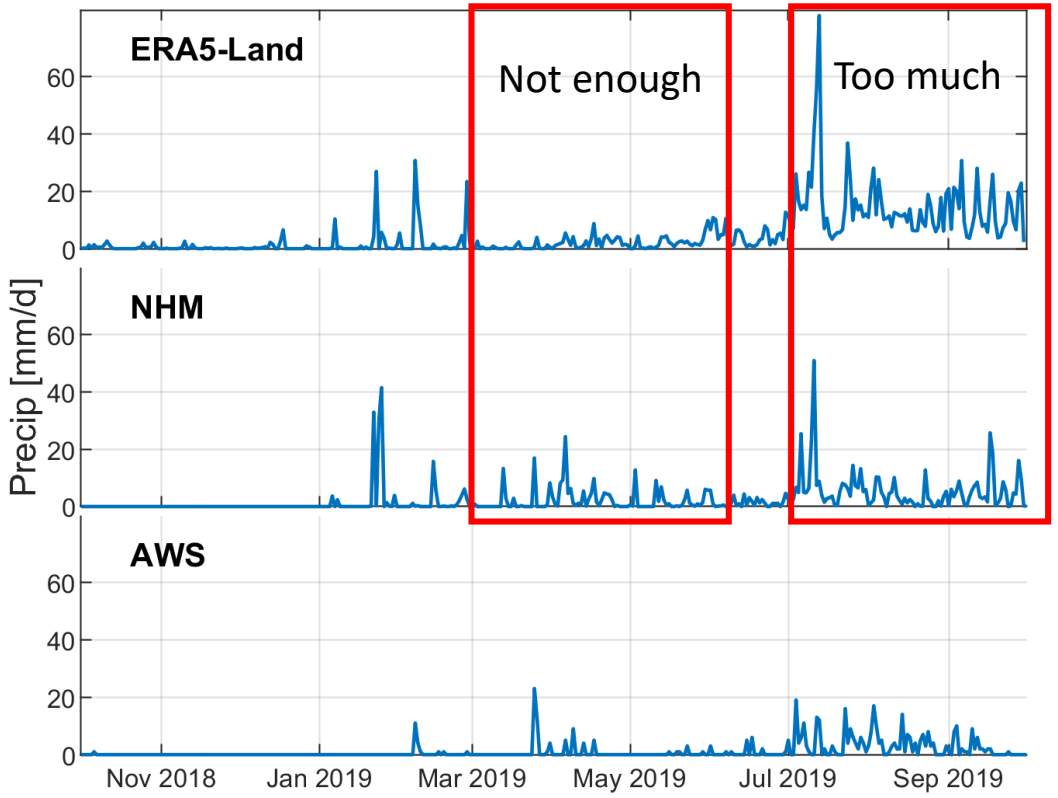
Importance of meteorological forcing

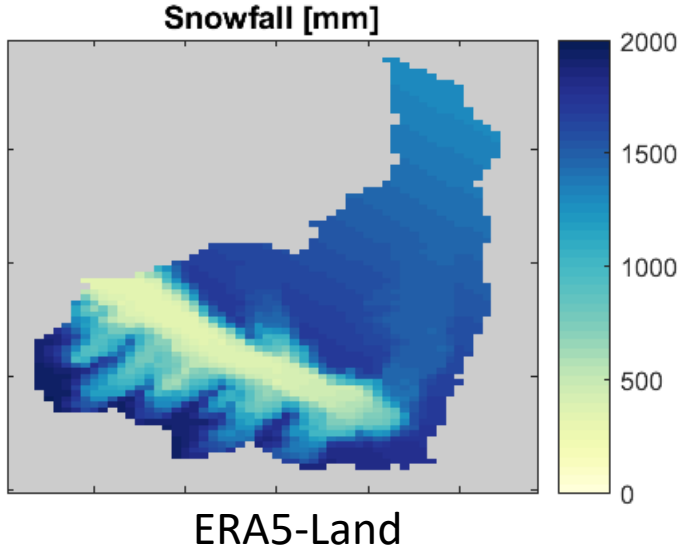
ERA5

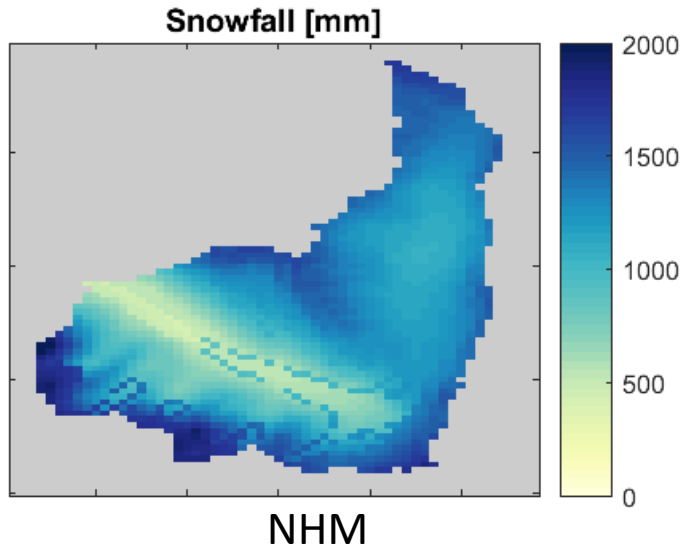


NHM



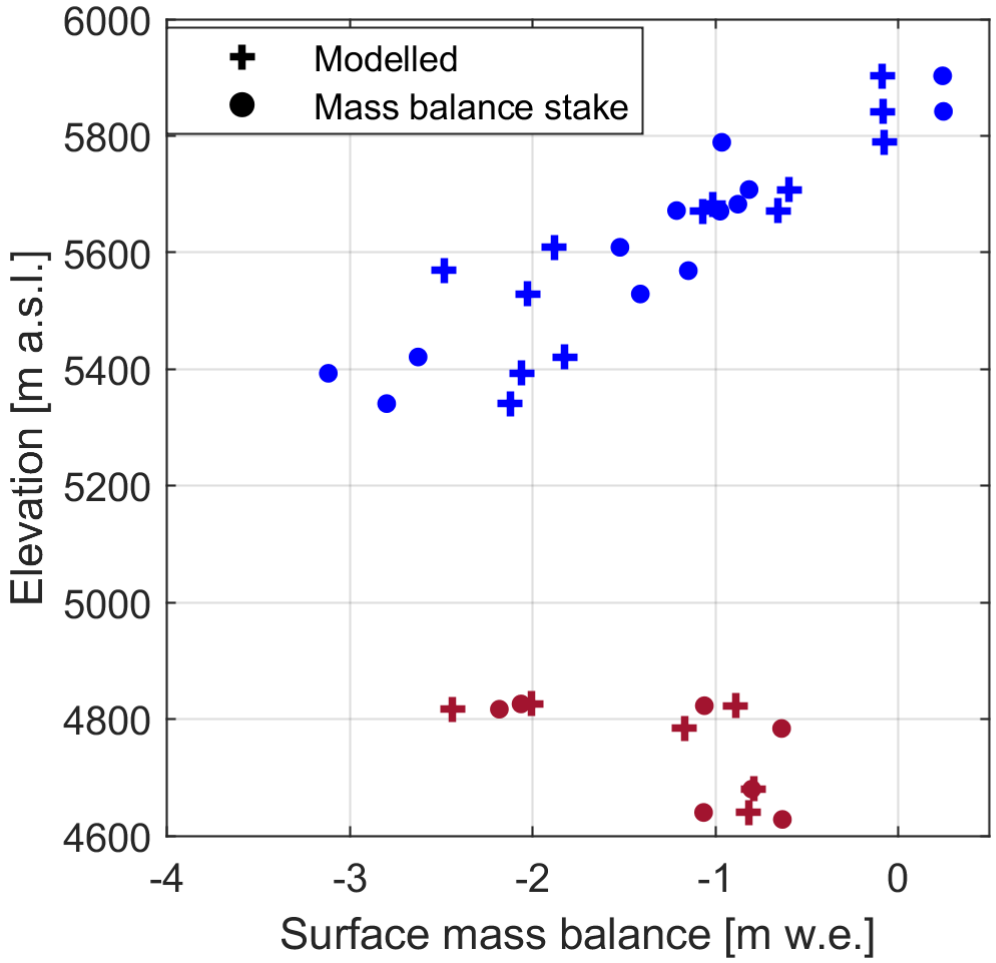




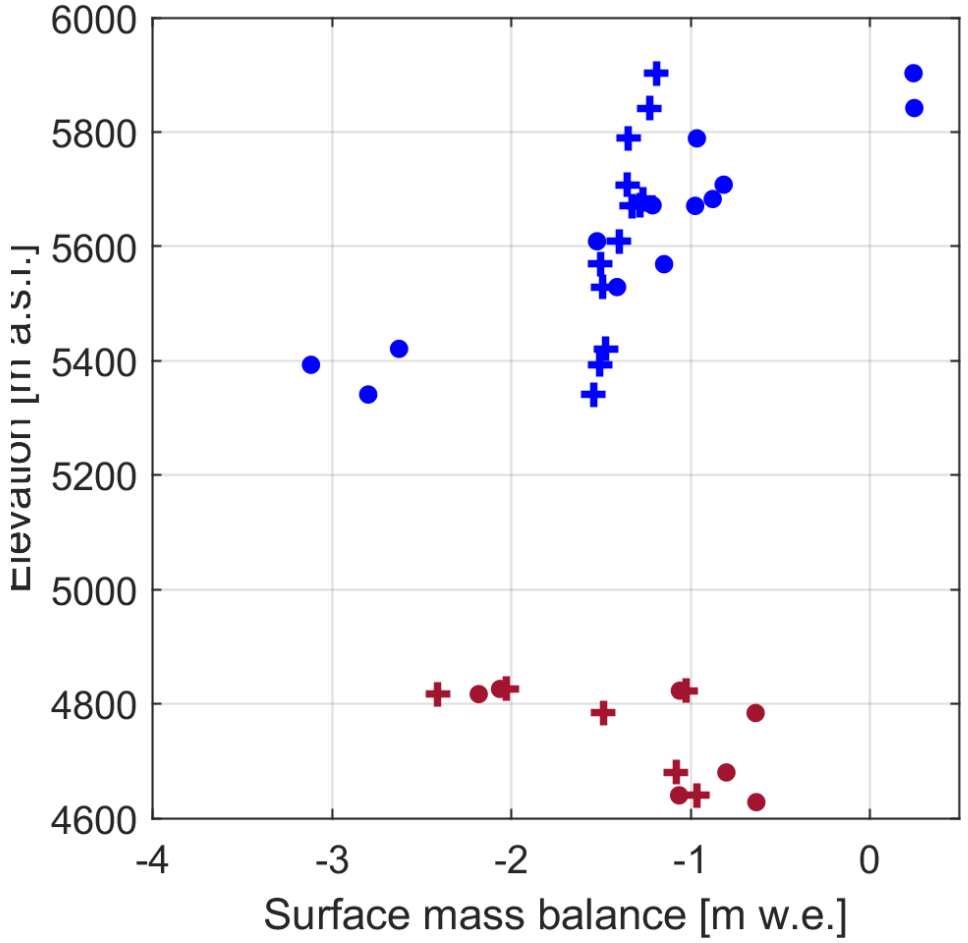


Better representation of high elevation mass balance

NHM



ERA5-Land



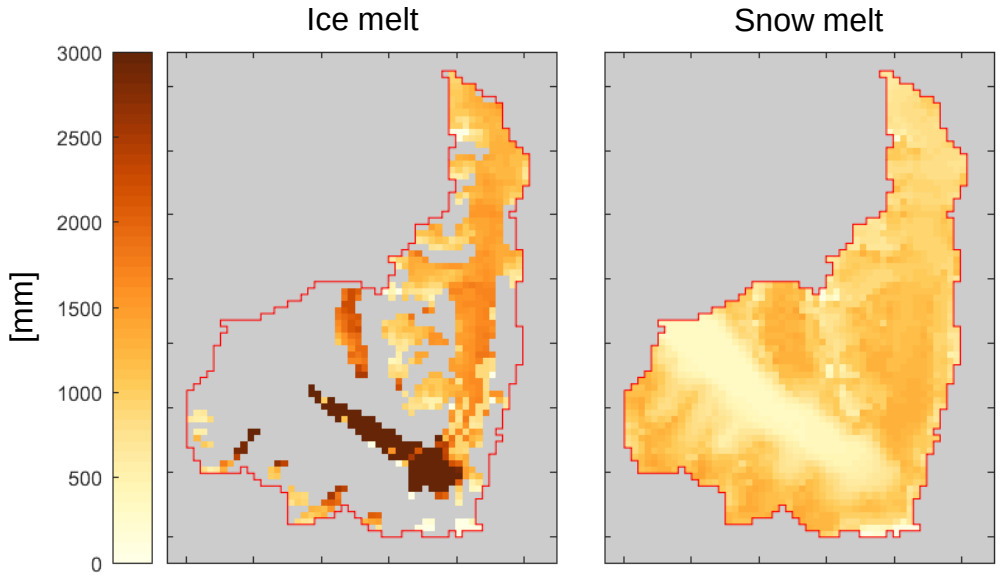
Clean ice

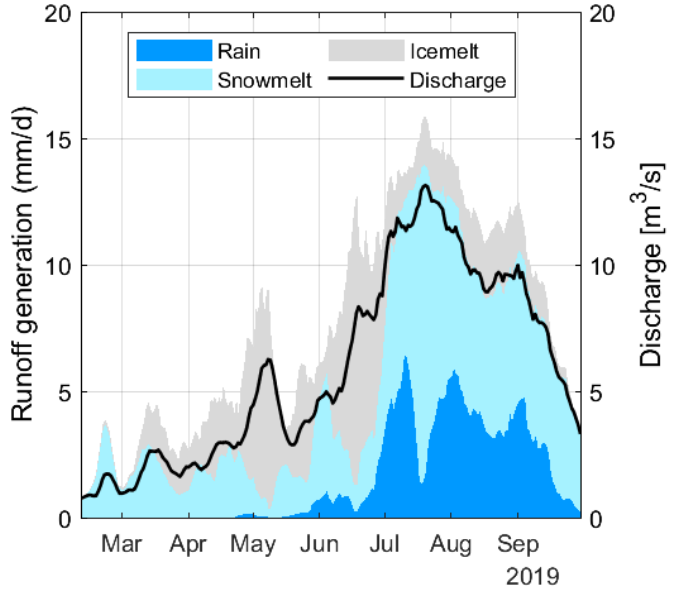
Debris-covered ice

Hydrological implications

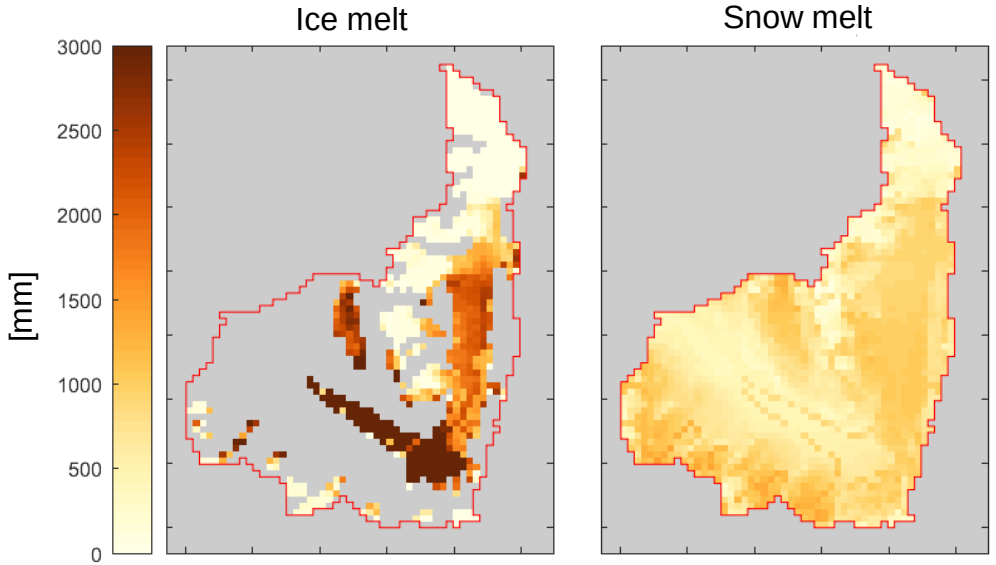
Differences in discharge timing, magnitude and runoff contributions

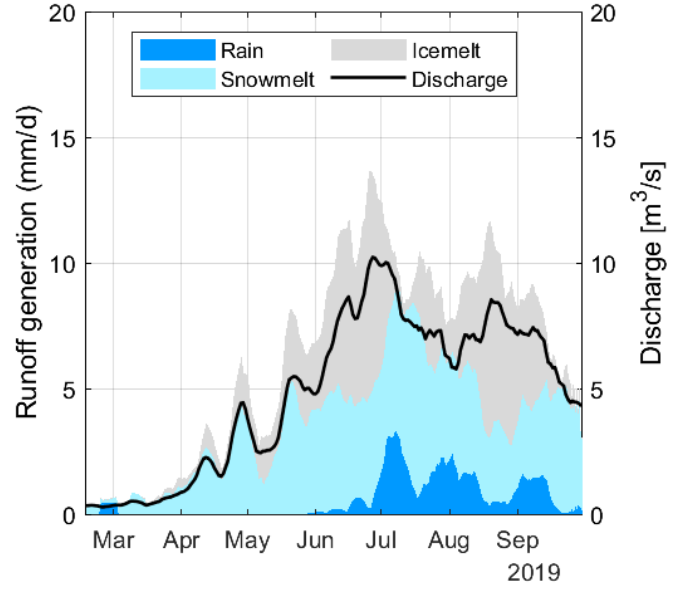
ERA5





NHM

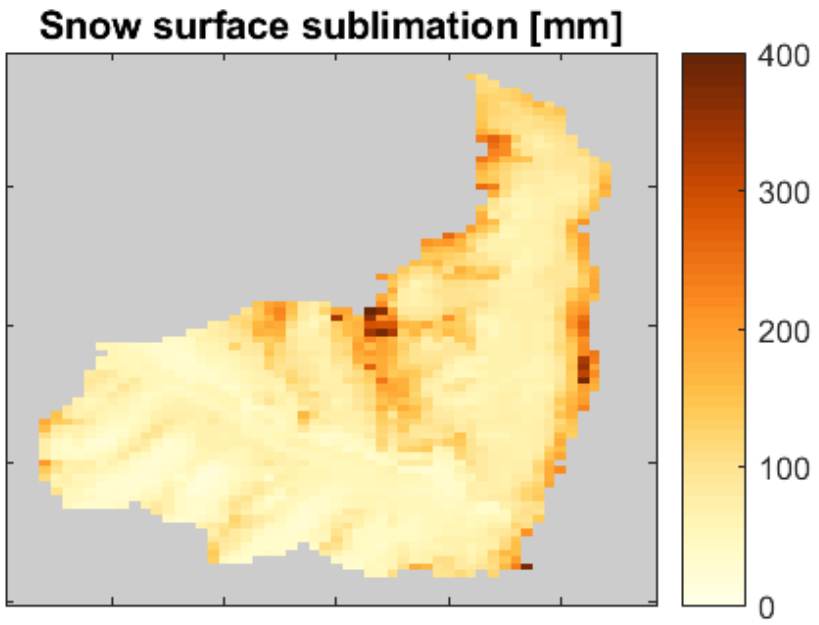




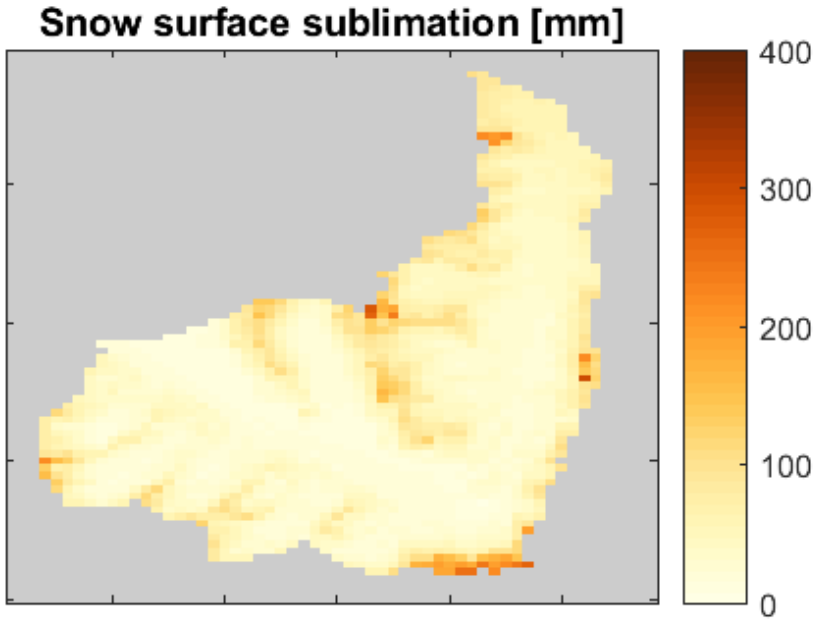
Key messages

- Good model performance of land-surface model forced with high resolution atmospheric simulation

- Promising to quantify high elevation snow processes in remote areas



NHM: 86 mm

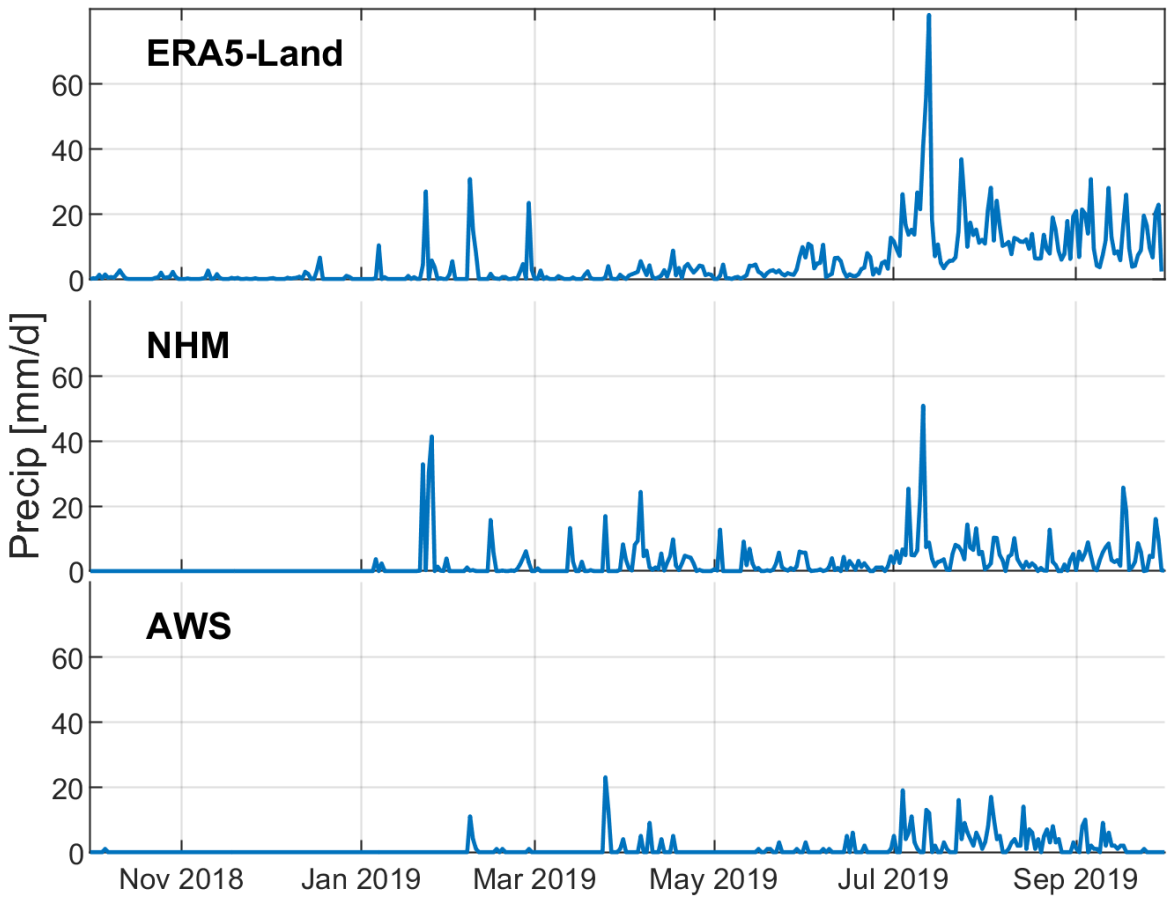


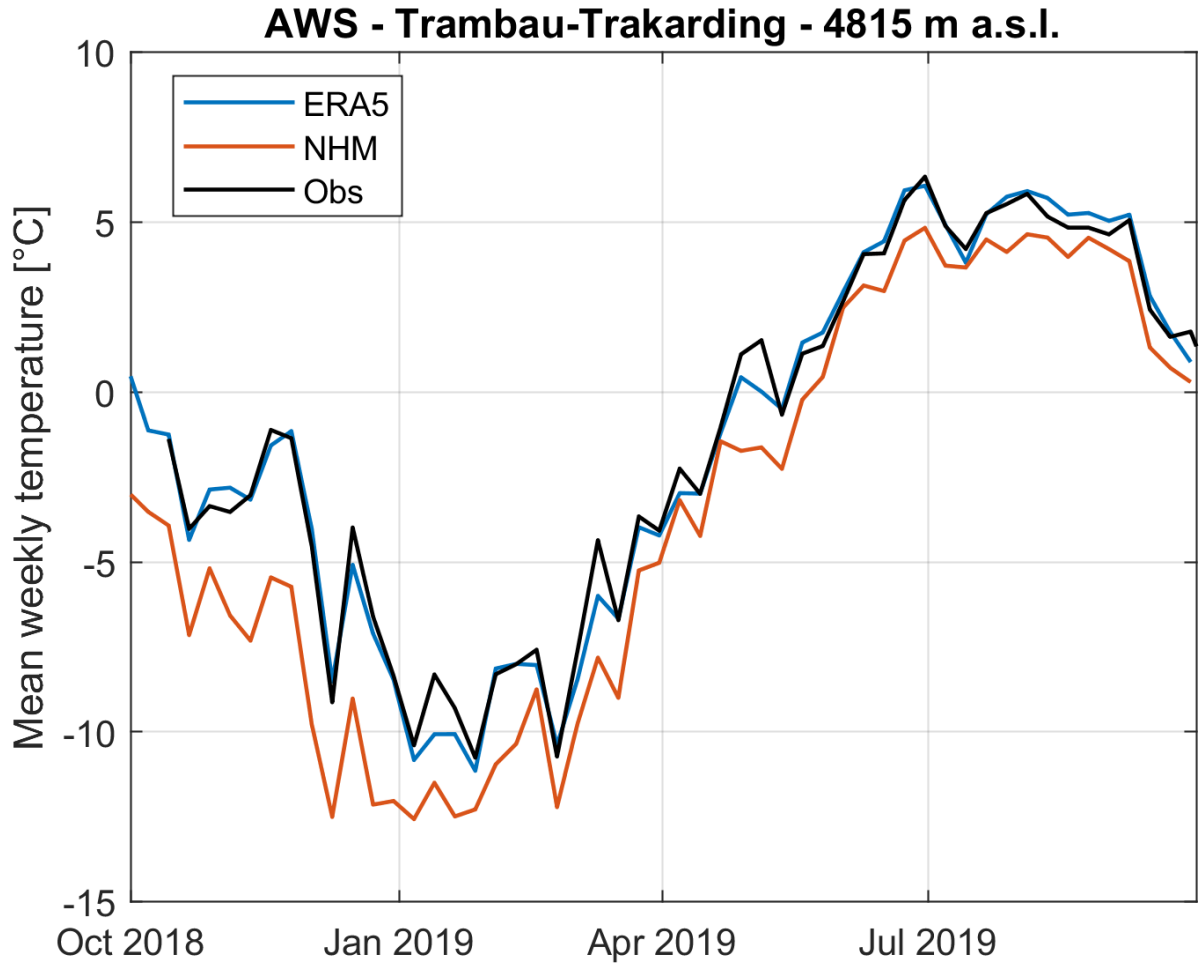
ERA5-Land: 48 mm

Thank you for your attention

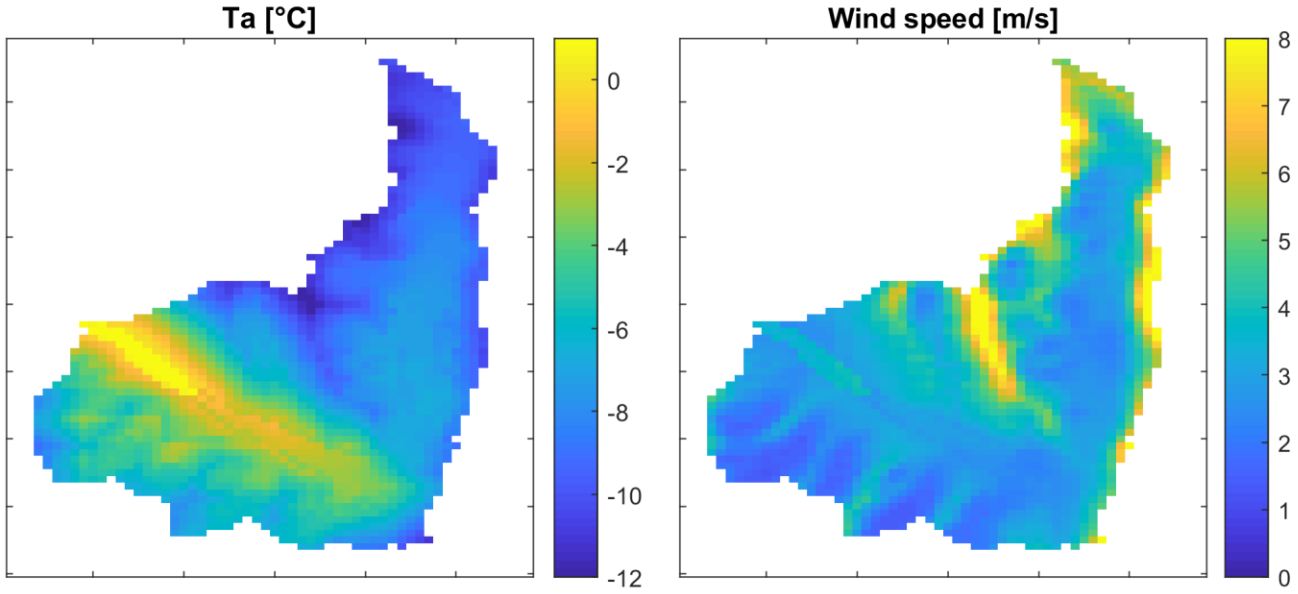
Questions ?

Back-up slides


ERA5-Land
NHM
AWS
Precip [mm/d]
0
20
40
60
Nov 2018
Jan 2019
Mar 2019
May 2019
Jul 2019
Sep 2019


AWS - Trambau-Trakarding - 4815 m a.s.l.
ERA5
NHM
Obs
Mean weekly temperature [°C]
10
5
0
-5
-10
-15
Oct 2018
Jan 2019
Apr 2019
Jul 2019

NHM



ERA5-Land