InSAR-based characterization of rock glacier kinematics in the La Sal Mountains, Utah, USA

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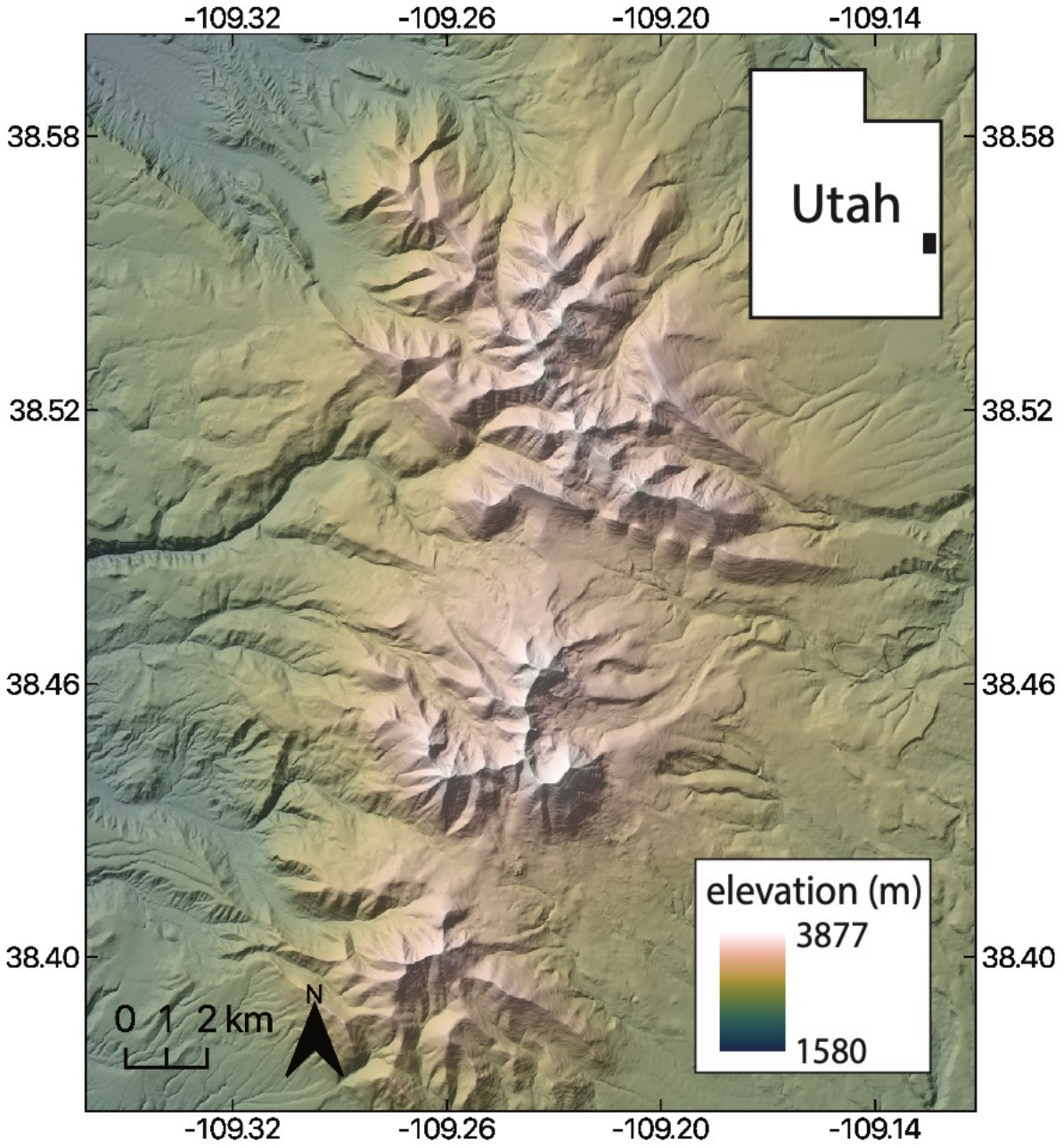
This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

La Sal Mountains, Utah, USA

- Isolated mountain range on the Colorado Plateau
- Runoff recharges the Colorado River and a reservoir that provides water to Moab
- Abundant rock glaciers

Image from commonswiki



(Geiger et al., 2014)

Investigating the kinematic behavior of rock glaciers

- Perennially frozen bodies of rock debris and ice that flow downslope due to basal shear and deformation of ice
- Increasingly critical component of high mountain hydrology

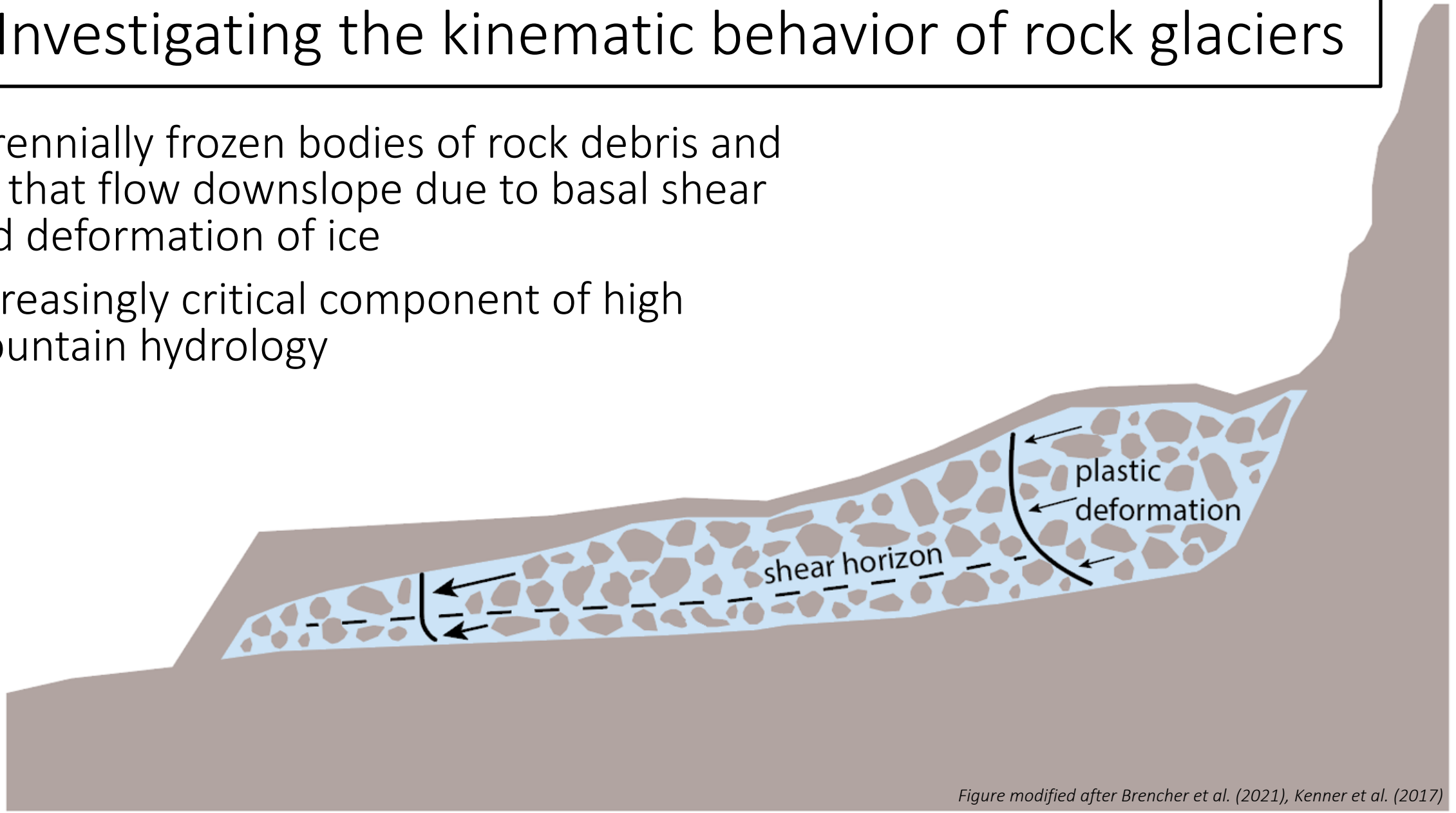
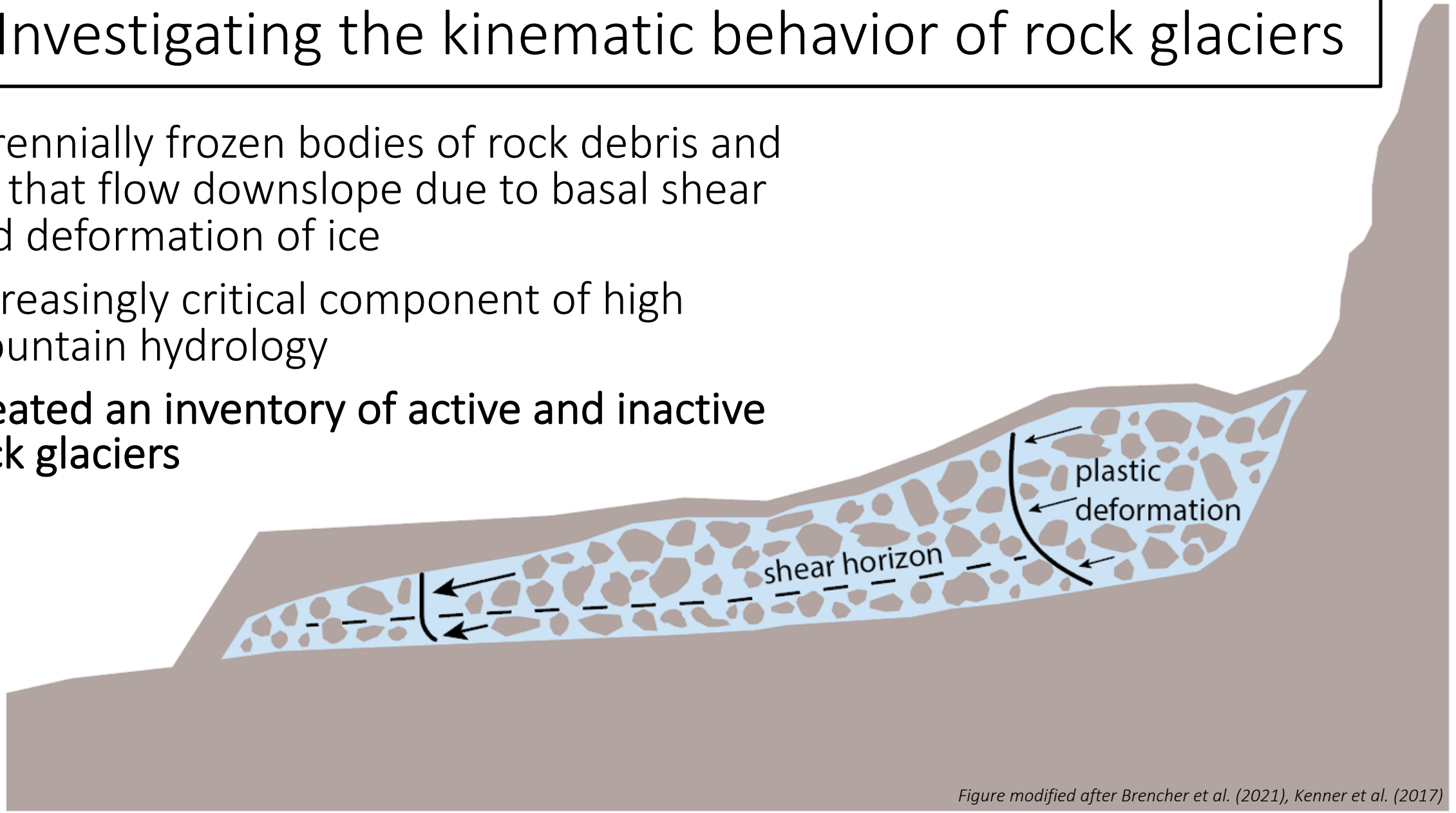


Figure modified after Brencher et al. (2021), Kenner et al. (2017)

(Strozzi et al., 2020; Azócar & Brenning, 2010)

Investigating the kinematic behavior of rock glaciers

- Perennially frozen bodies of rock debris and ice that flow downslope due to basal shear and deformation of ice
- Increasingly critical component of high mountain hydrology
- **Created an inventory of active and inactive rock glaciers**



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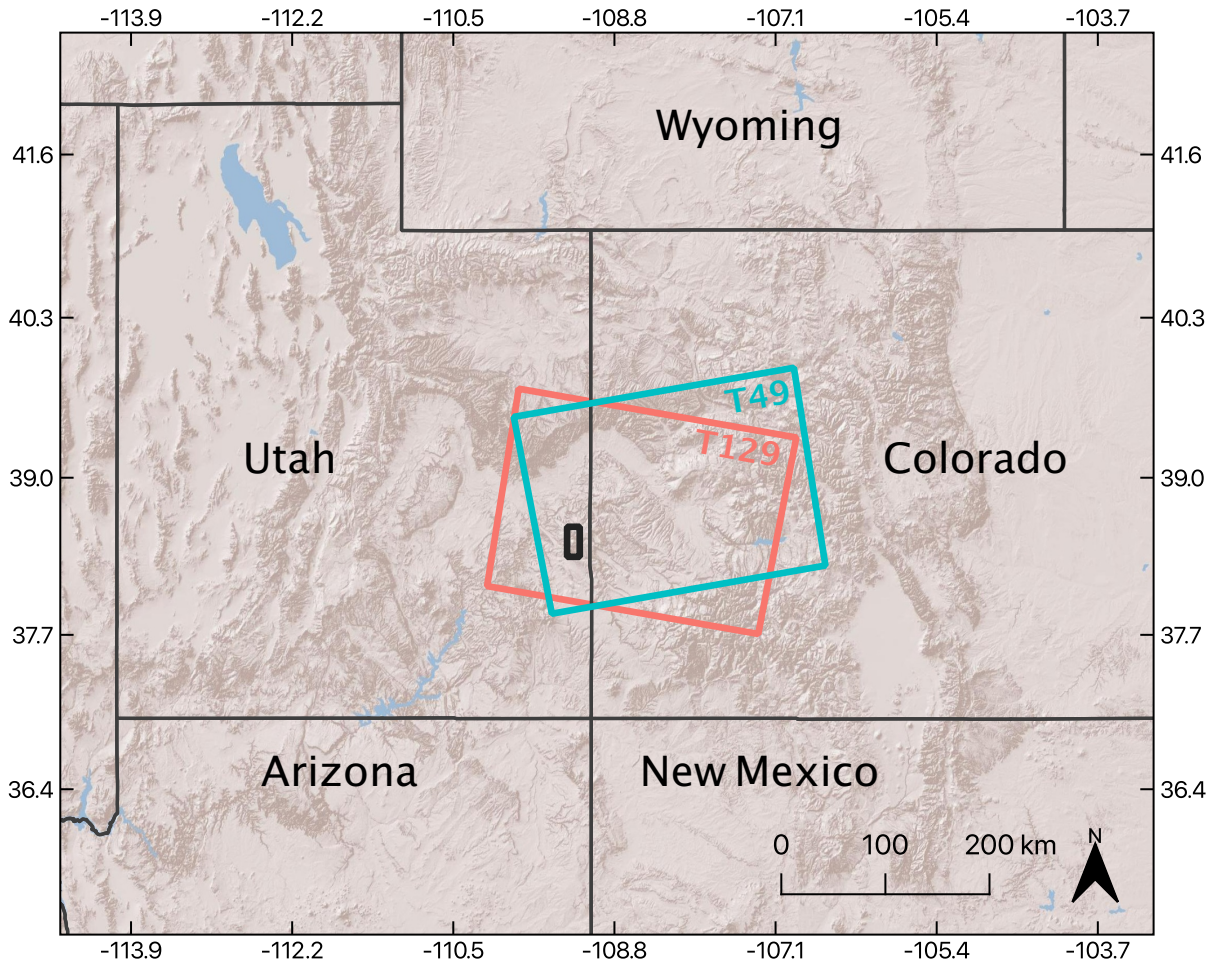
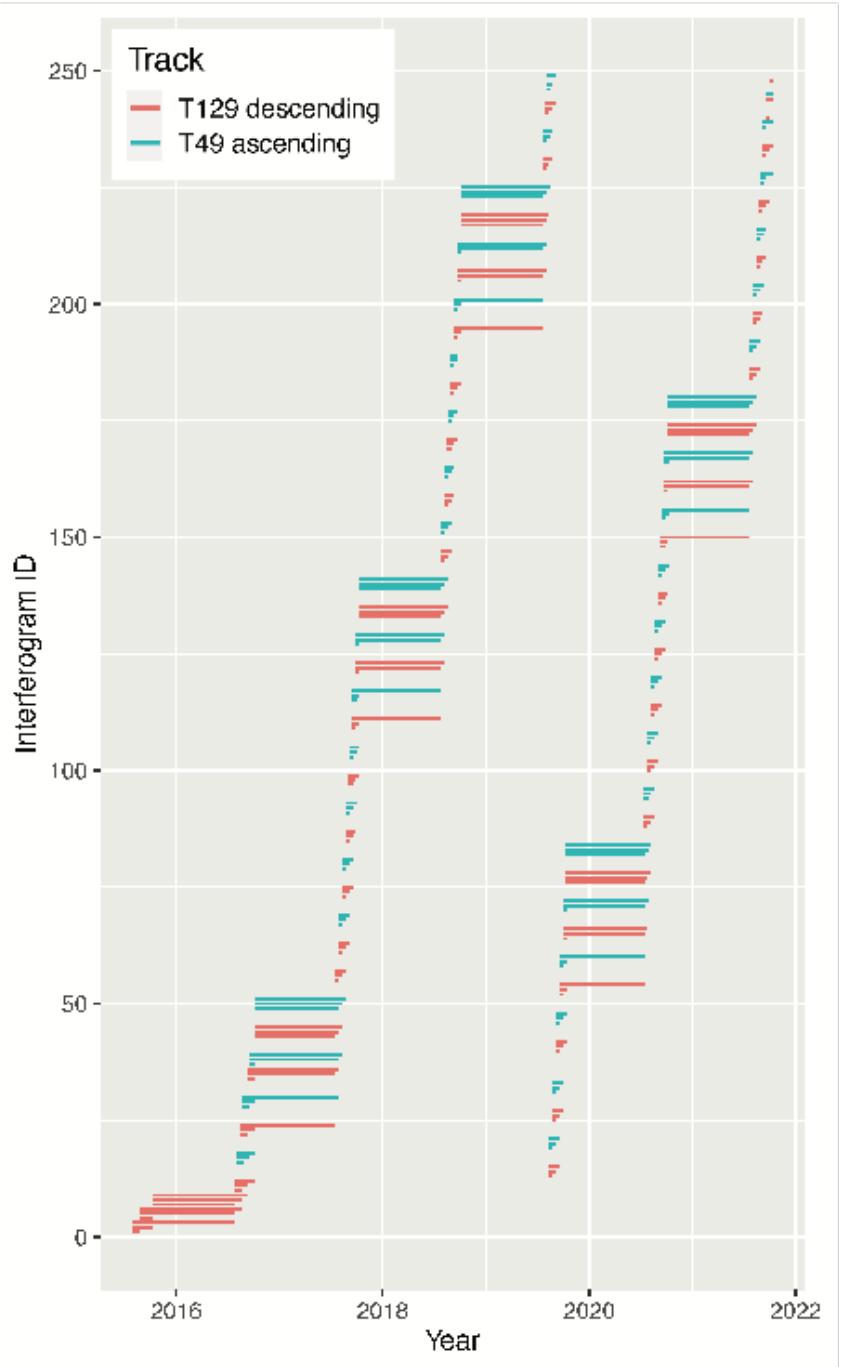
Measuring shifting ground with InSAR

DATA ACQUISITION

InSAR PROCESSING

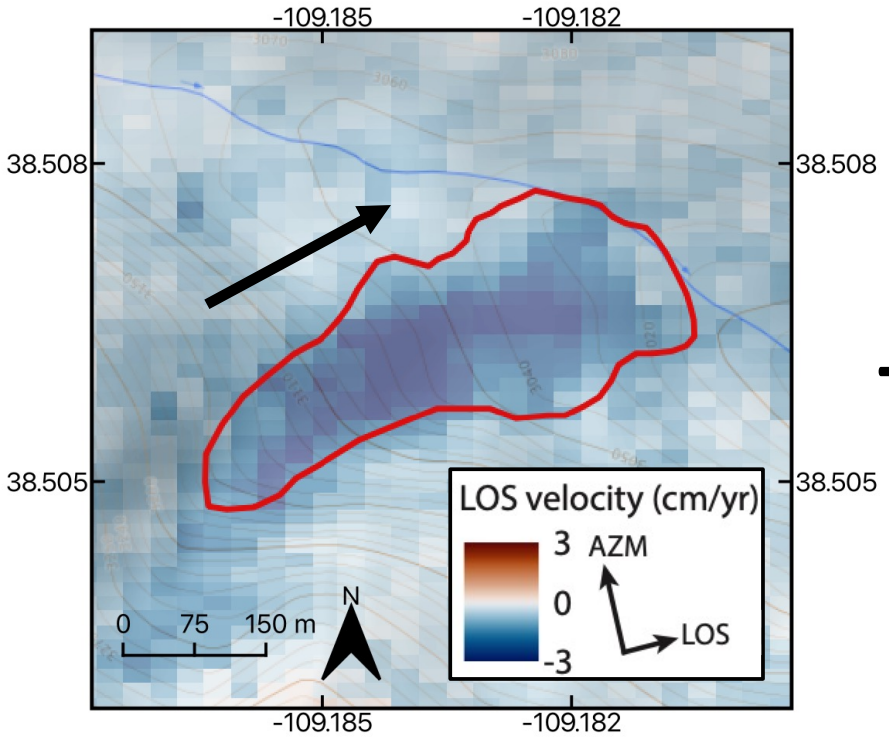
TIME SERIES GENERATION





Inventory building

InSAR



LOS Velocity Maps

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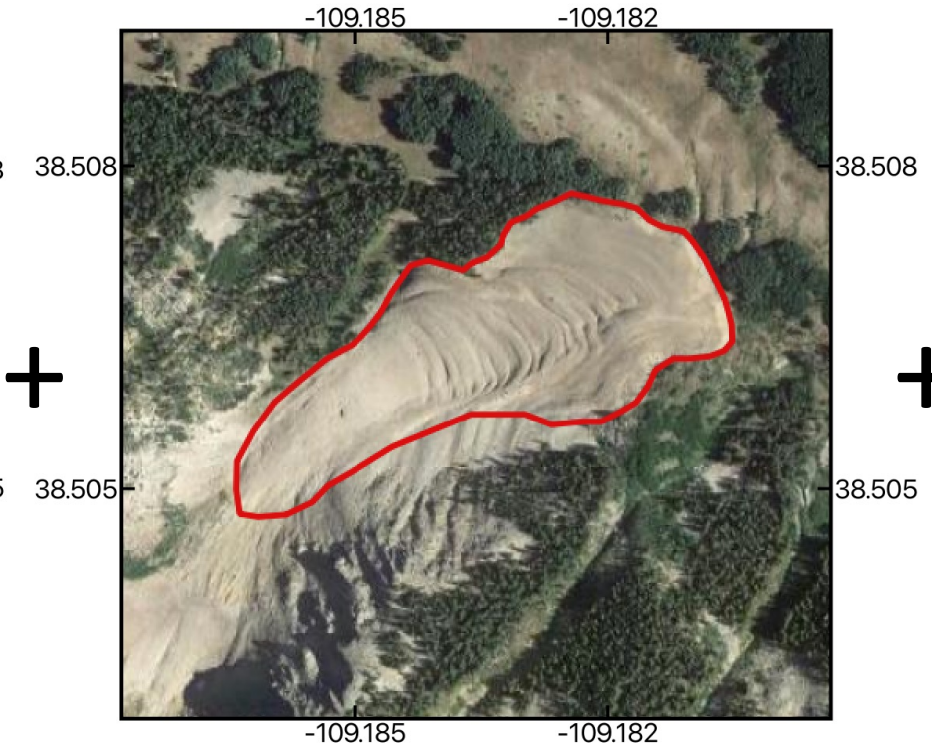
Optical Imagery



Google Earth

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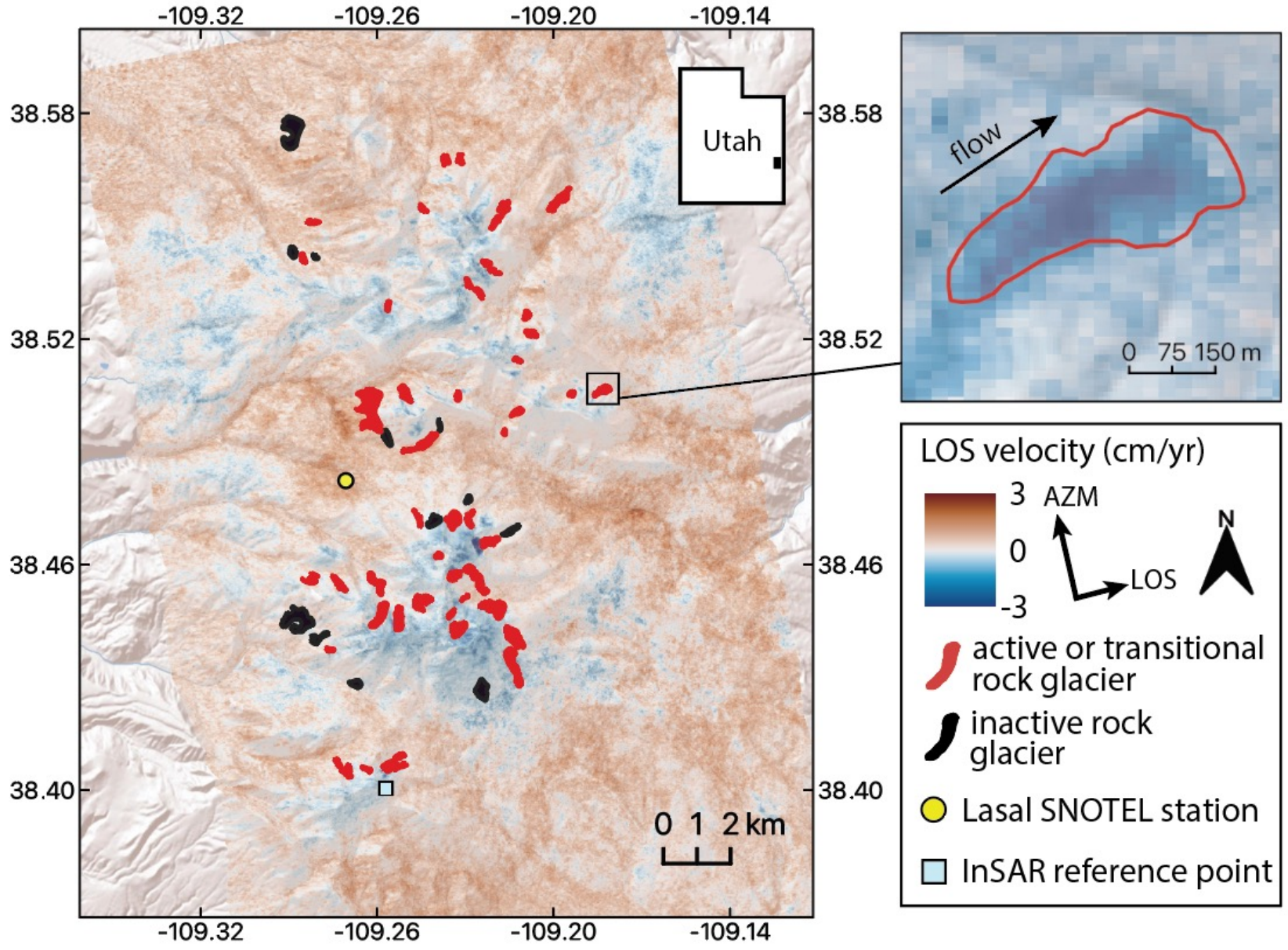
Additional Info

- USGS 10 m DEM
- Previous rock glacier inventories

DEM, Johnson et al. 2021 Inventory

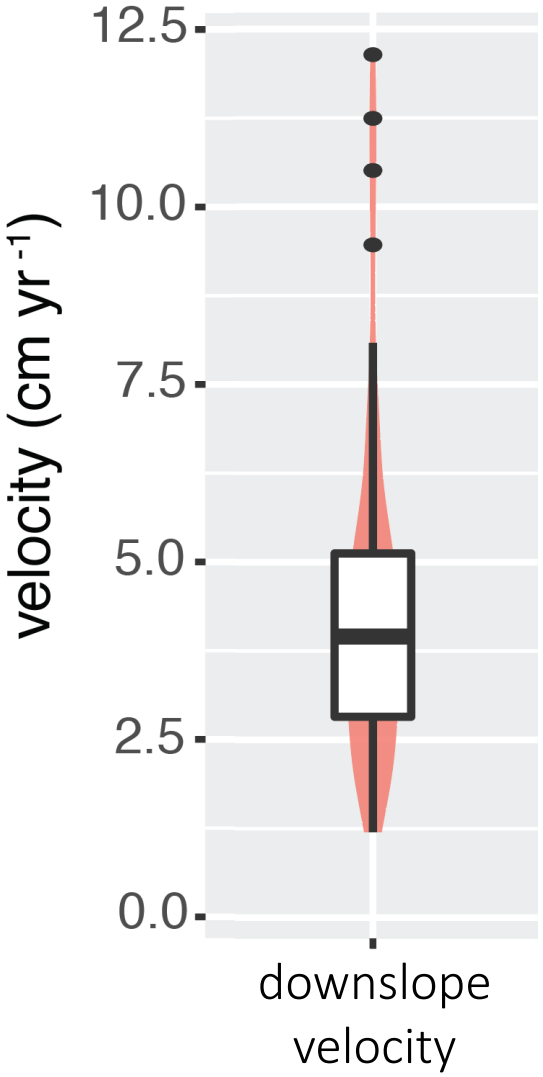
Rock glacier distribution

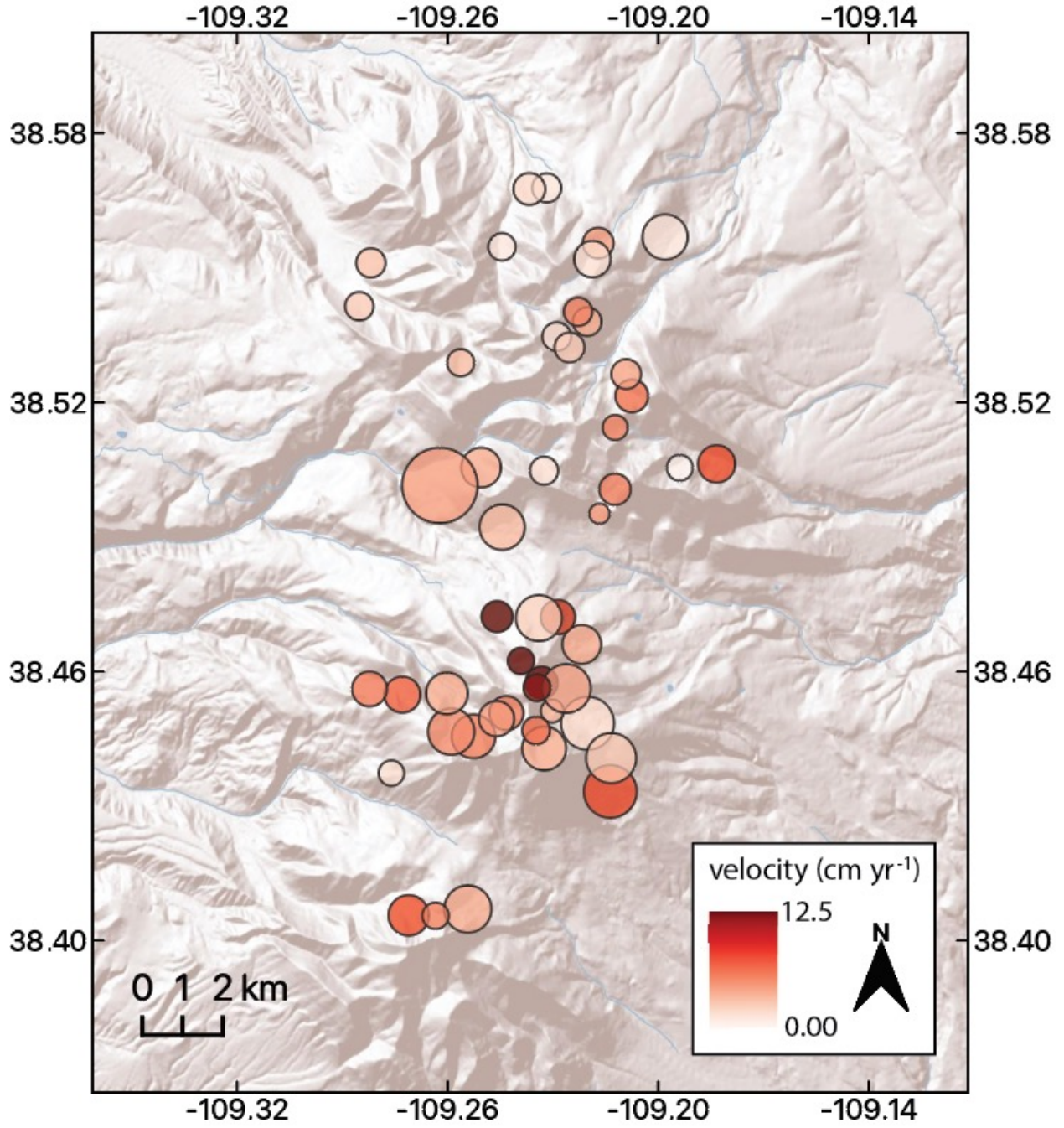


- 49 active/transitional rock glaciers, 12 inactive rock glaciers, covering a collective area of 5.6 km^2
- Mean elevation of active rock glaciers is 3199 m

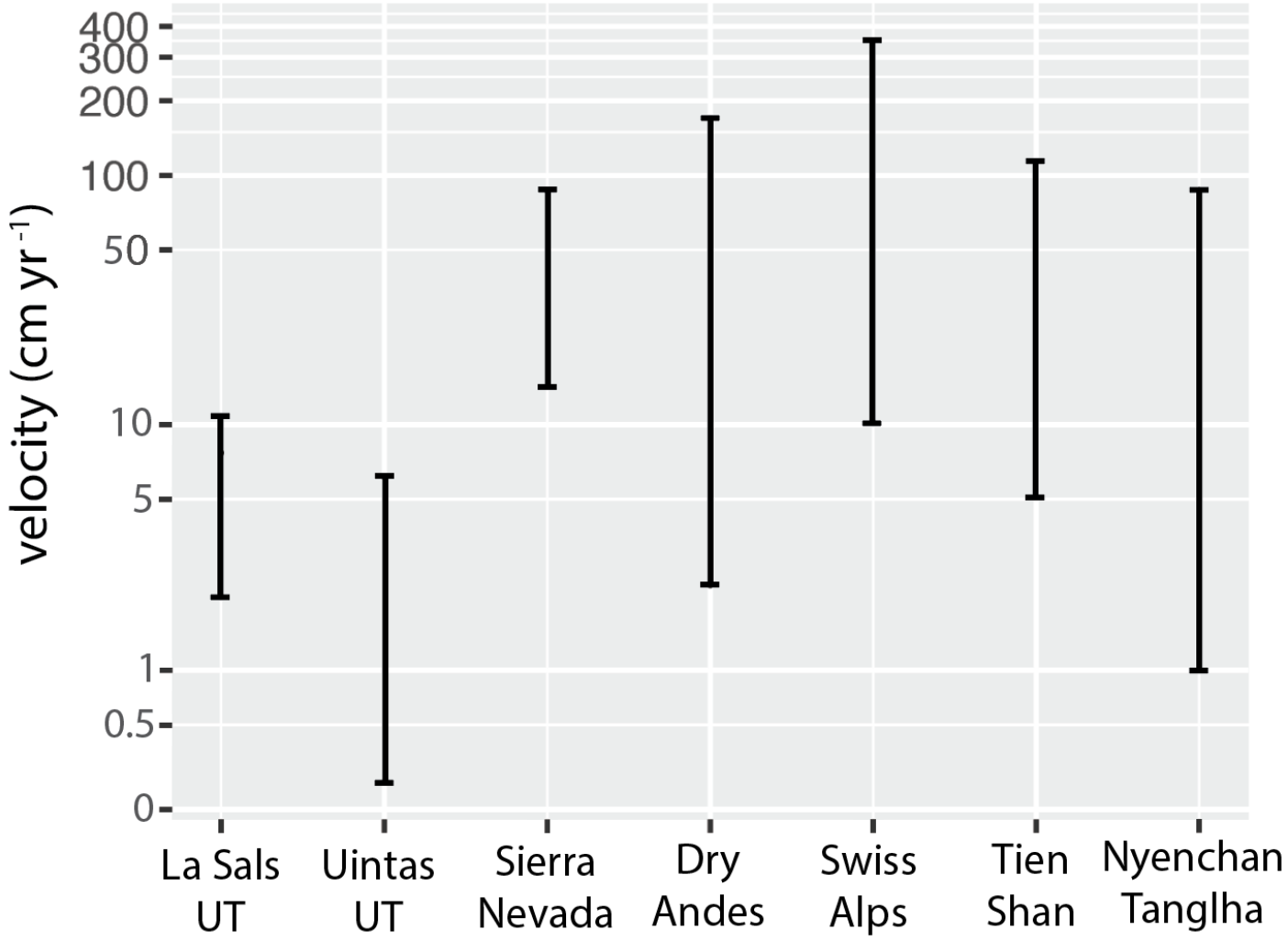
Rock glacier kinematics

- Mean active rock glacier velocity is 4.51 cm yr^{-1}



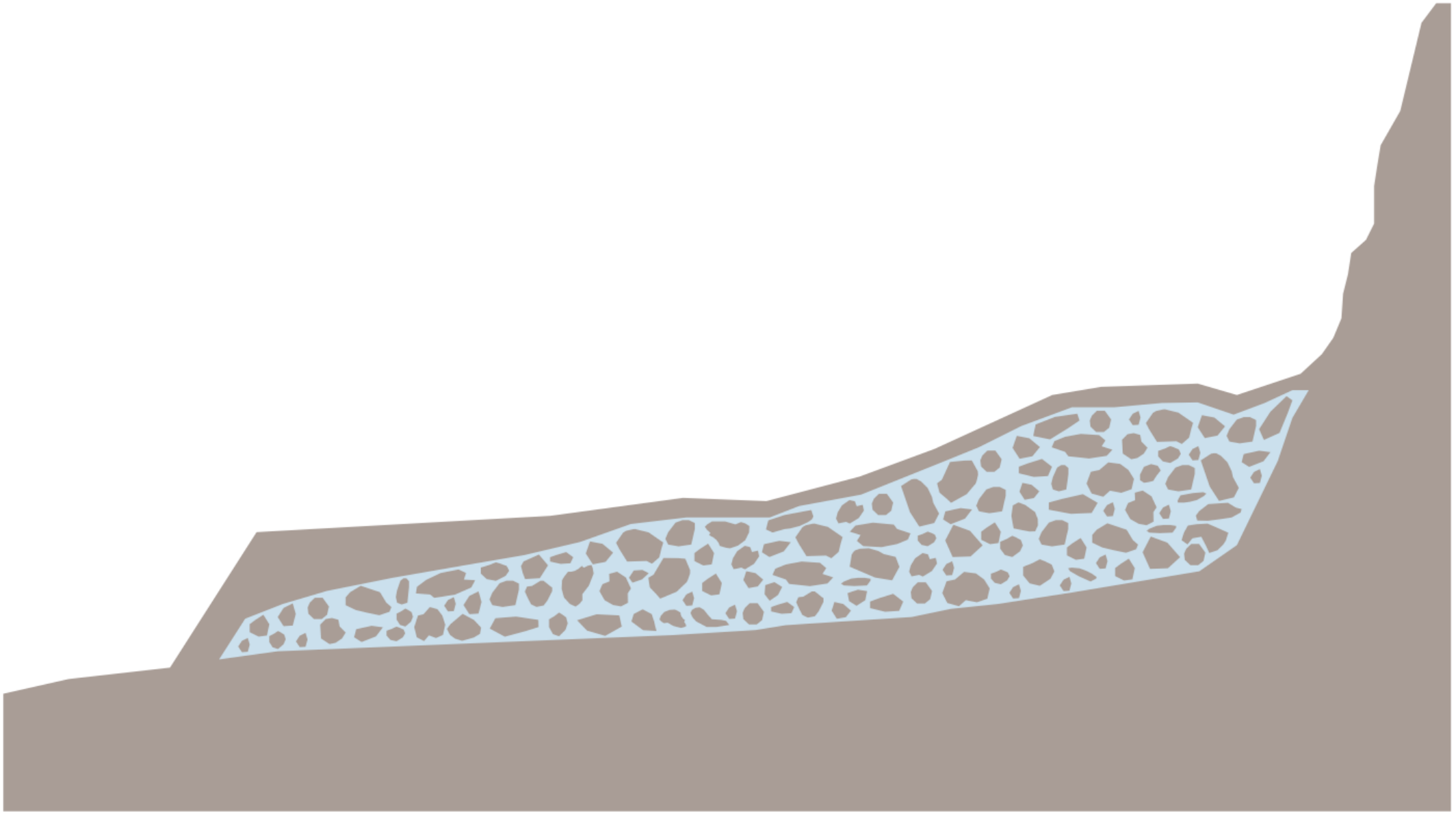


Utah rock glaciers are slower other than other InSAR-based rock glacier inventories:



(Brencher et al., 2021; Liu et al., 2013; Villarroel et al., 2018; Barboux et al., 2014; Wang et al., 2017; Reinosch et al., 2021)

Slow velocities may be explained by low ice content



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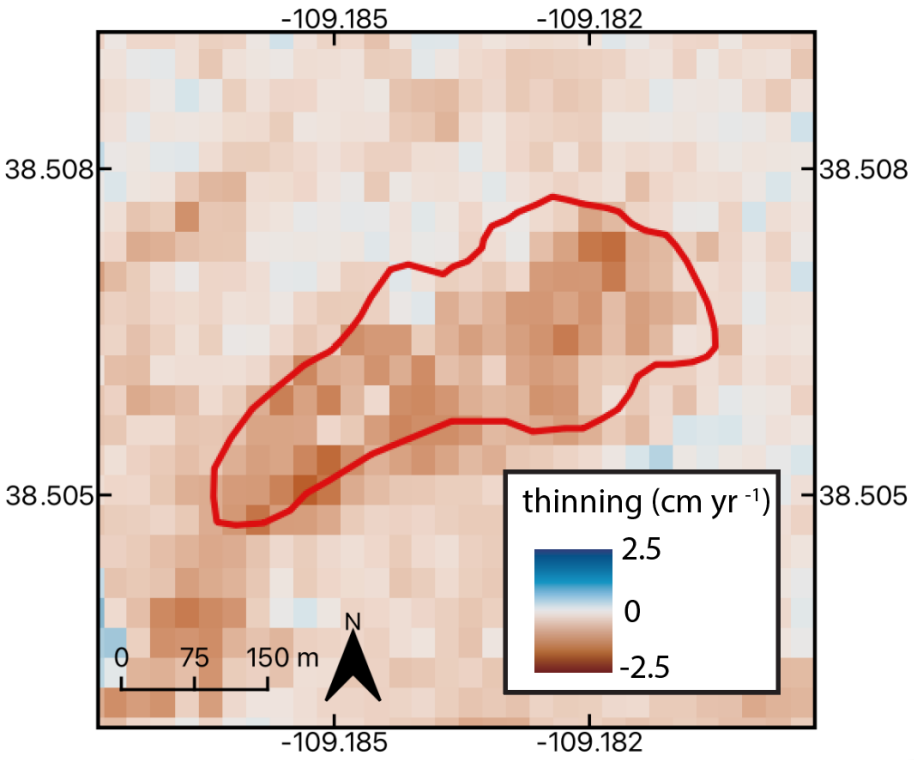

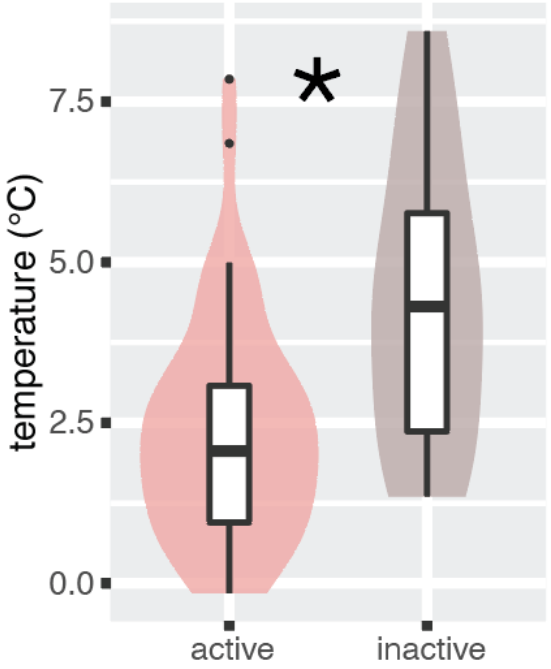

Summary

- InSAR-based inventory of 49 active/transitional rock glaciers in the La Sals
- Rock glaciers may persist in active forms above the 0 °C isotherm
- A slow inventory-wide velocity of 4.51 cm yr^{-1} may be explained by low internal ice content

Thank you!
Any questions?

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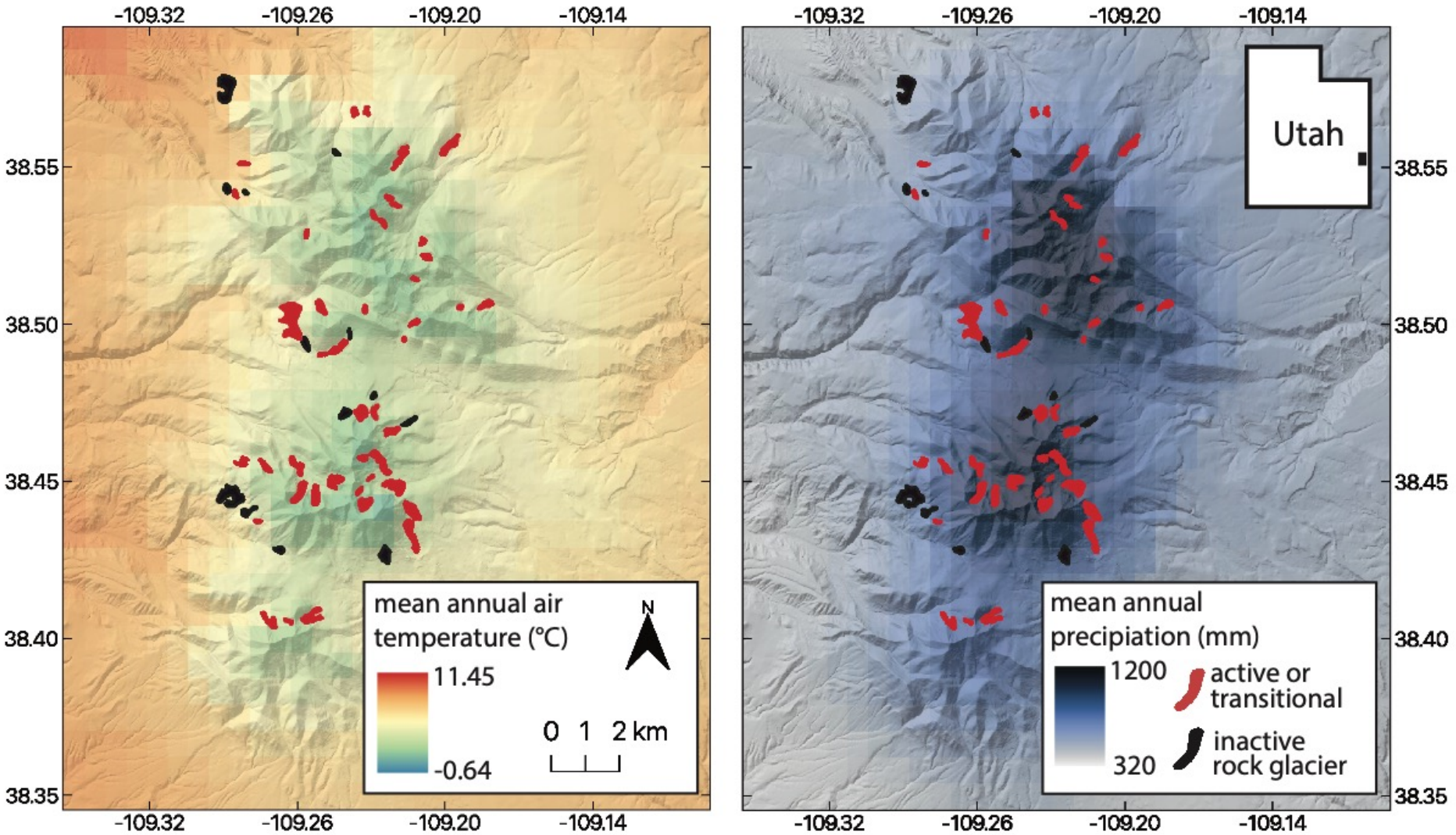
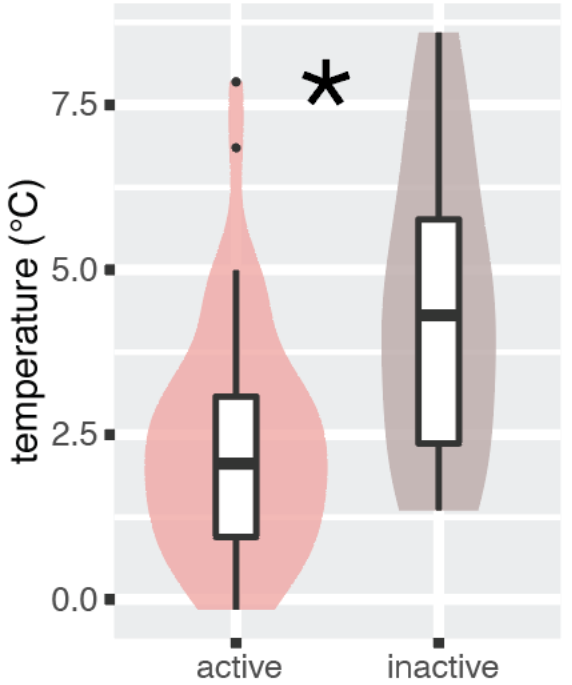
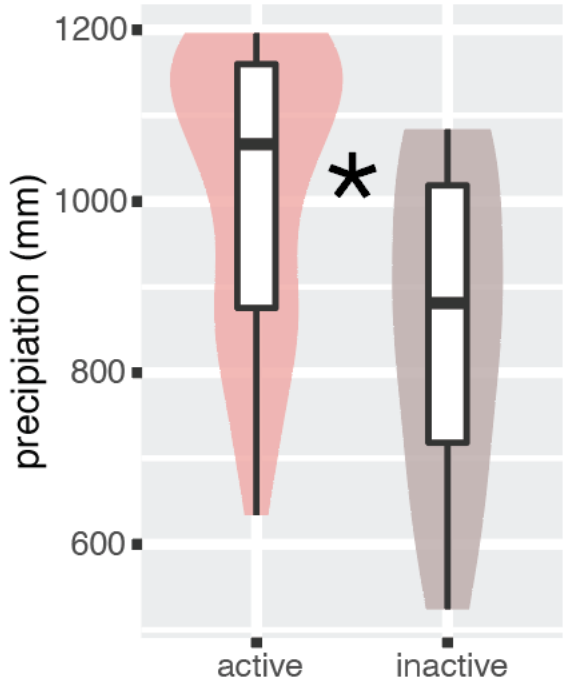
PRISM 1990-2020 climate envelope

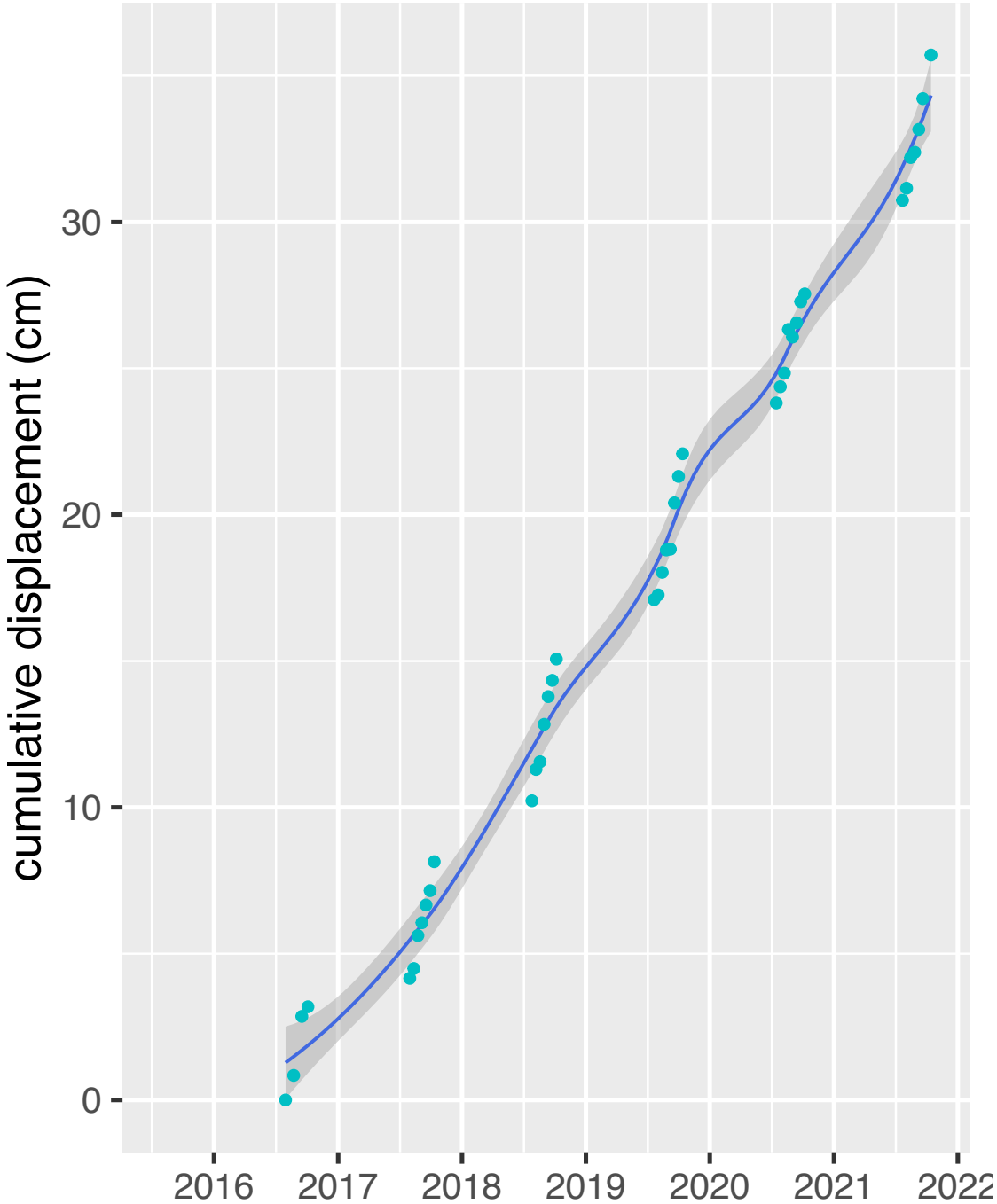






Controls on kinematics

- Time-series of 19 spatially distributed rock glaciers



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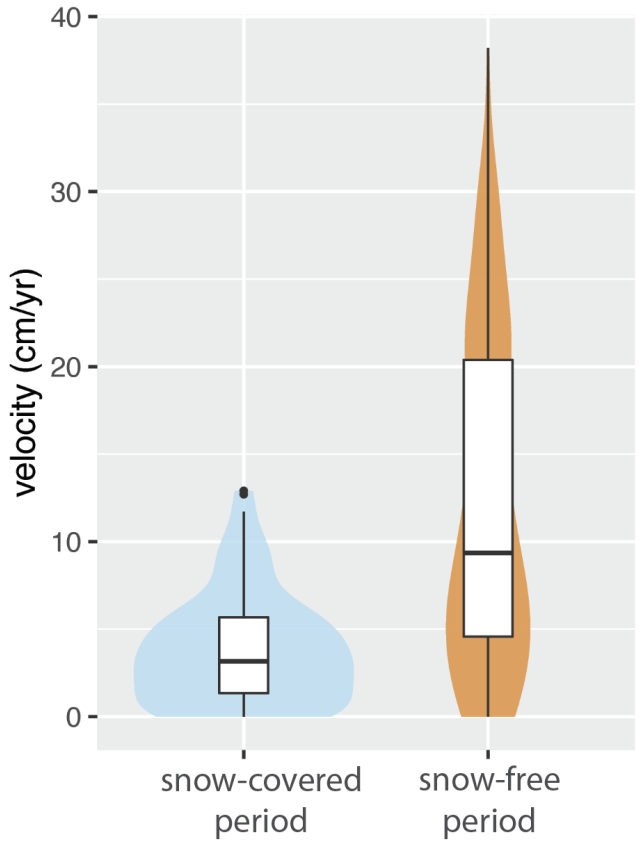
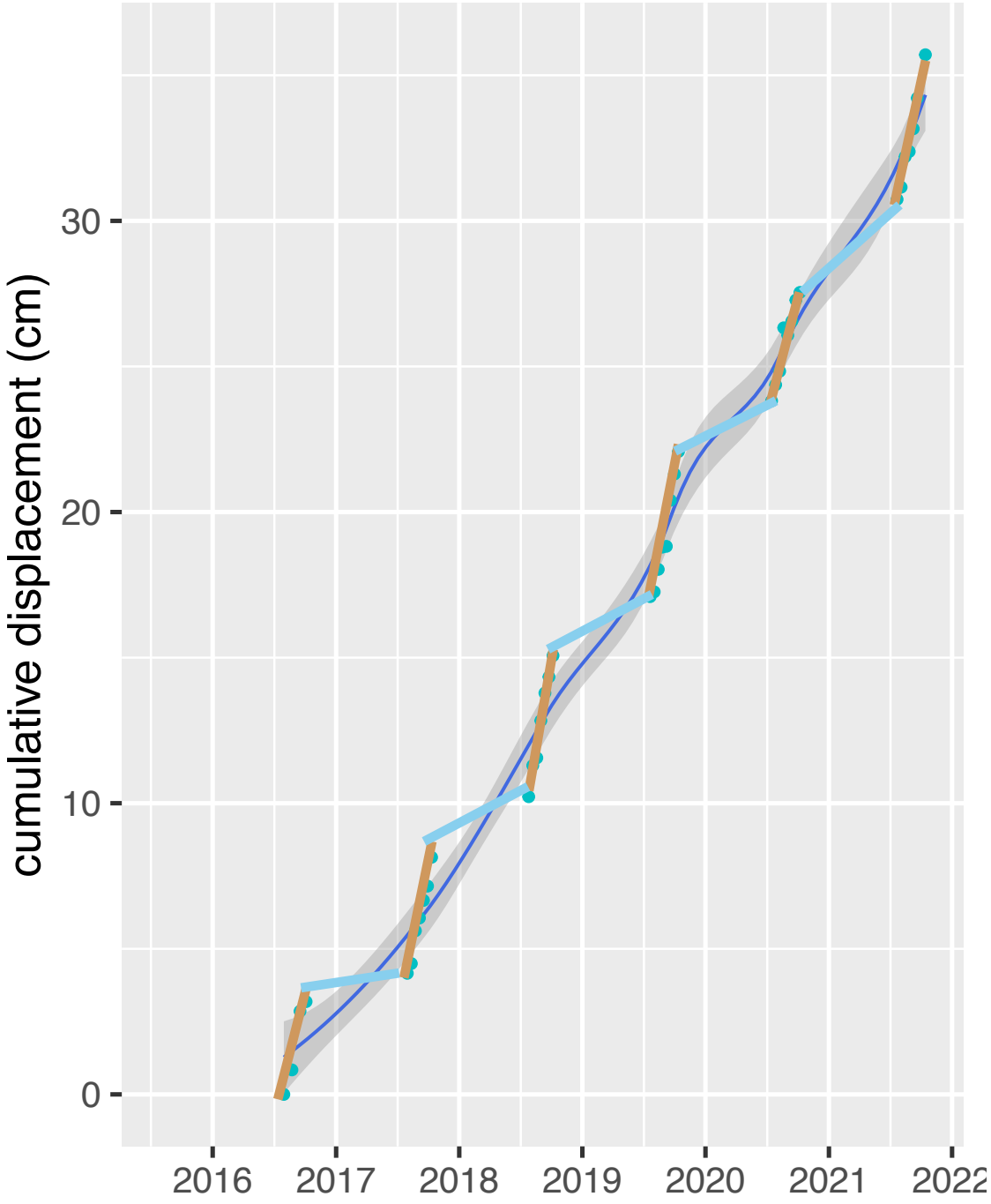
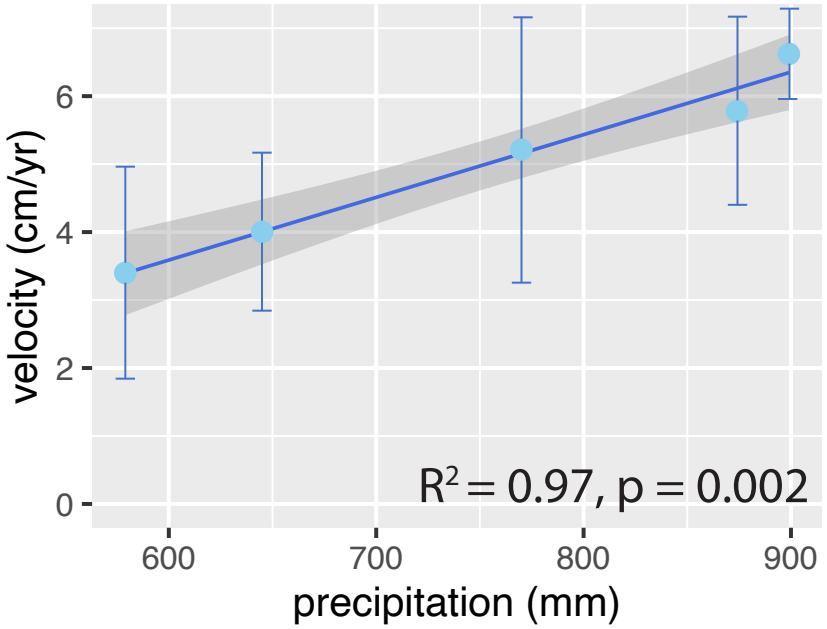
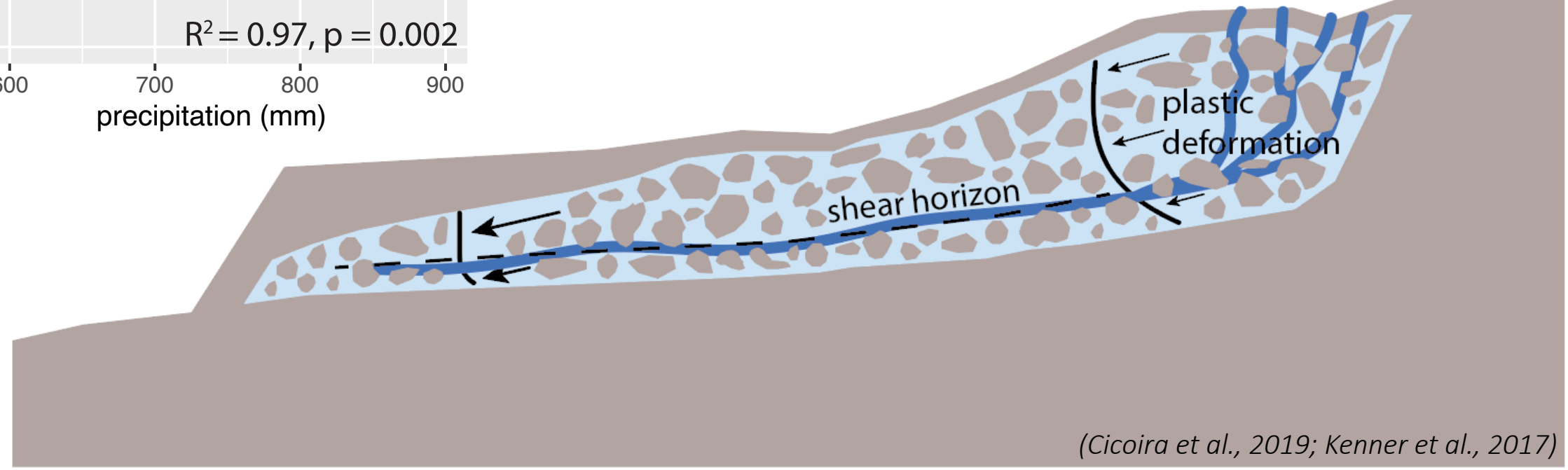




Liquid water availability likely controls velocity





(Cicoira et al., 2019; Kenner et al., 2017)