

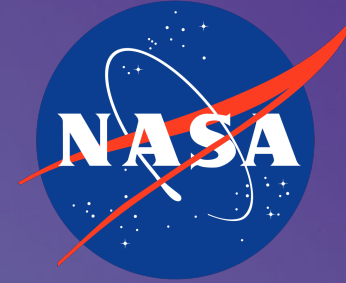
EXAMINING THE RELATIONSHIPS BETWEEN BASAL CHANNELS AND ICE SHELF STRUCTURAL EVOLUTION WITH REPEAT, HIGH-RESOLUTION ELEVATION MODELS AND ALTIMETRY

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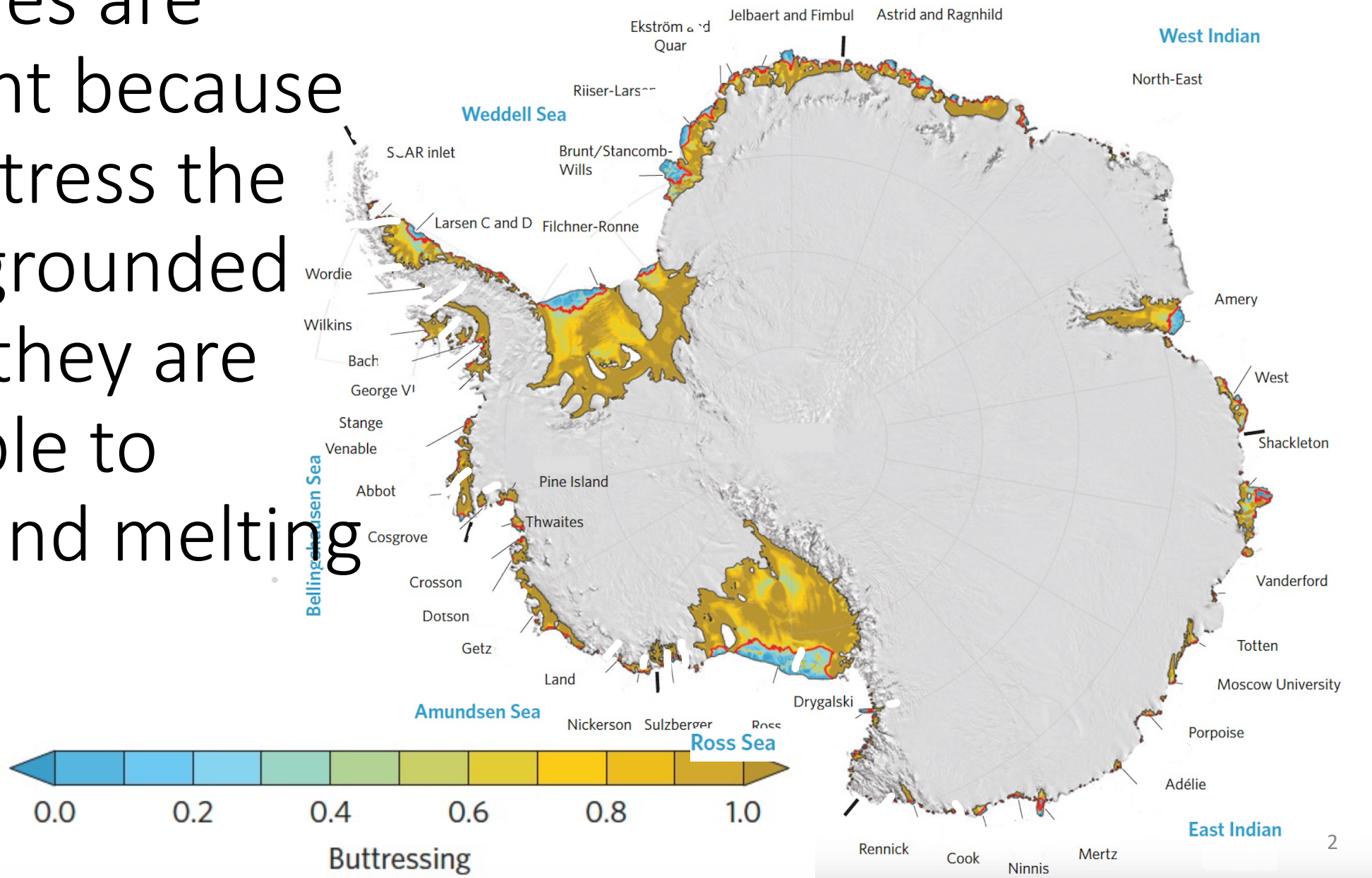


AGU FALL
MEETING

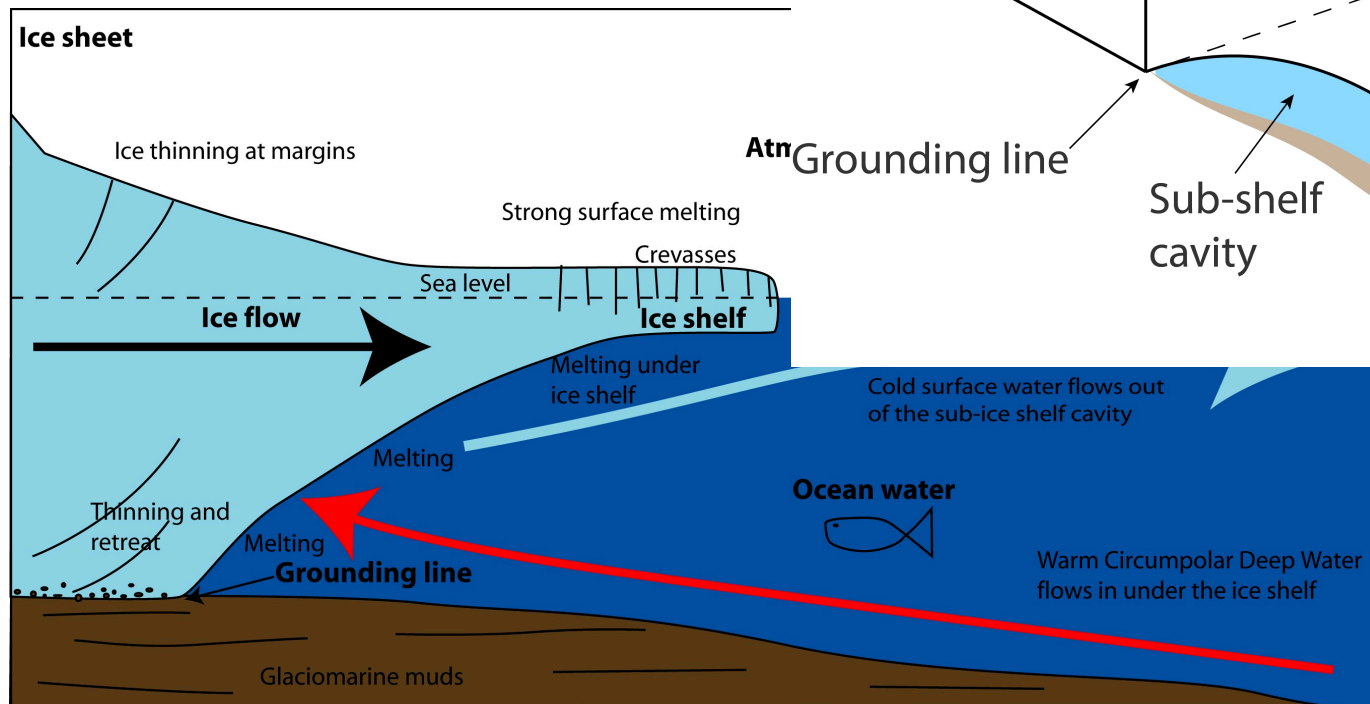
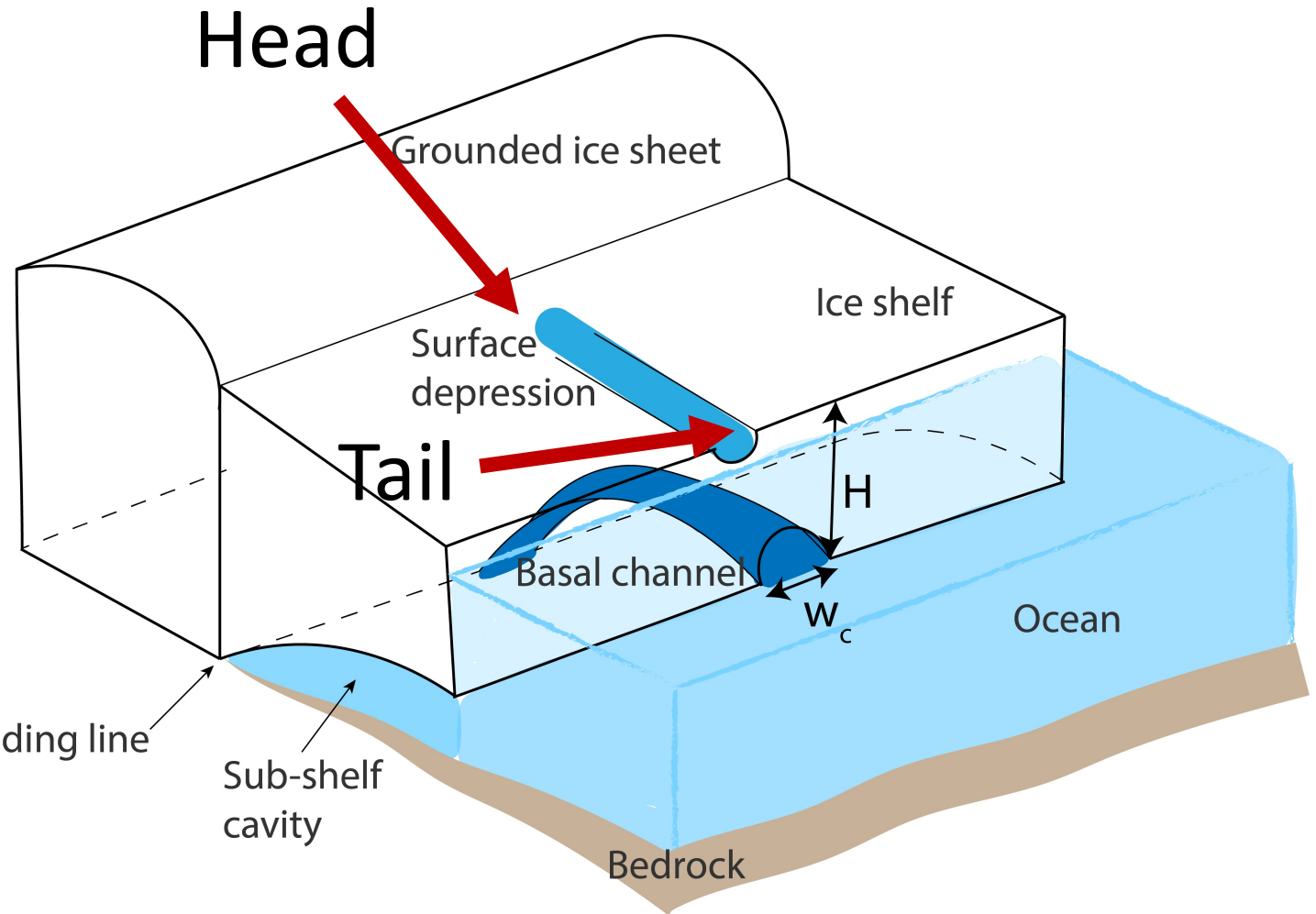
SCIENCE
is SOCIETY



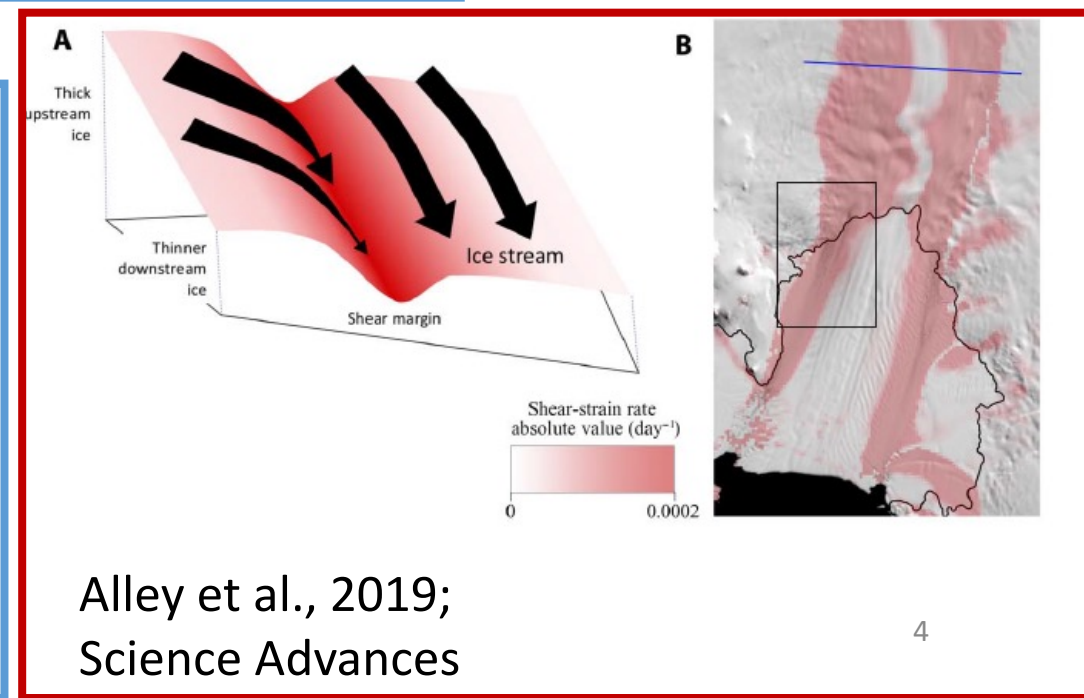
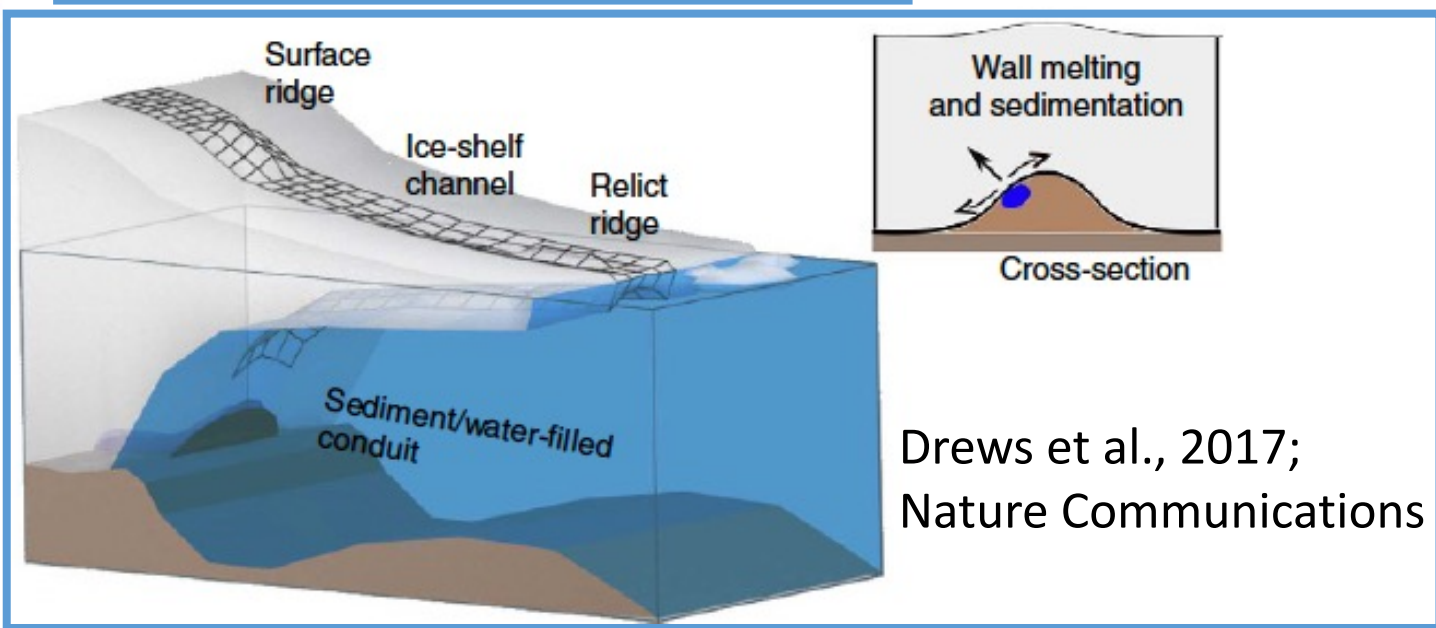
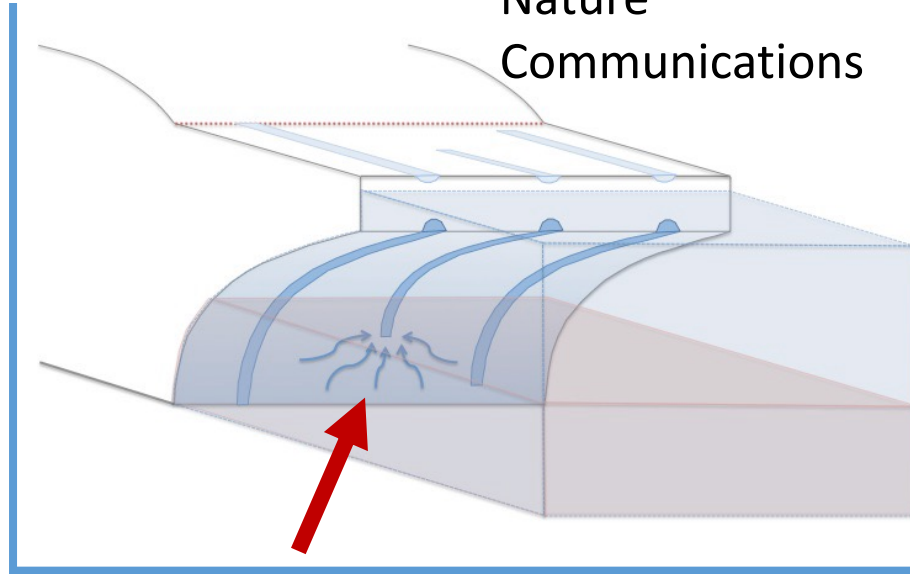
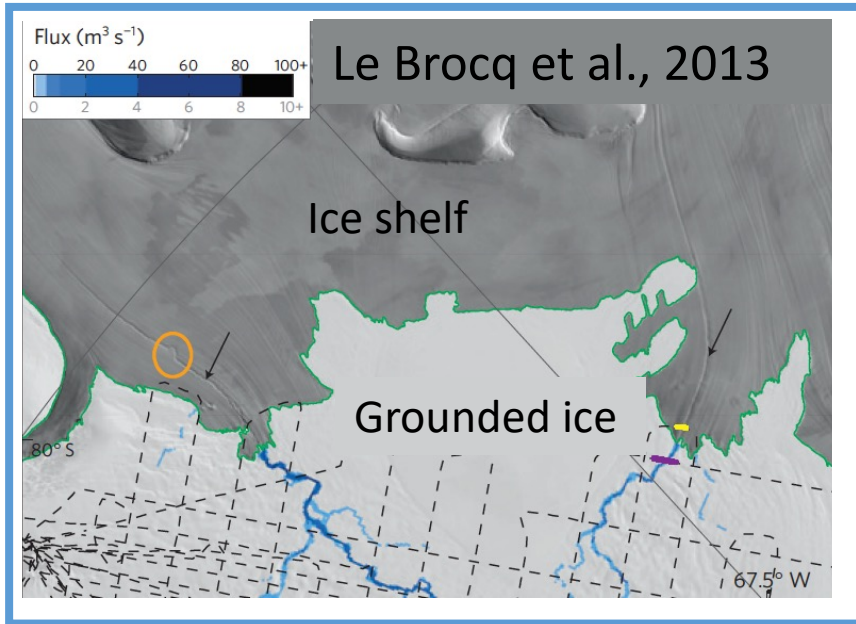
Ice shelves are important because they buttress the flow of grounded ice, but they are vulnerable to calving and melting



Basal channels are deep grooves at the base of ice shelves through which buoyant water is entrained

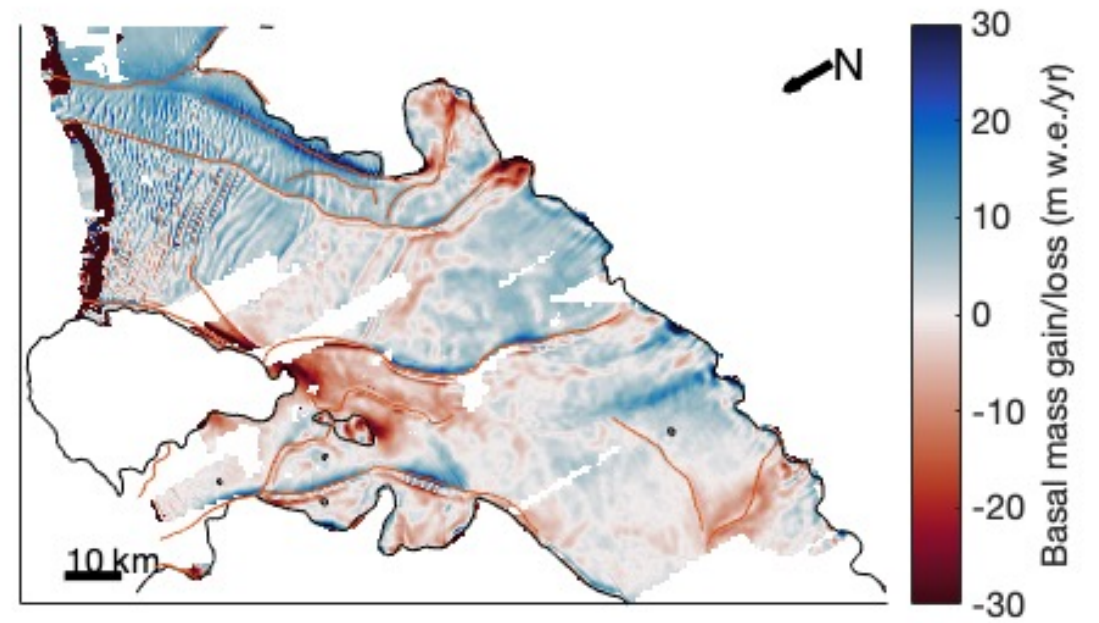
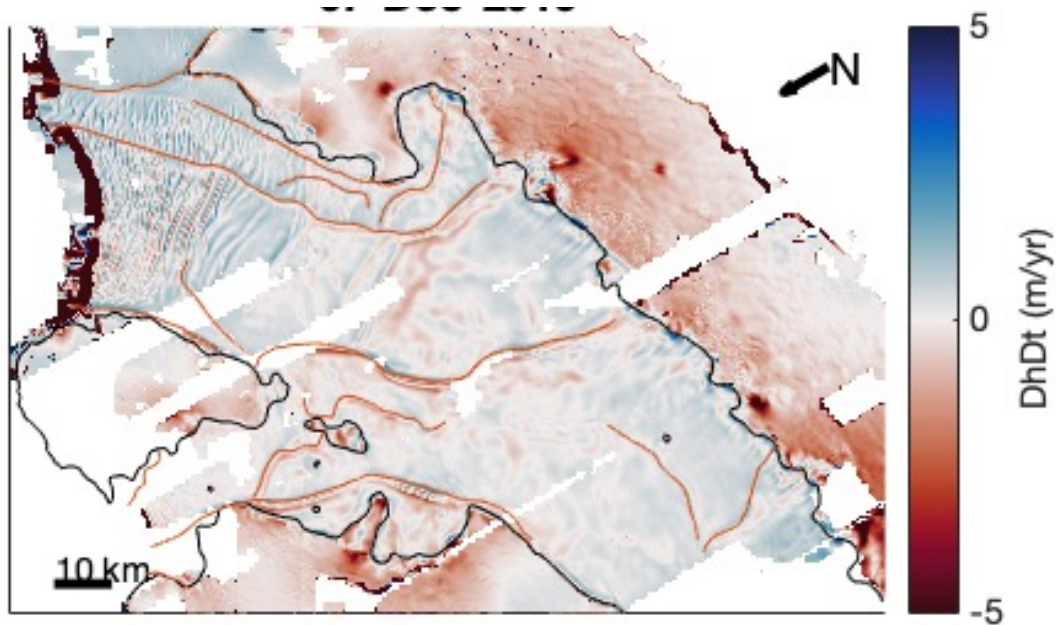


Basal channel formation



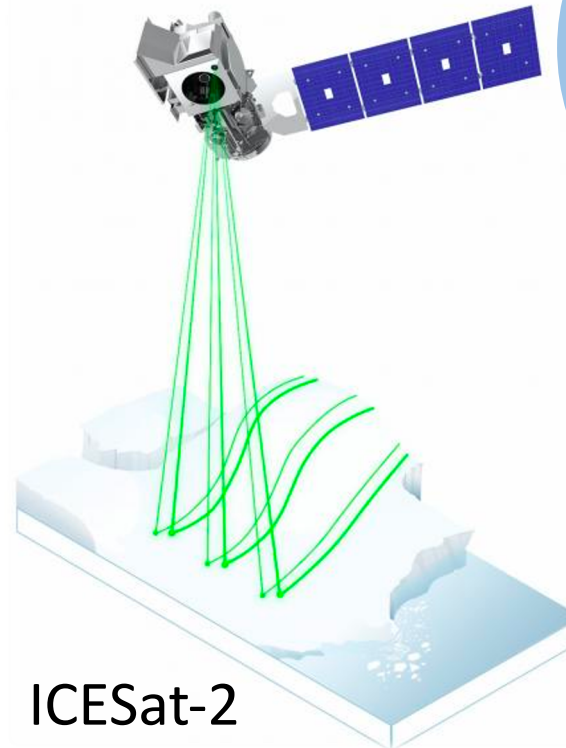
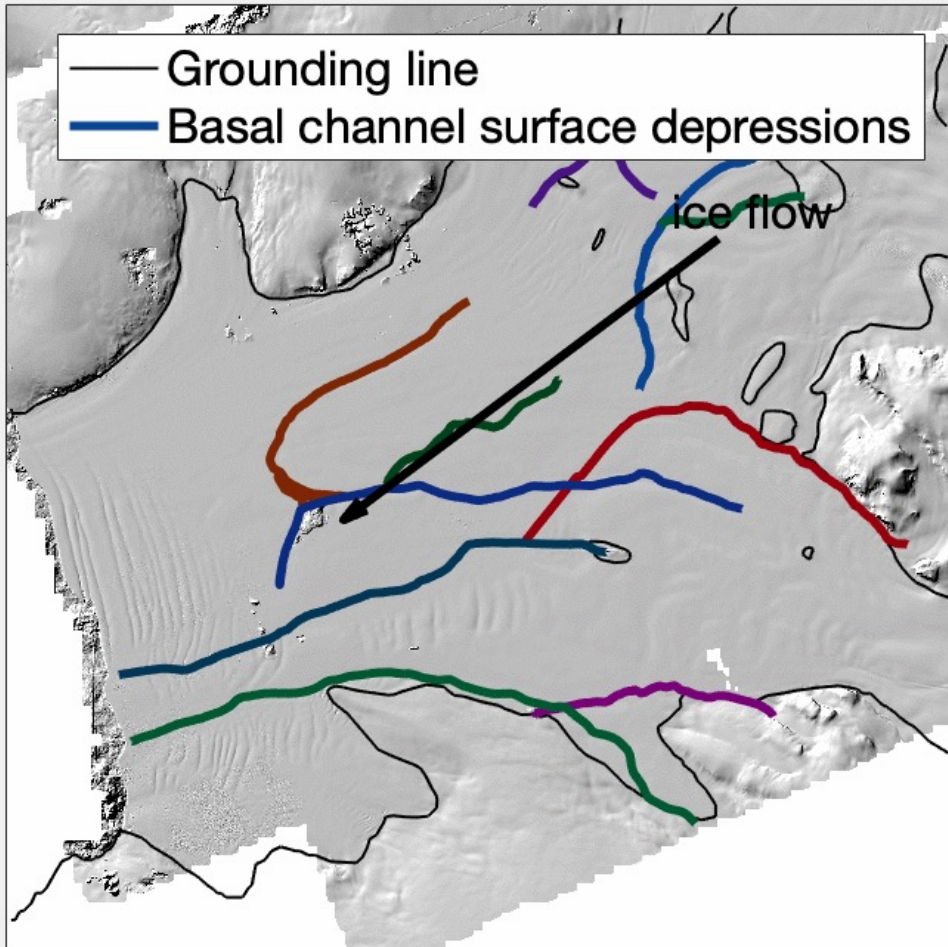
How is basal channel evolution related to changes at or upstream of the grounding line?

Rates of change between 2015 - 2019



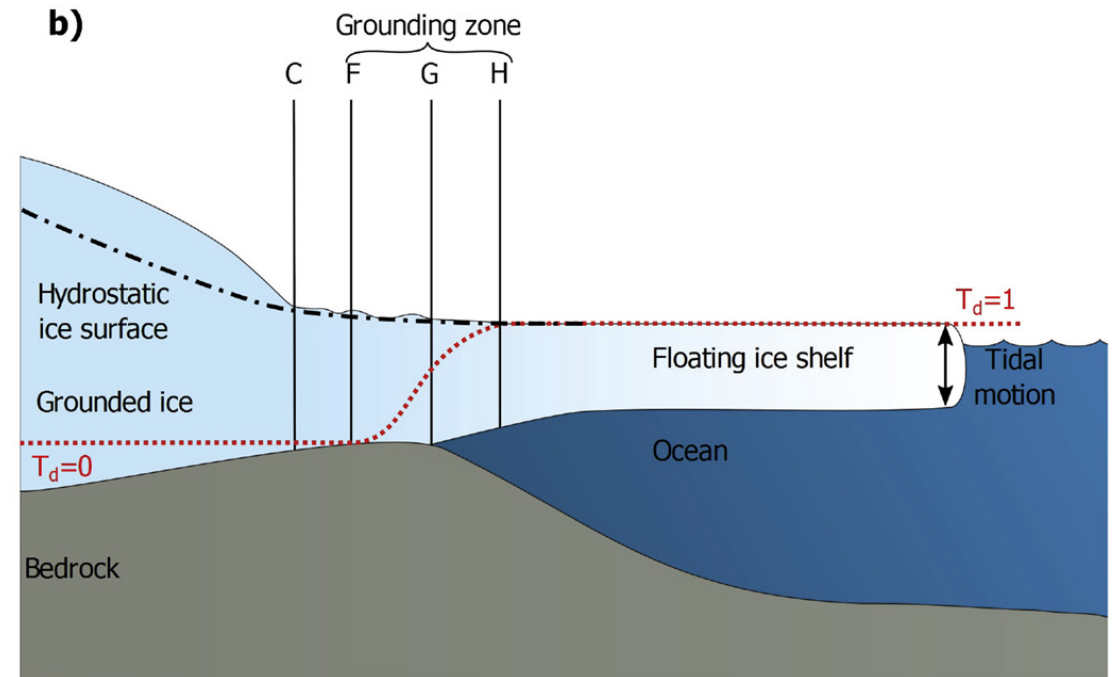
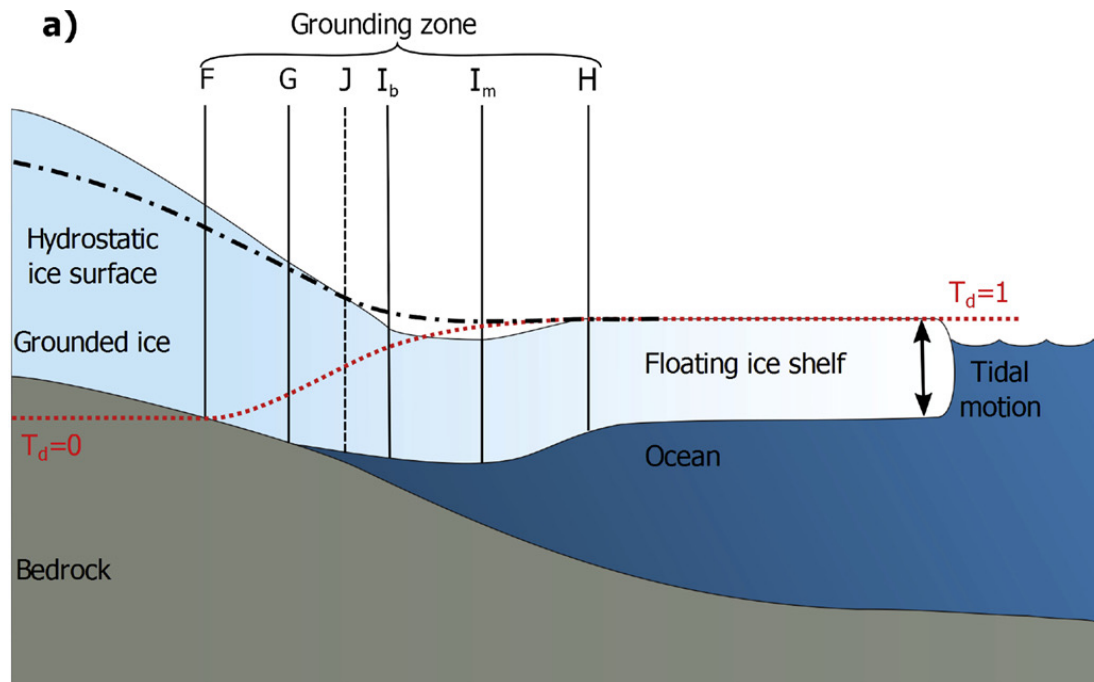
Surface elevation data are used to track surface depressions.

31-Dec-2010



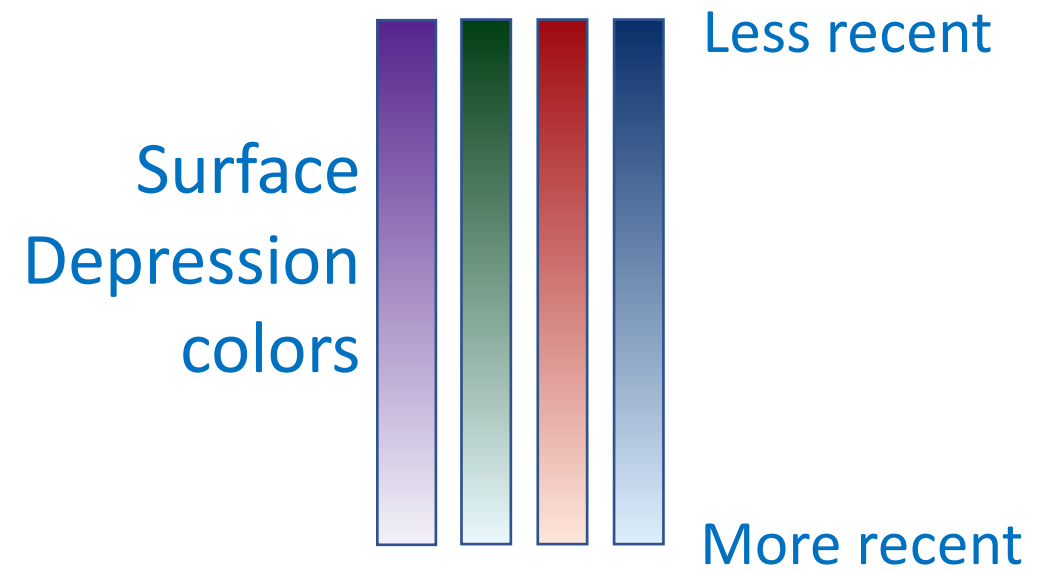
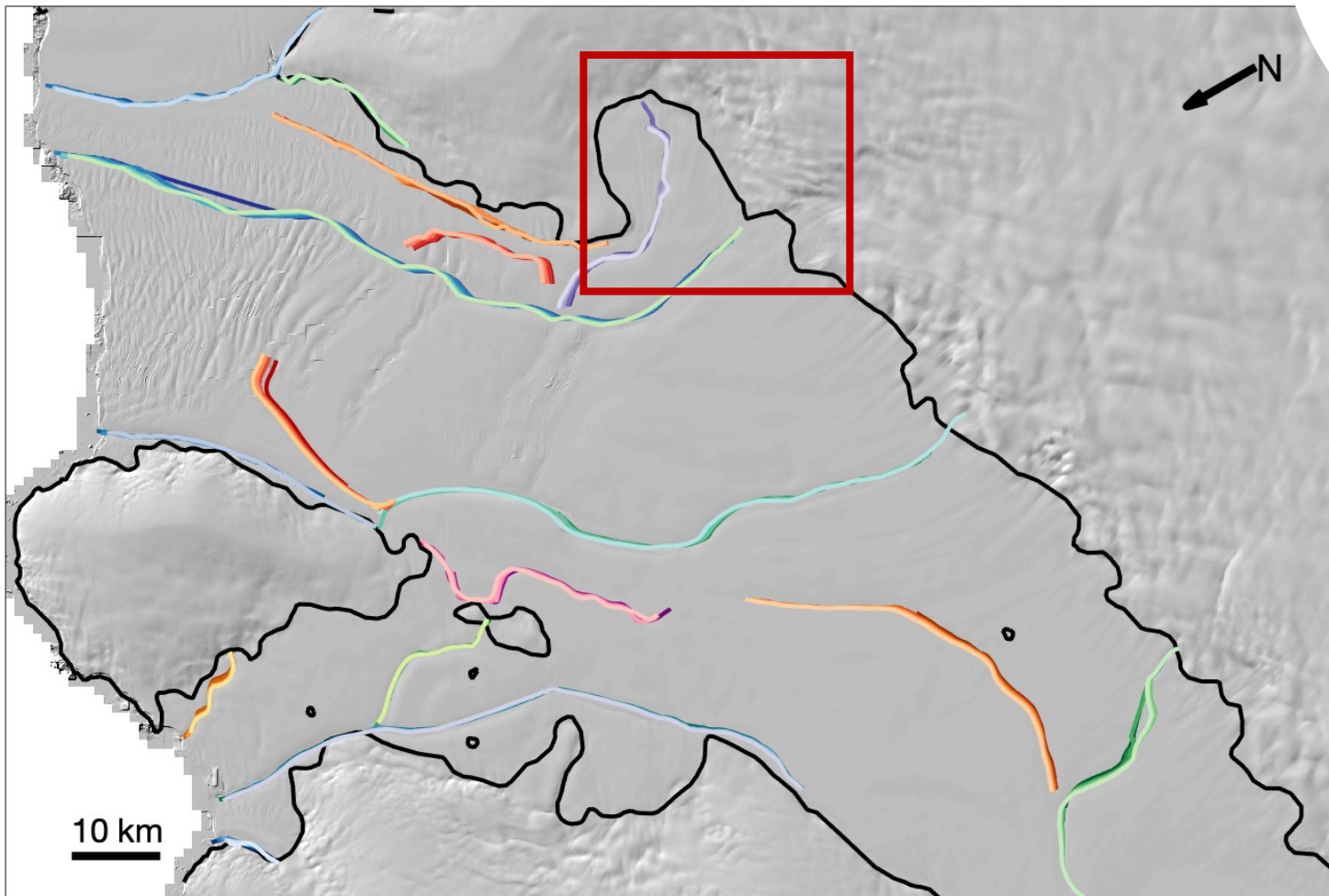
Ice-penetrating radar data are used to validate surface inferences.

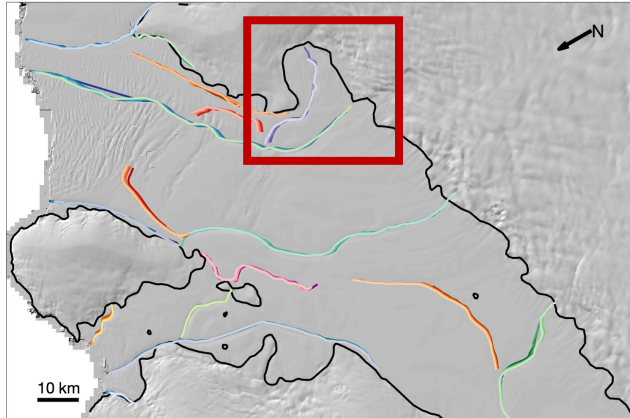




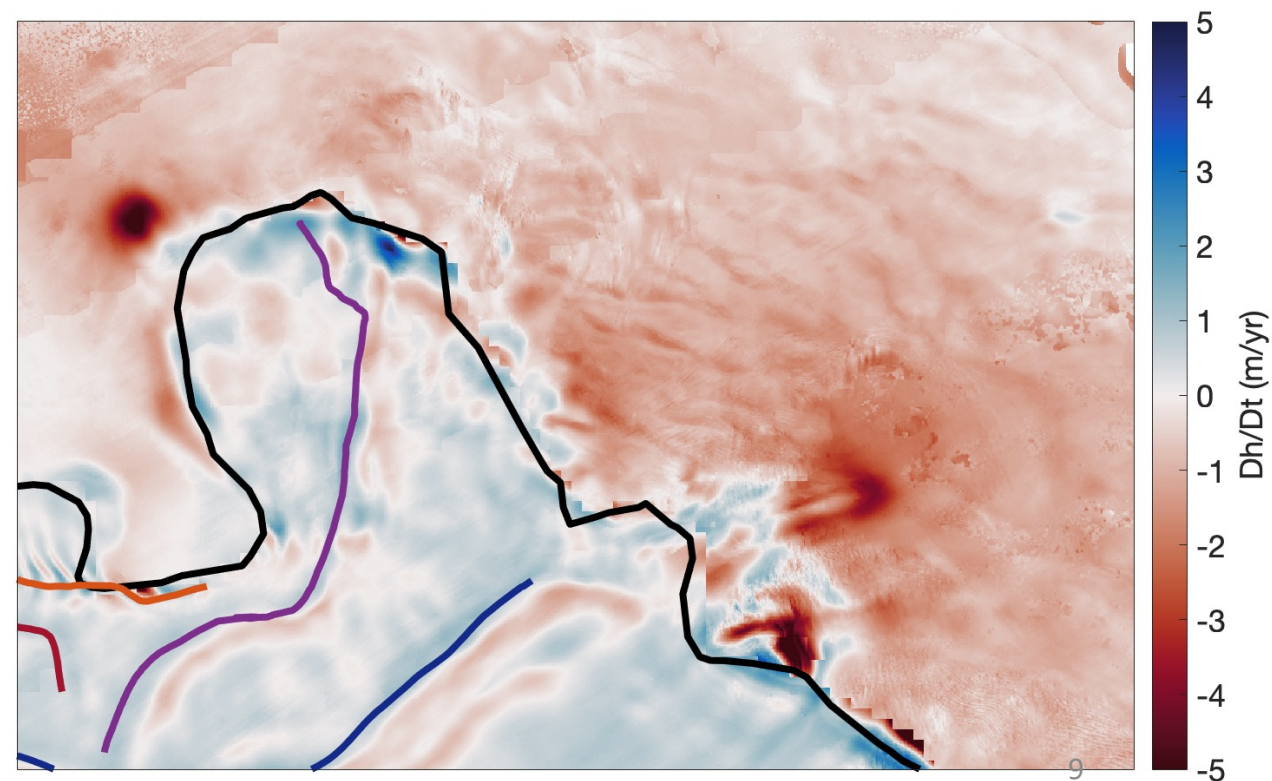
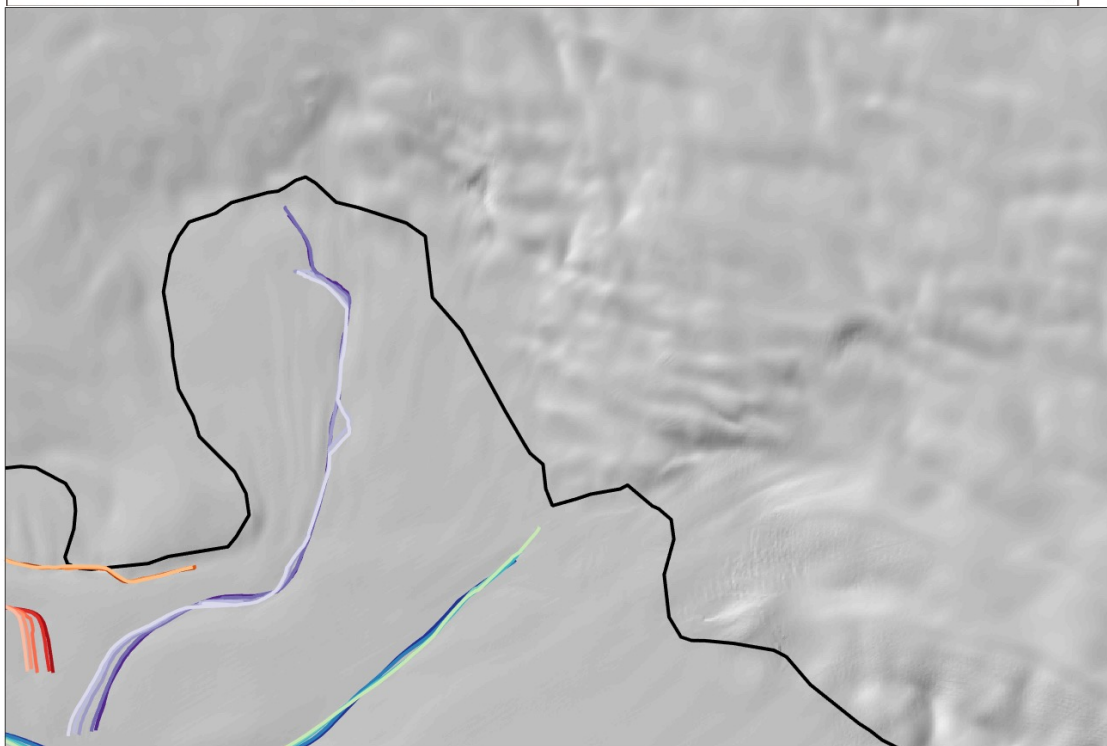
Friedl et al., 2020, Earth-Science Reviews

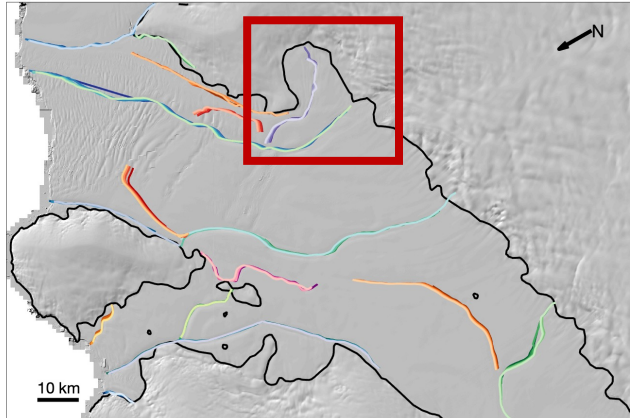
Getz Ice Shelf



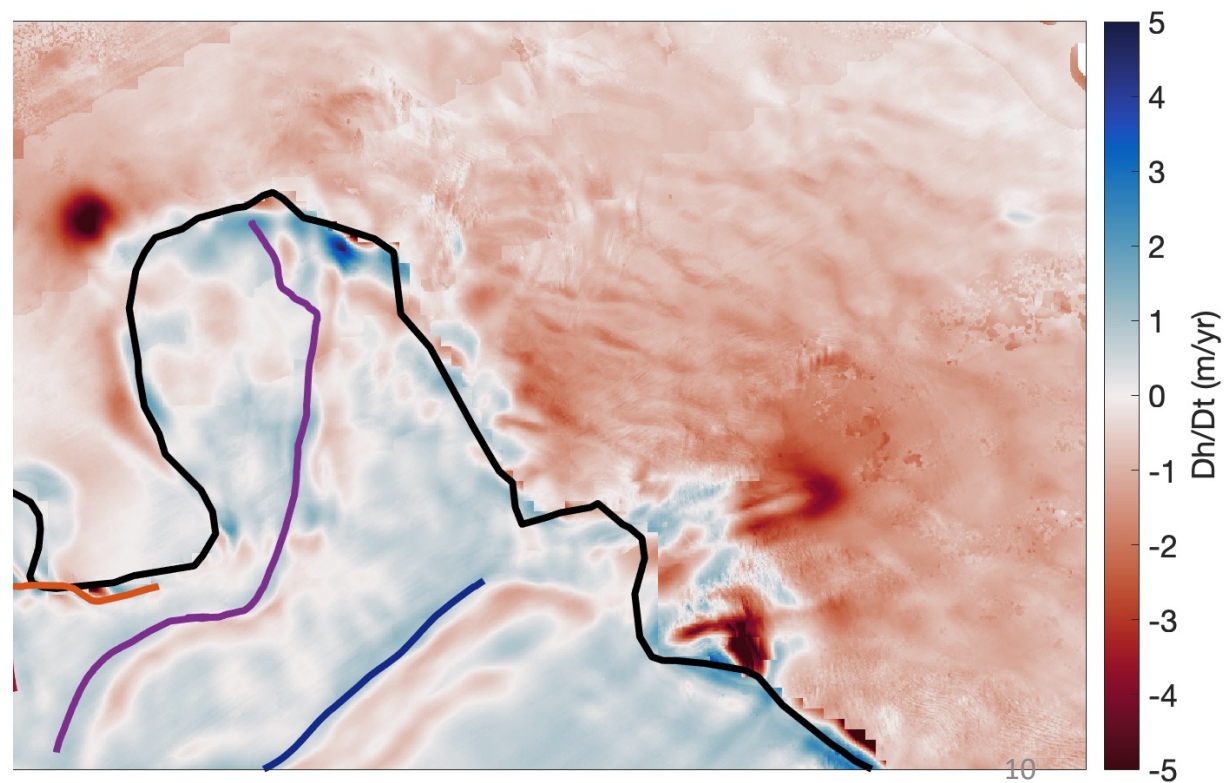
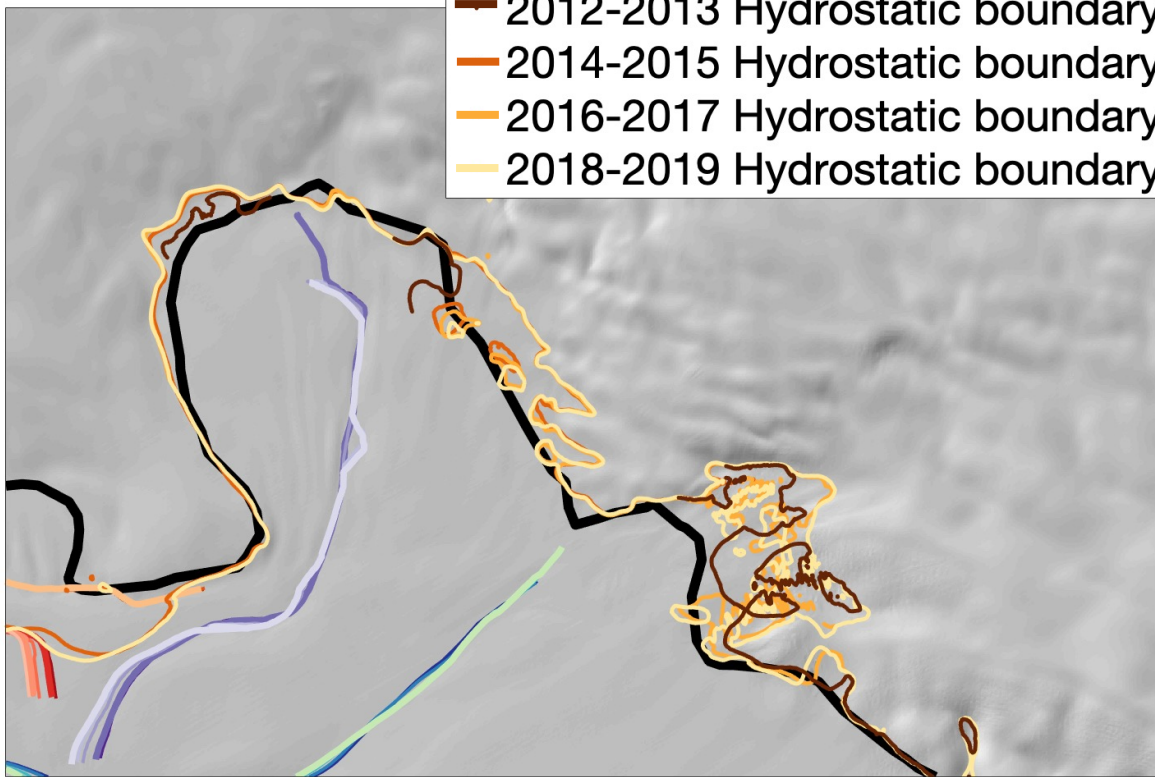


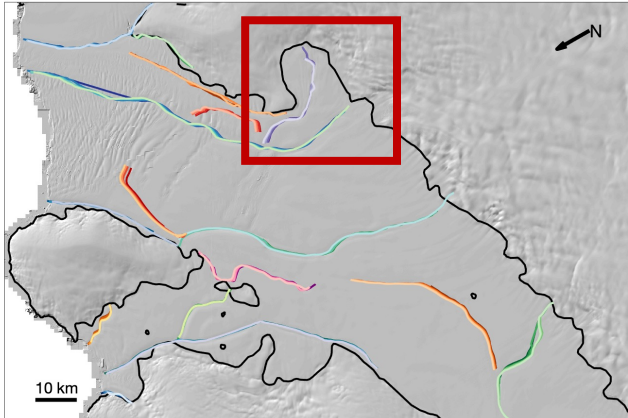
— InSAR grounding line
— Surface depression location (various colors)



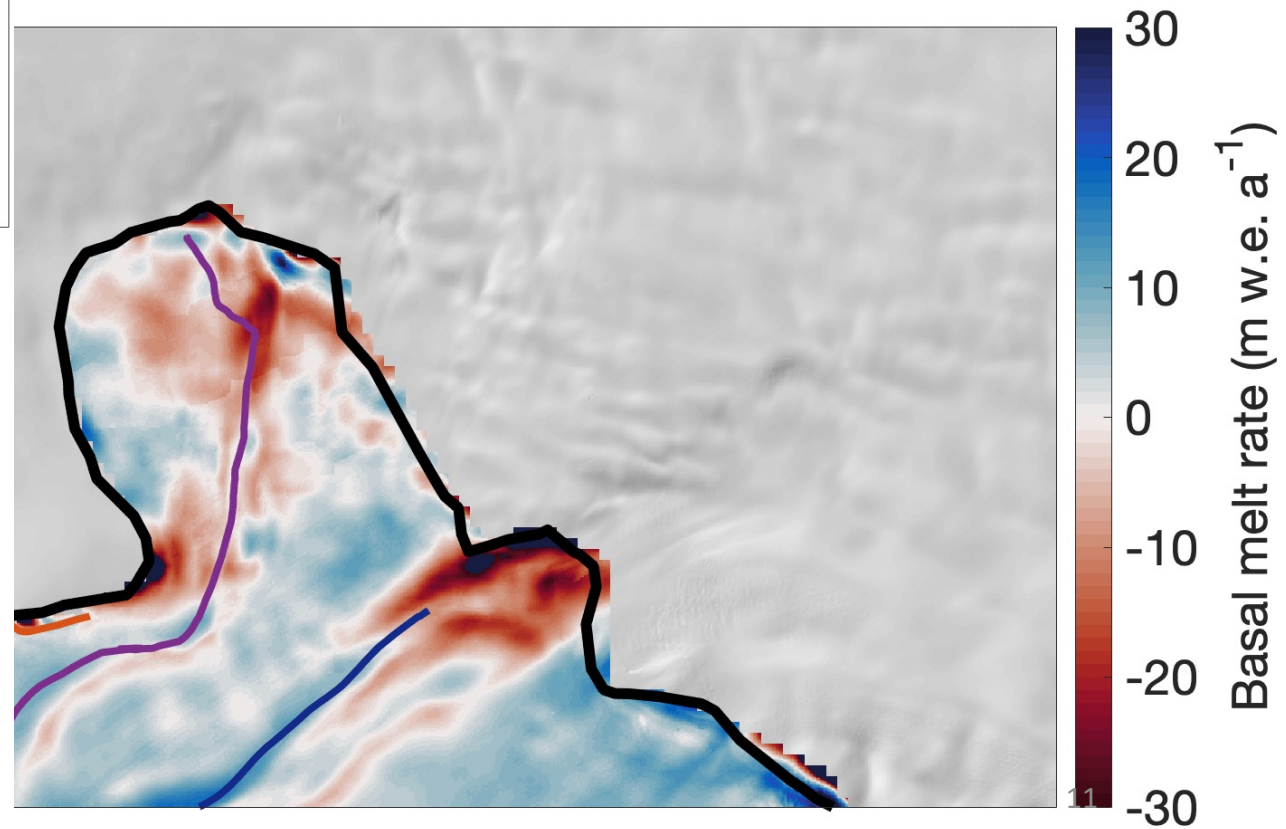
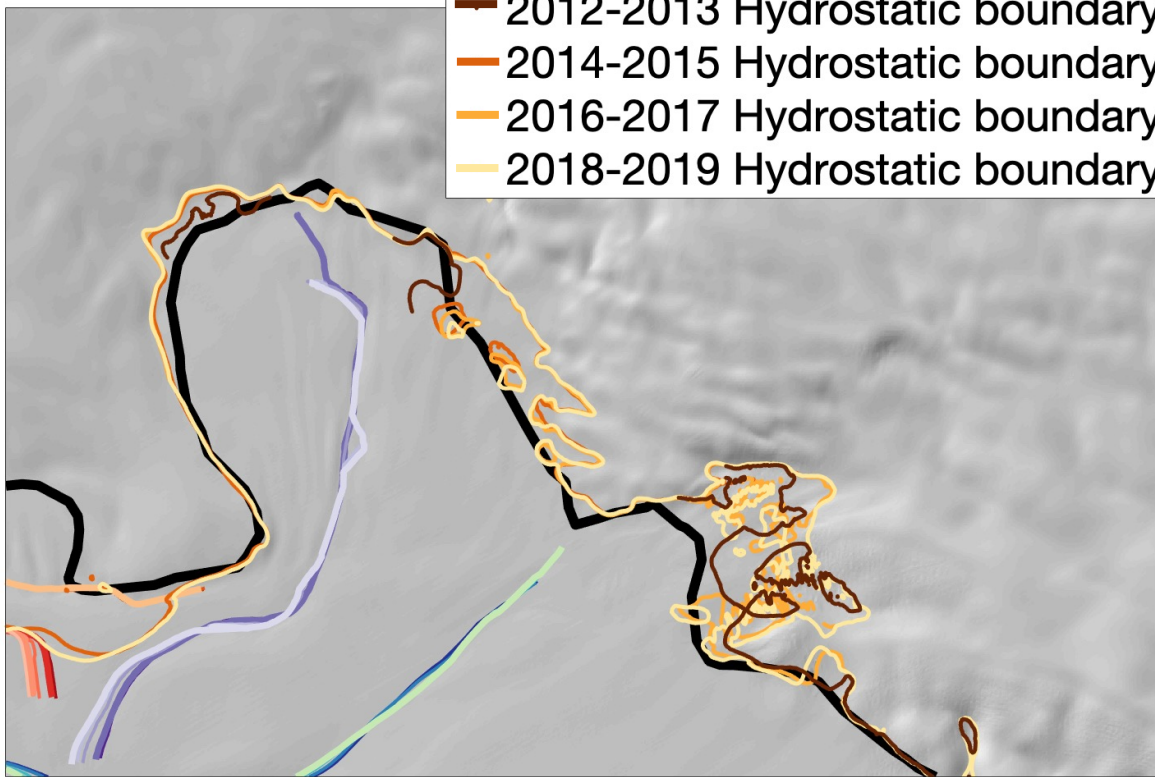


- InSAR grounding Line
- Surface depressions (various colors)
- 2012-2013 Hydrostatic boundary
- 2014-2015 Hydrostatic boundary
- 2016-2017 Hydrostatic boundary
- 2018-2019 Hydrostatic boundary

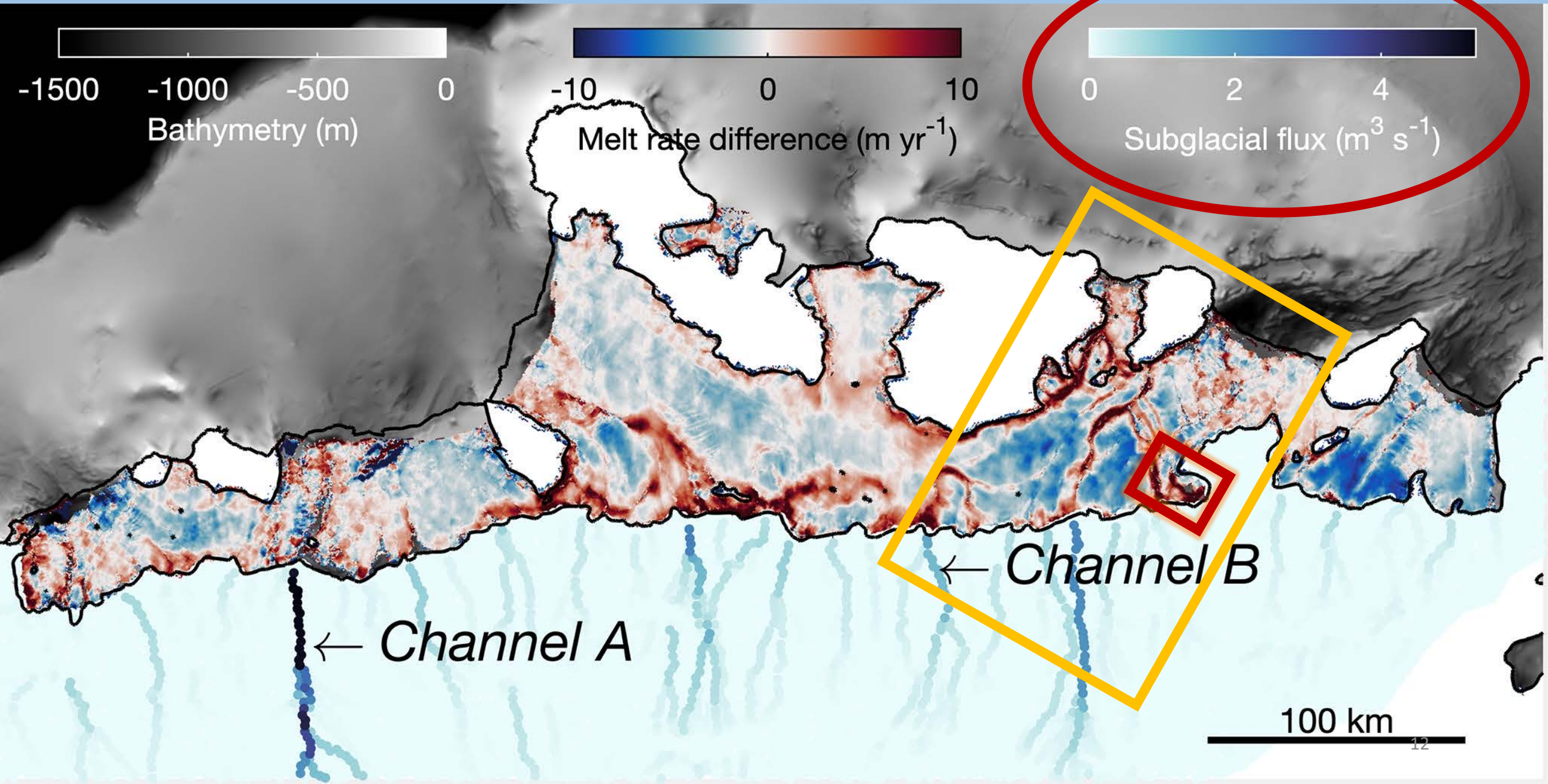


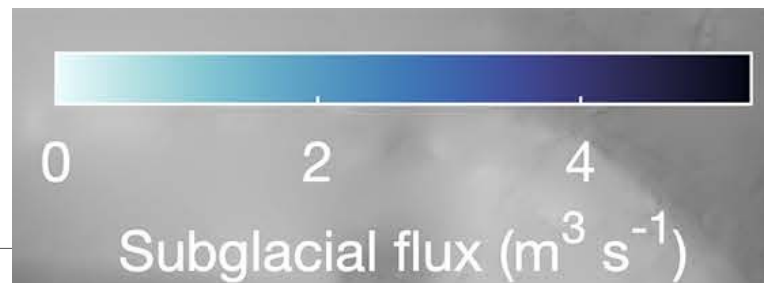
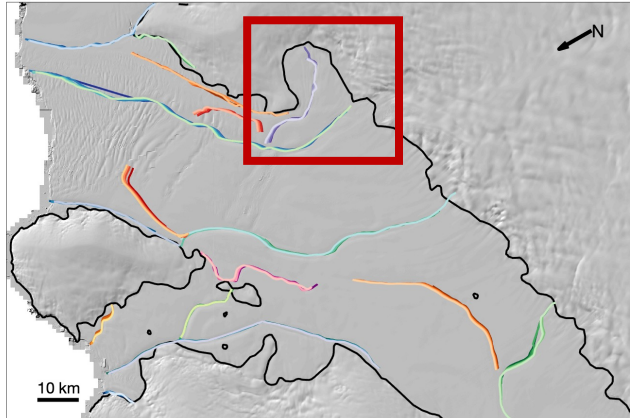


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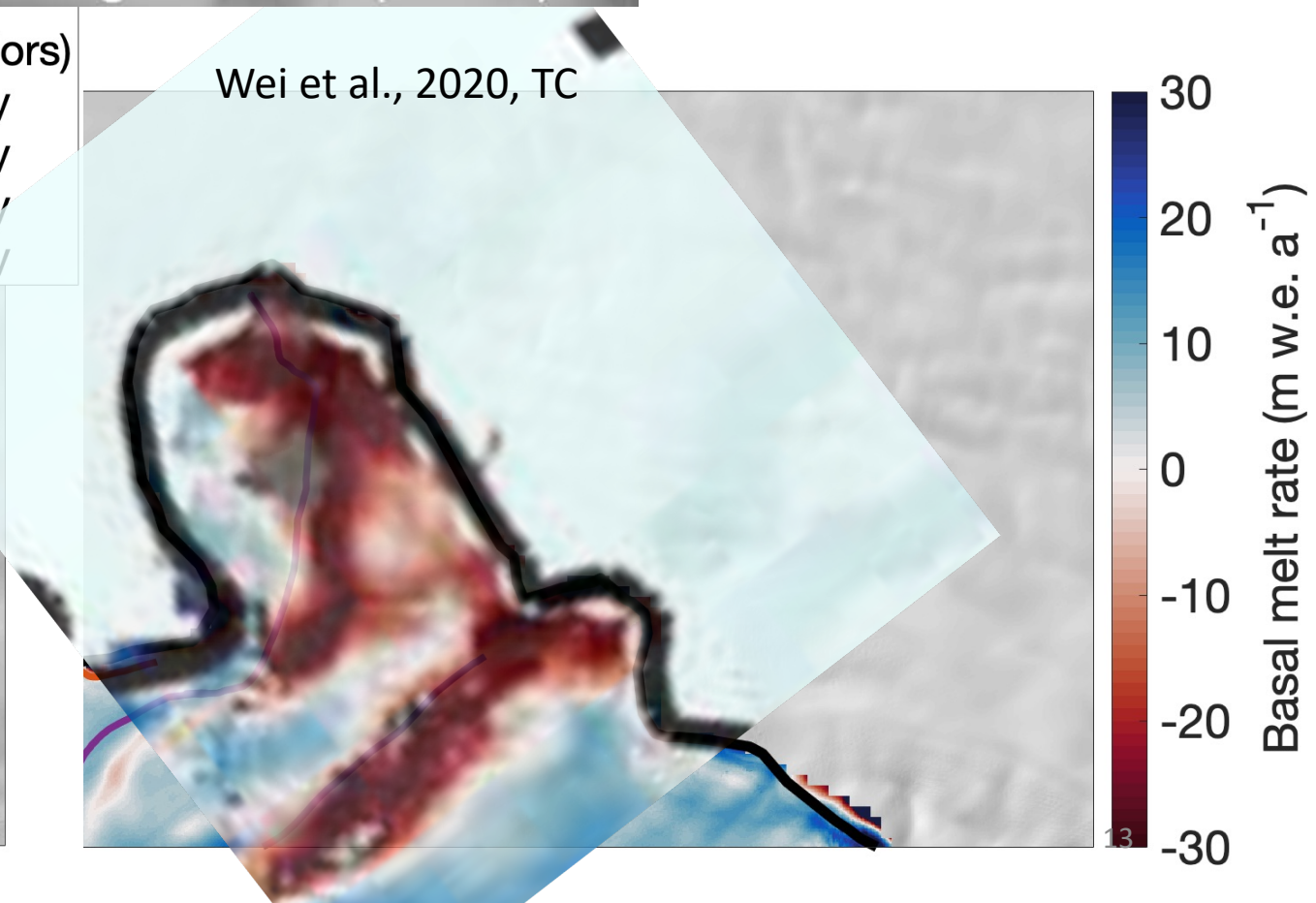
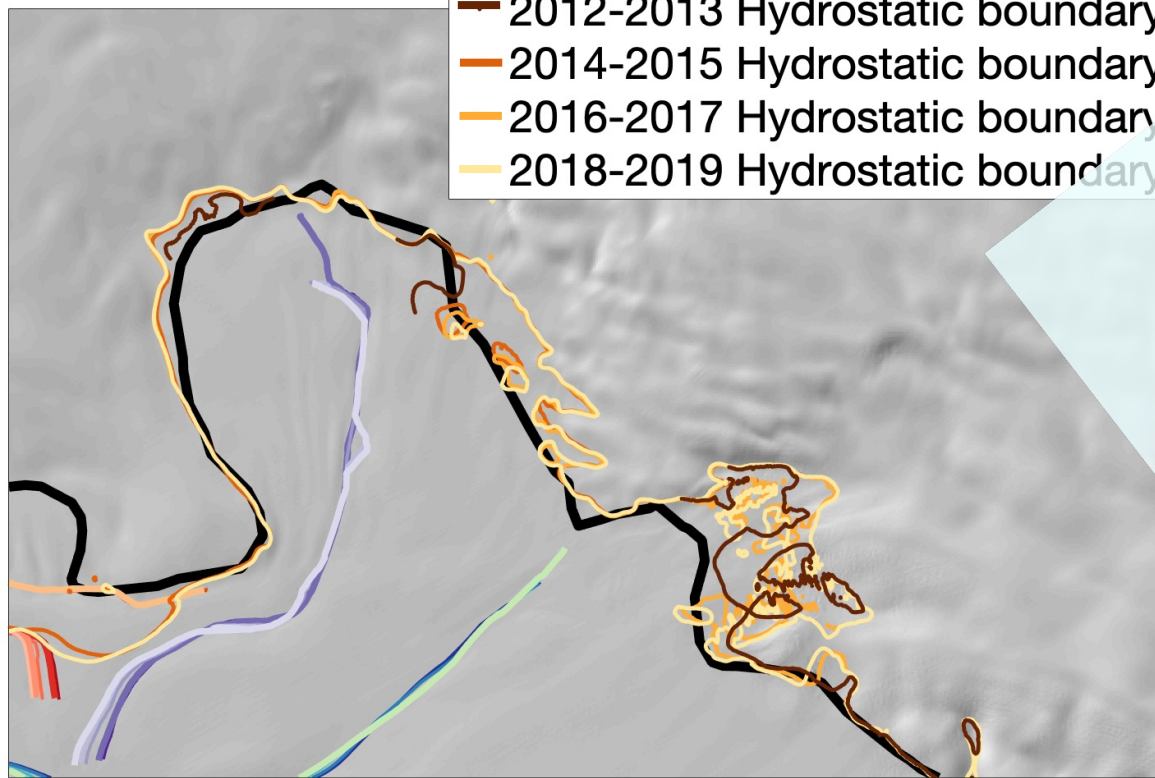


Modeled subglacial discharge - Wei et al., 2020, TC

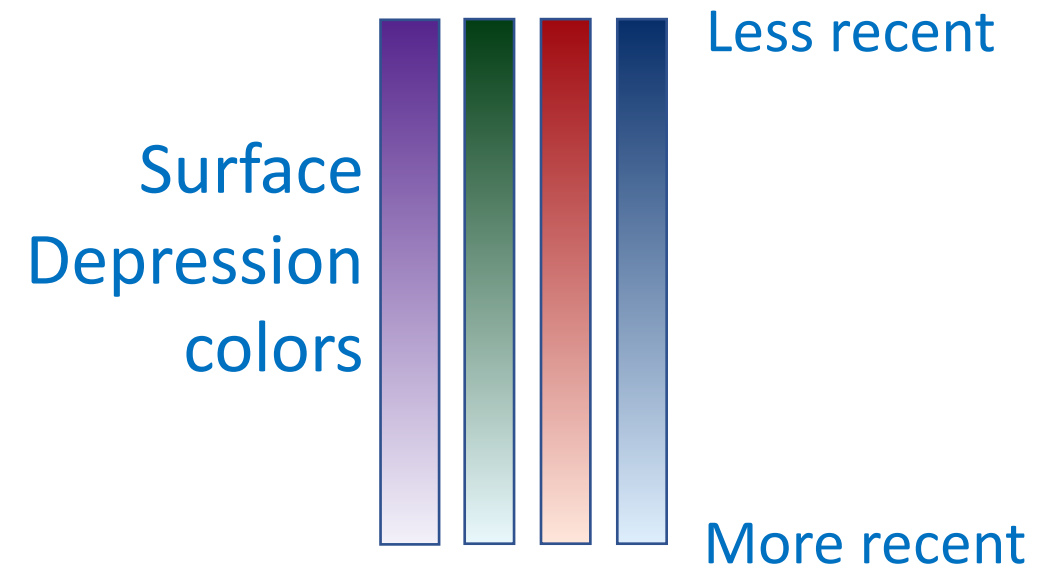
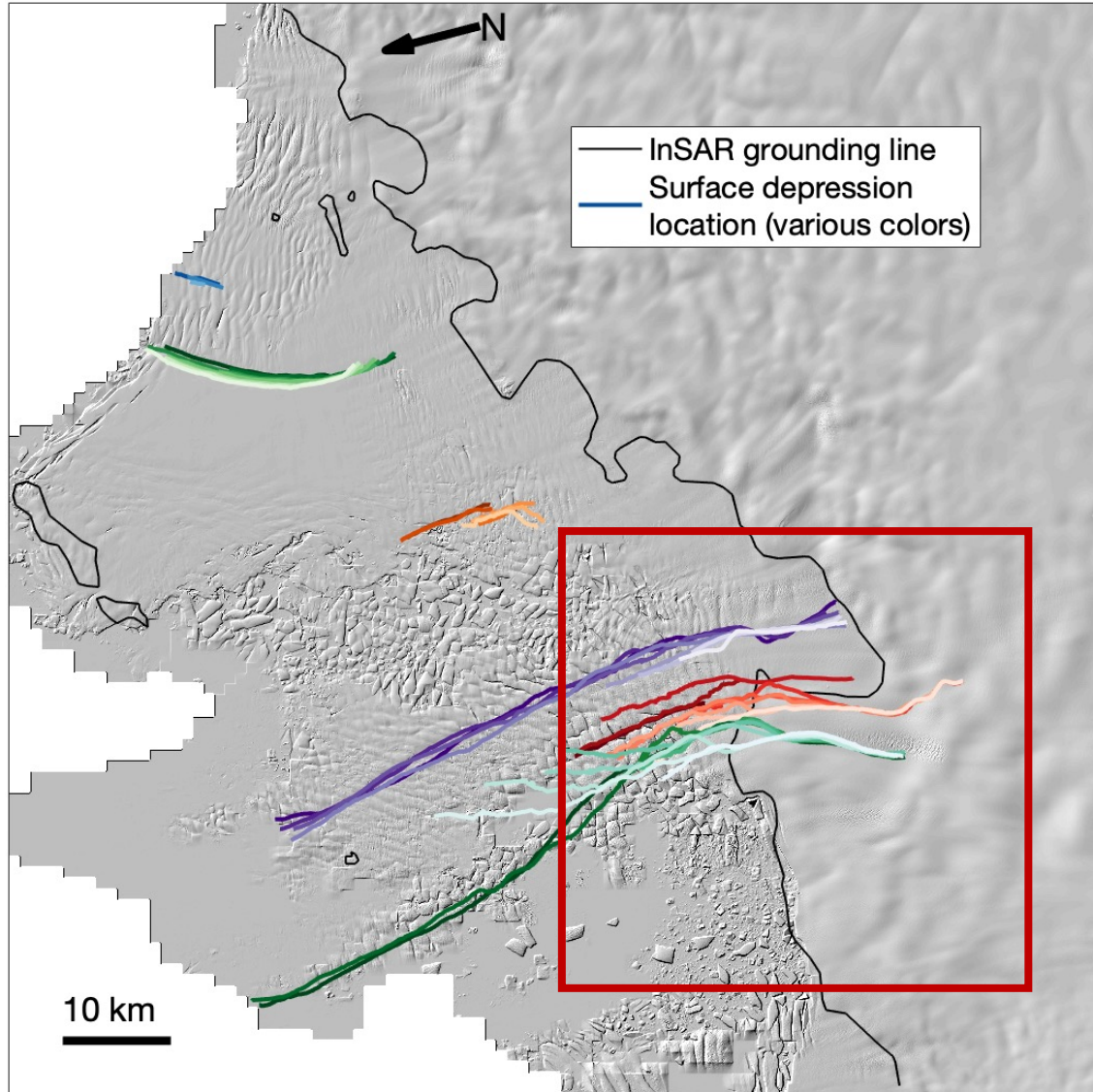


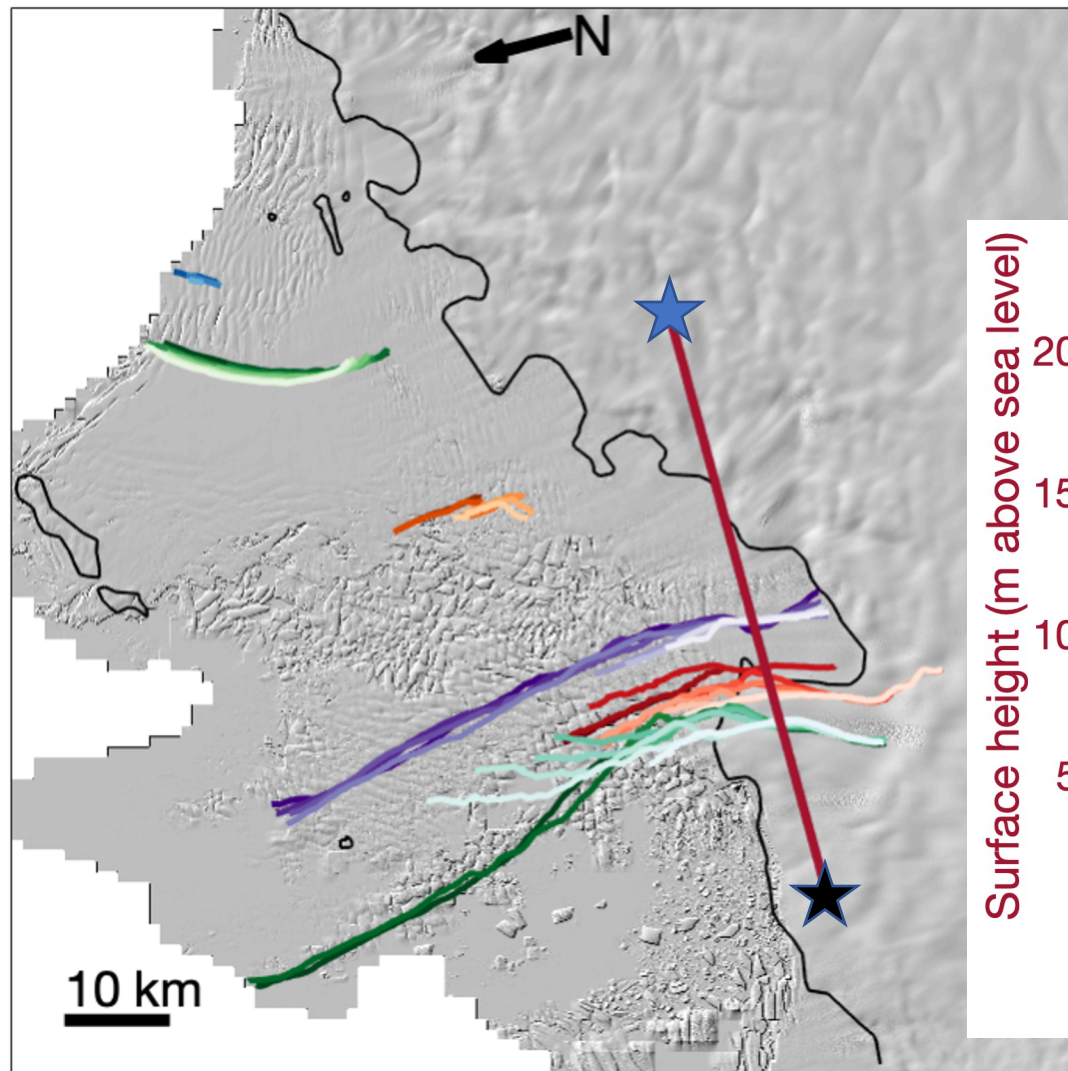


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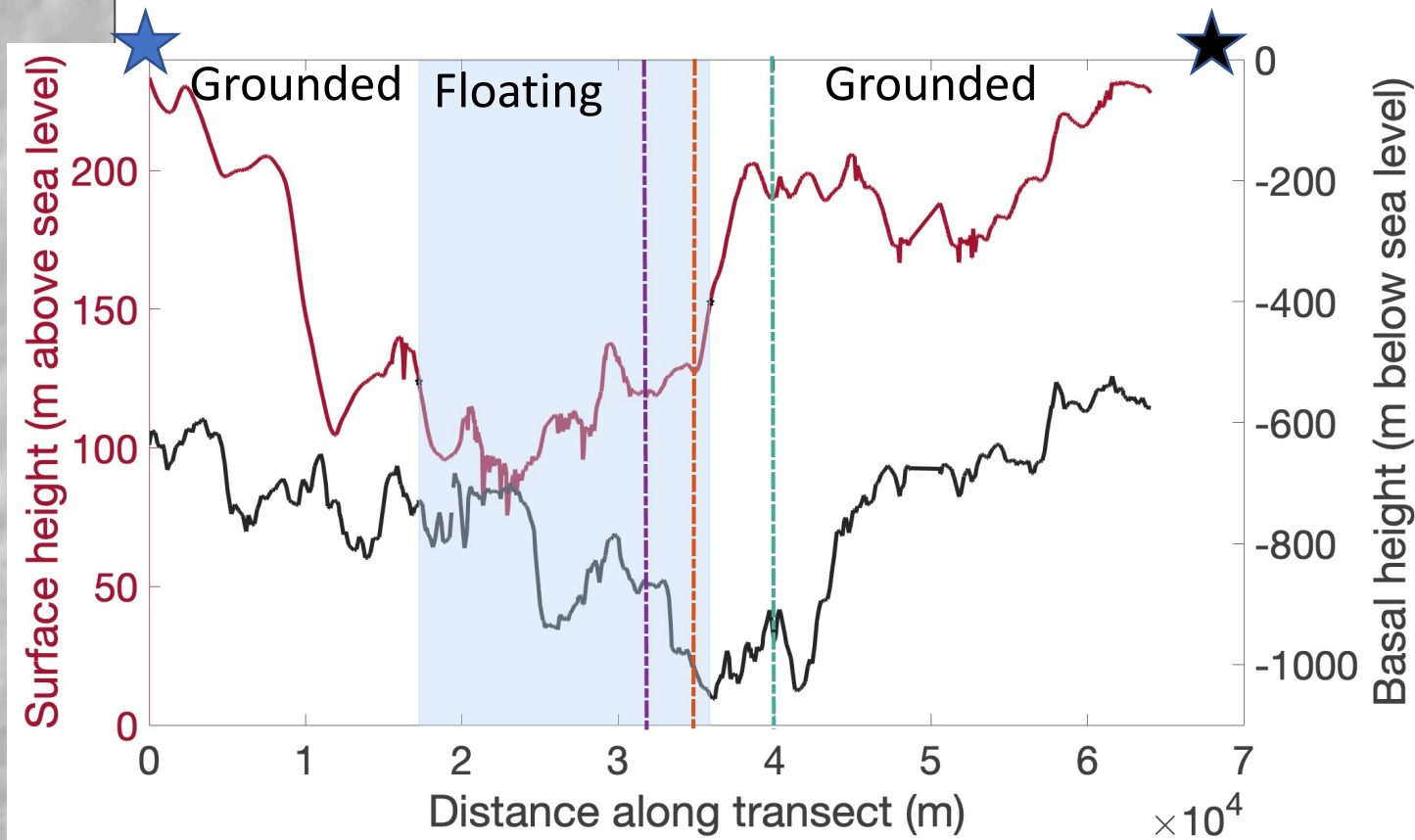


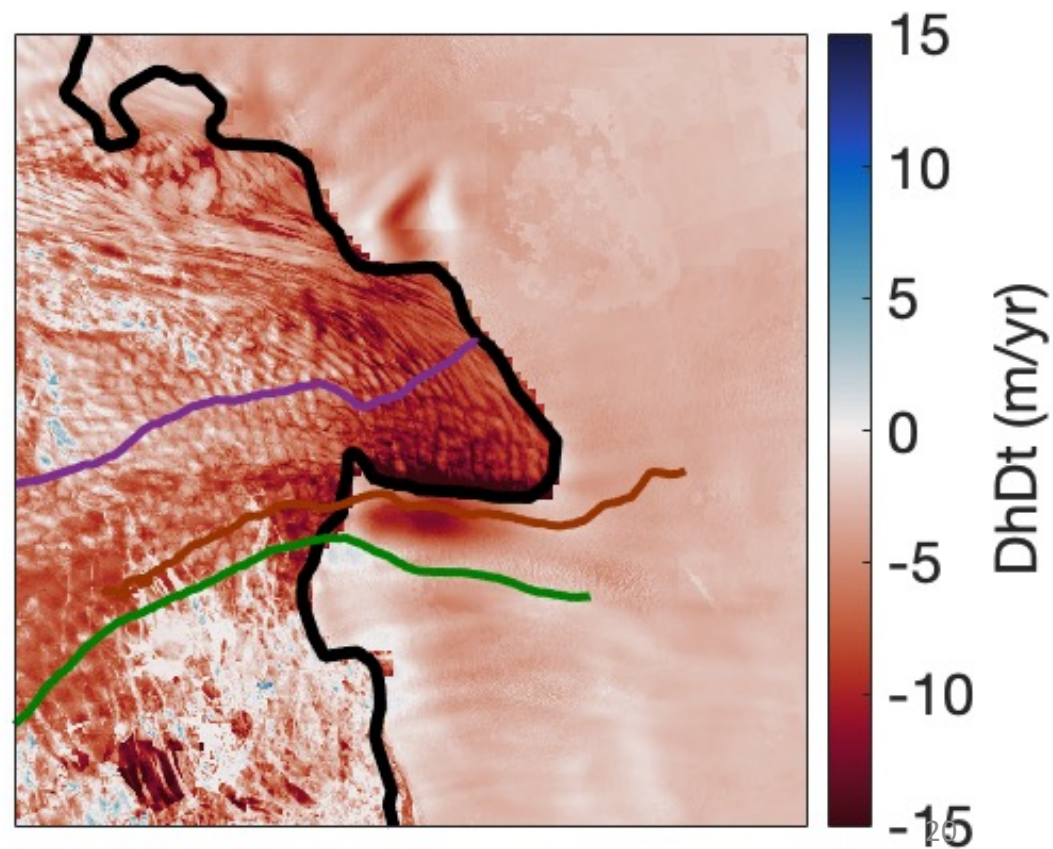
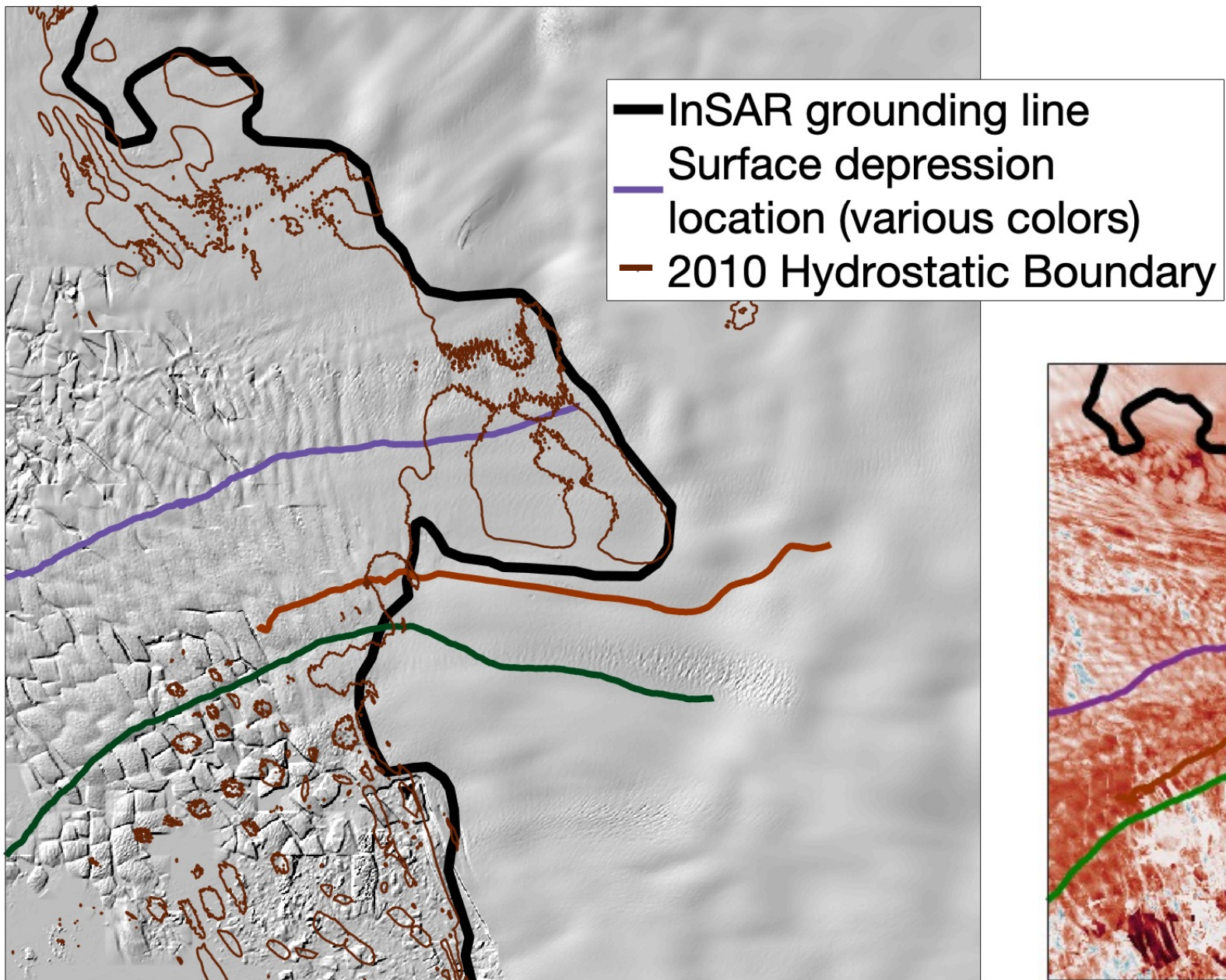
Thwaites Ice Shelf

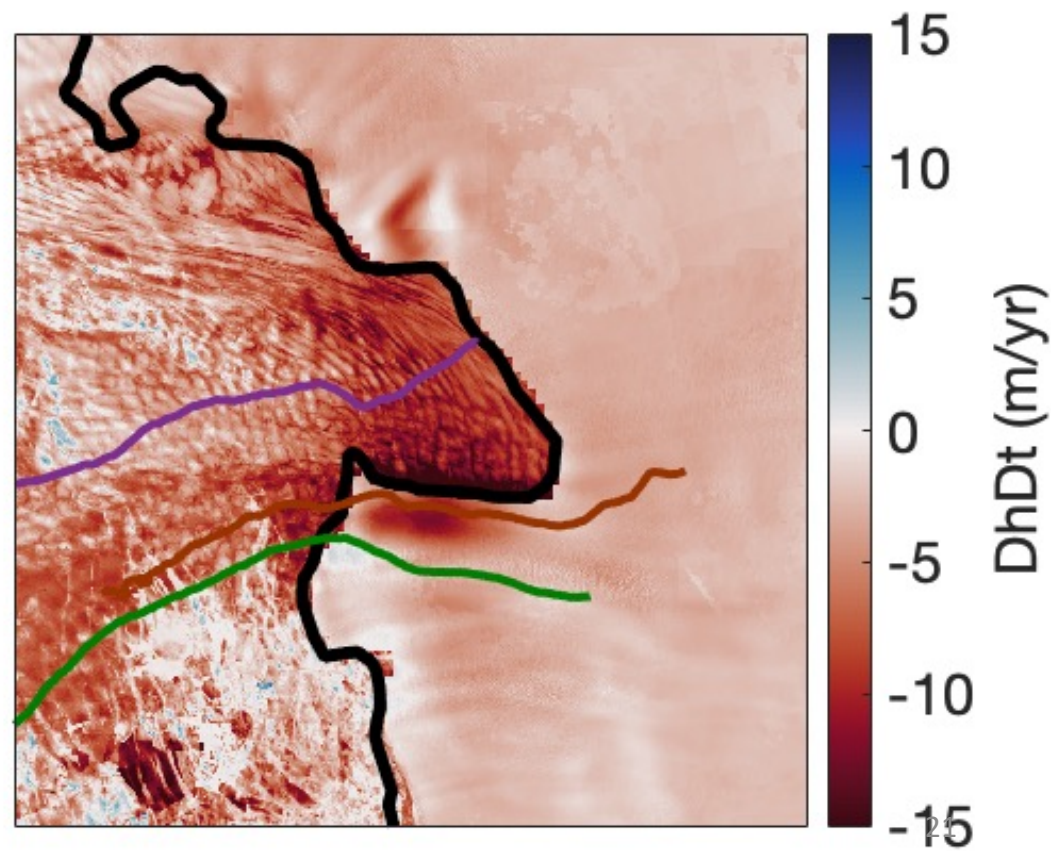
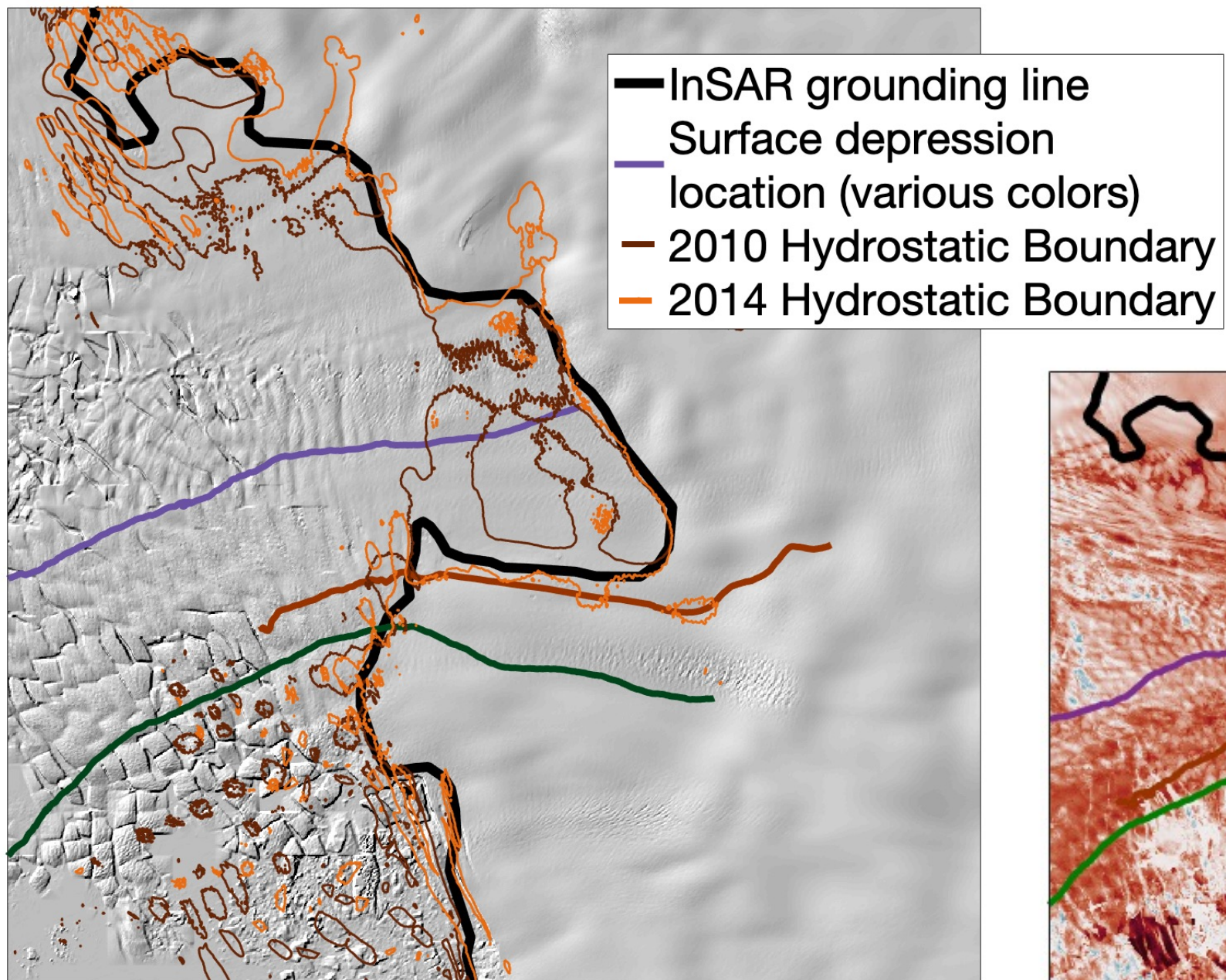


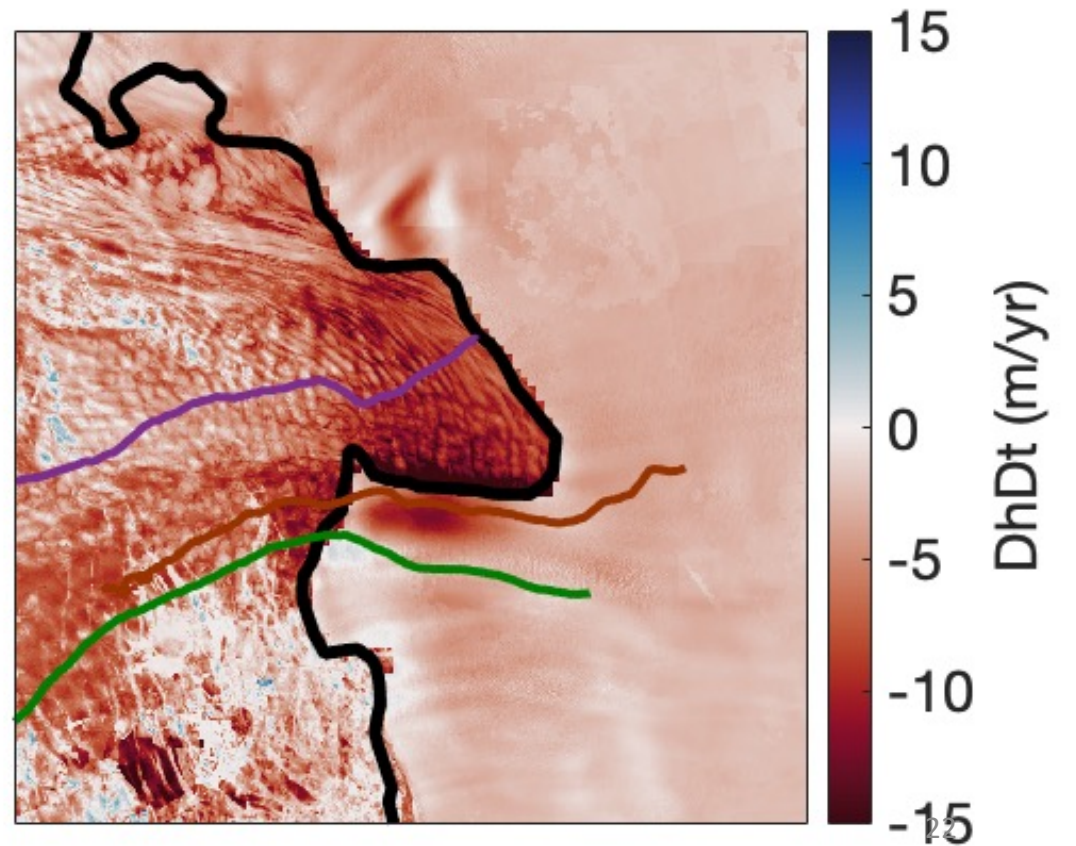
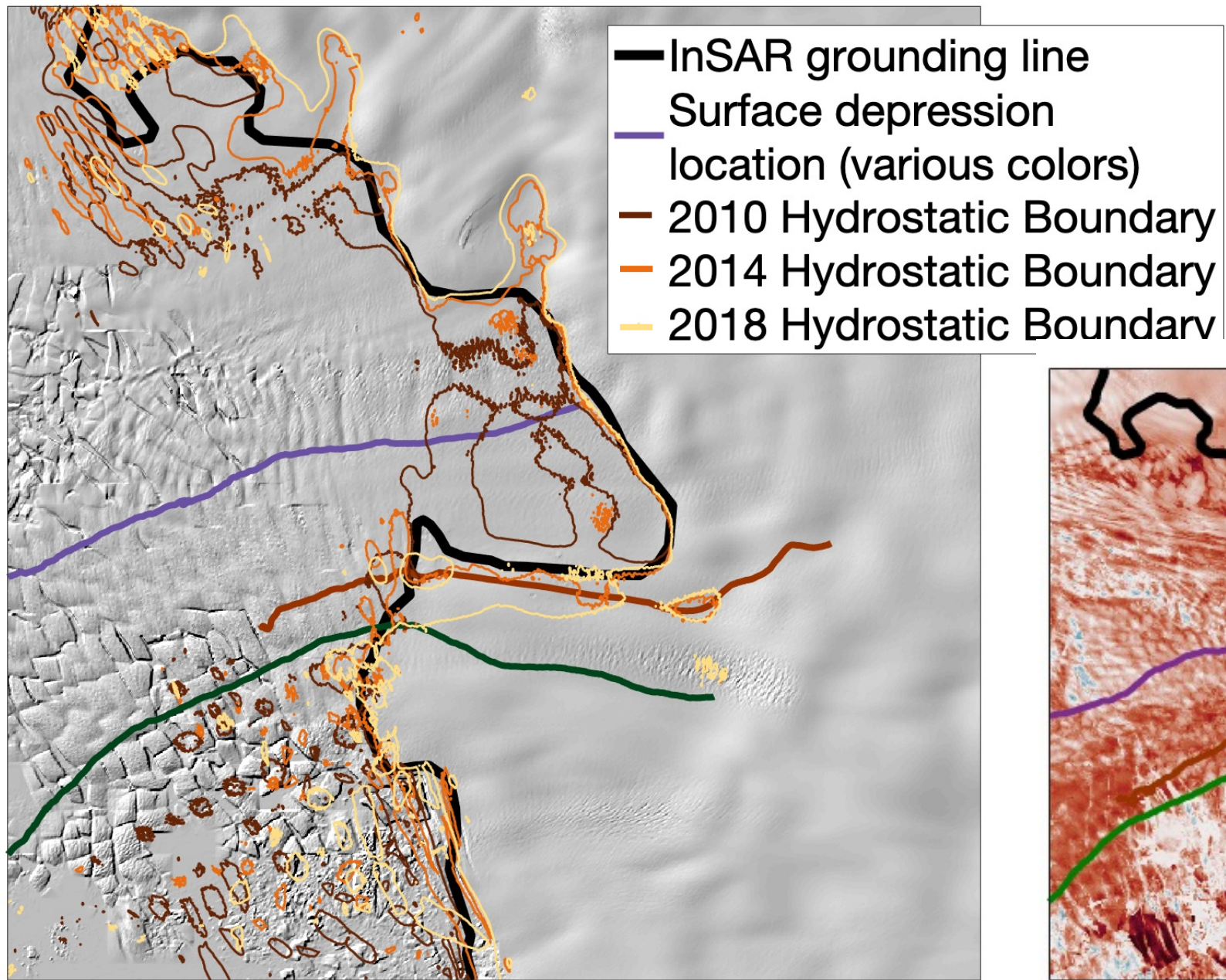


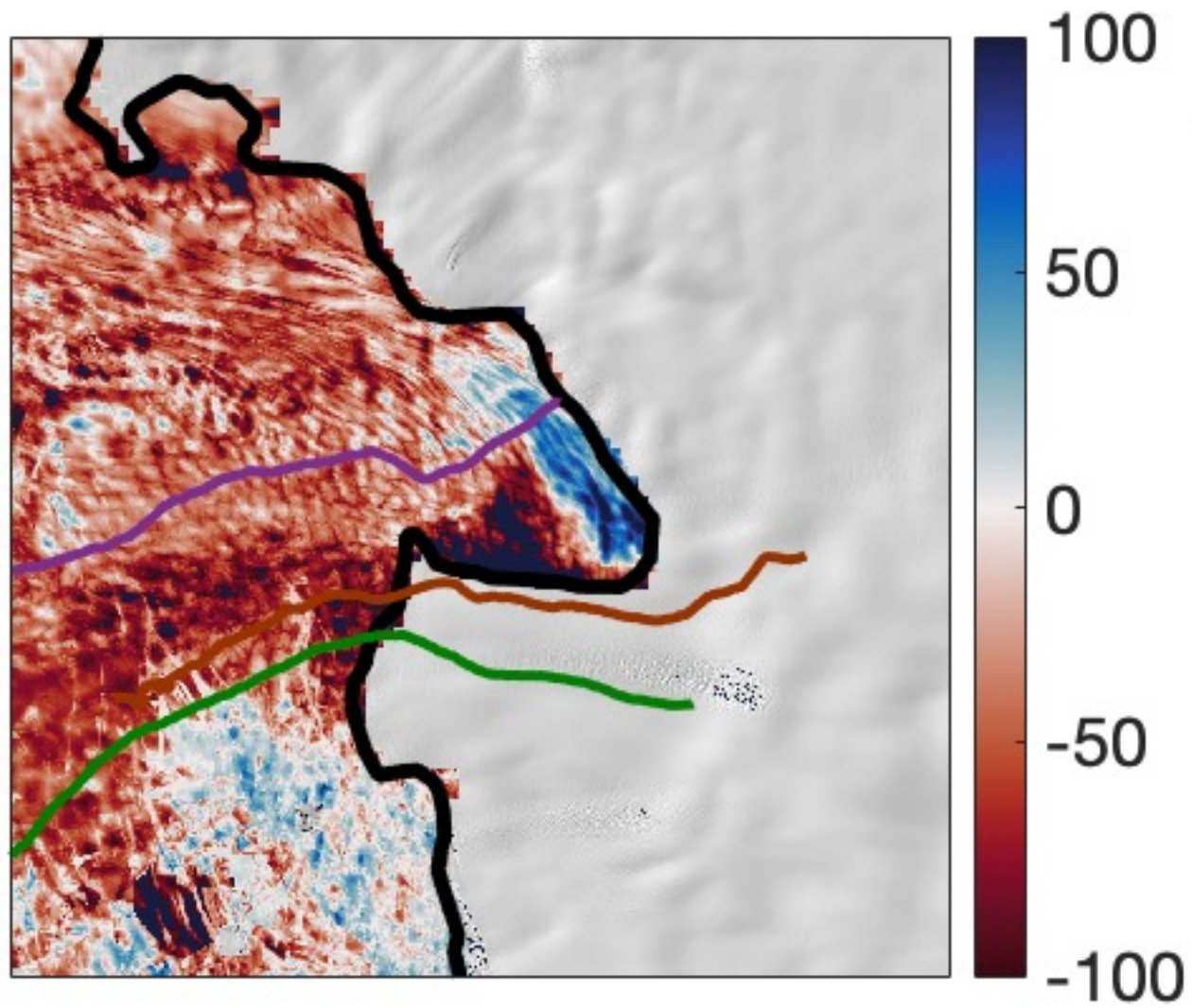
ATM/MCoRDS profile 4 Nov. 2011



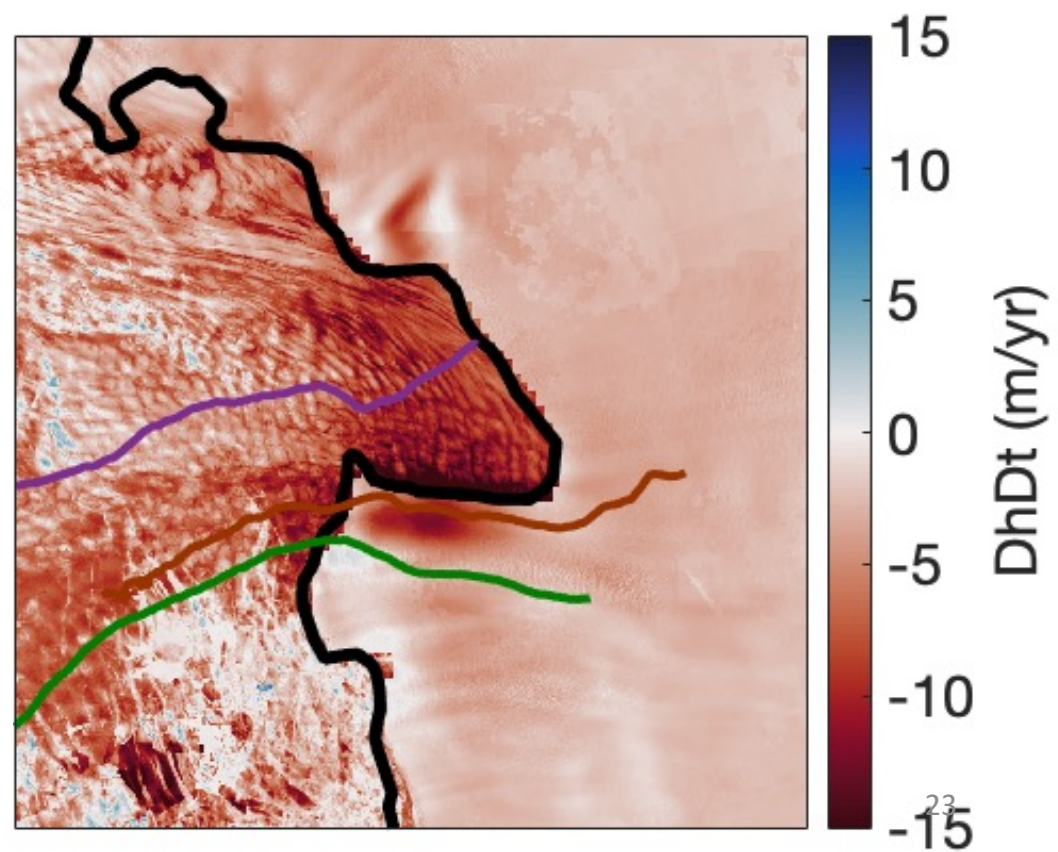


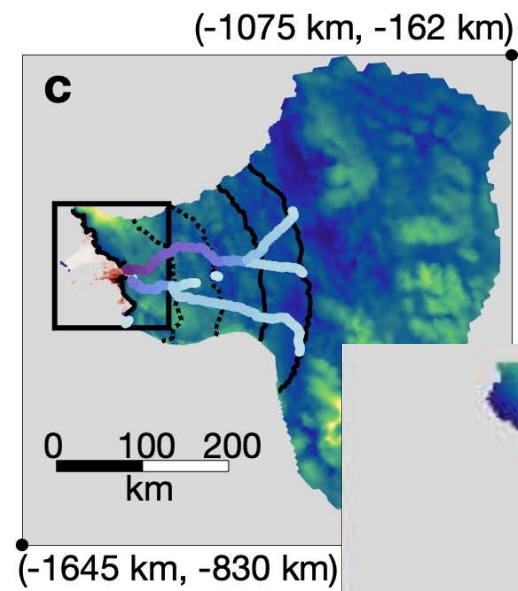
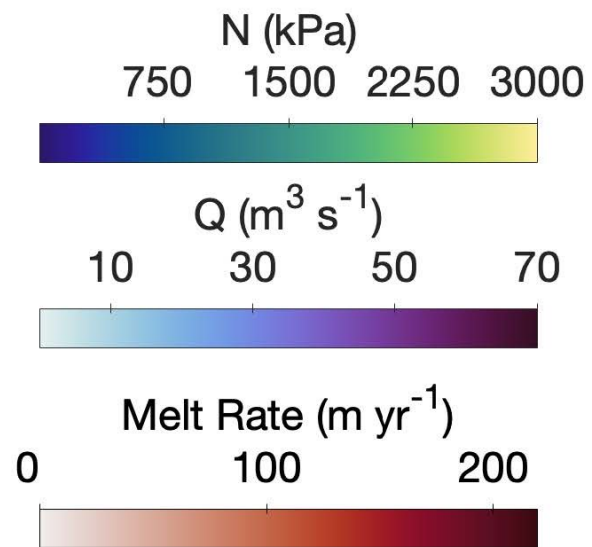




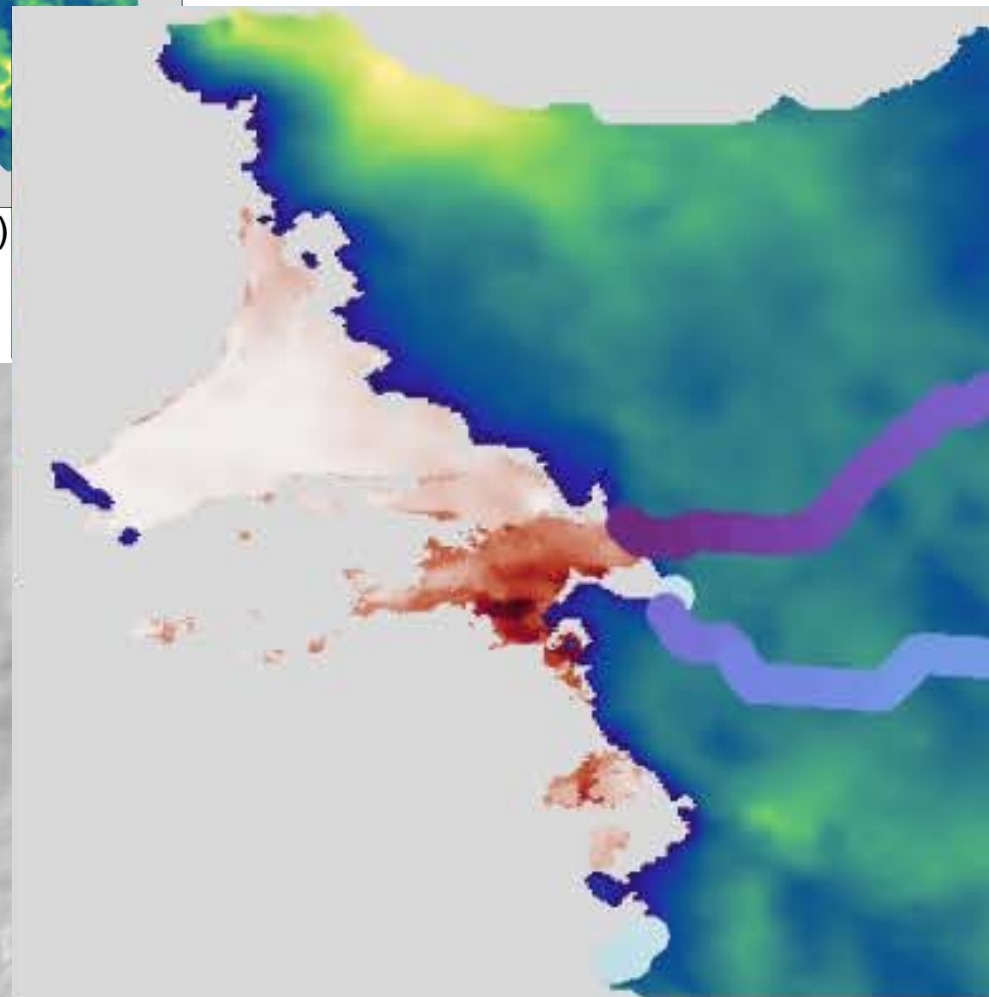
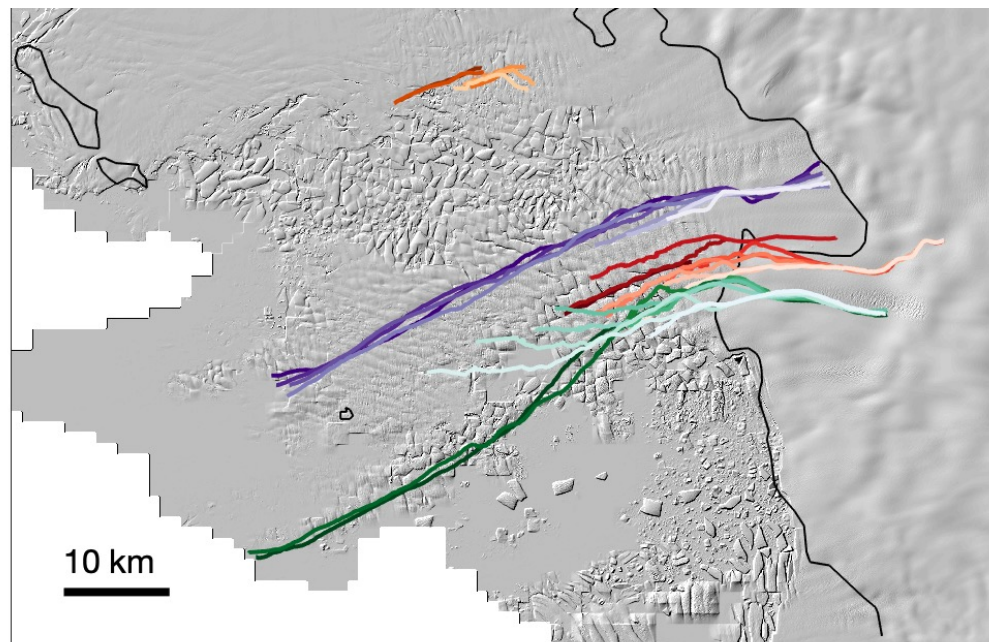


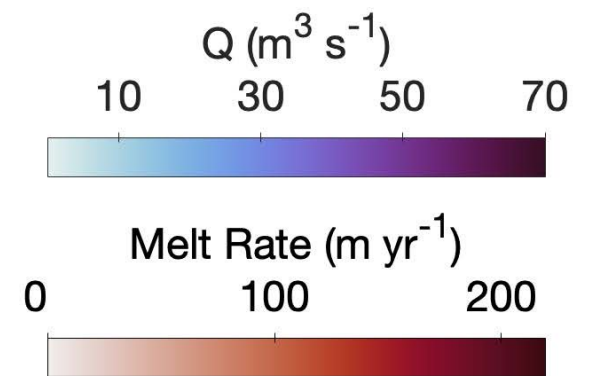
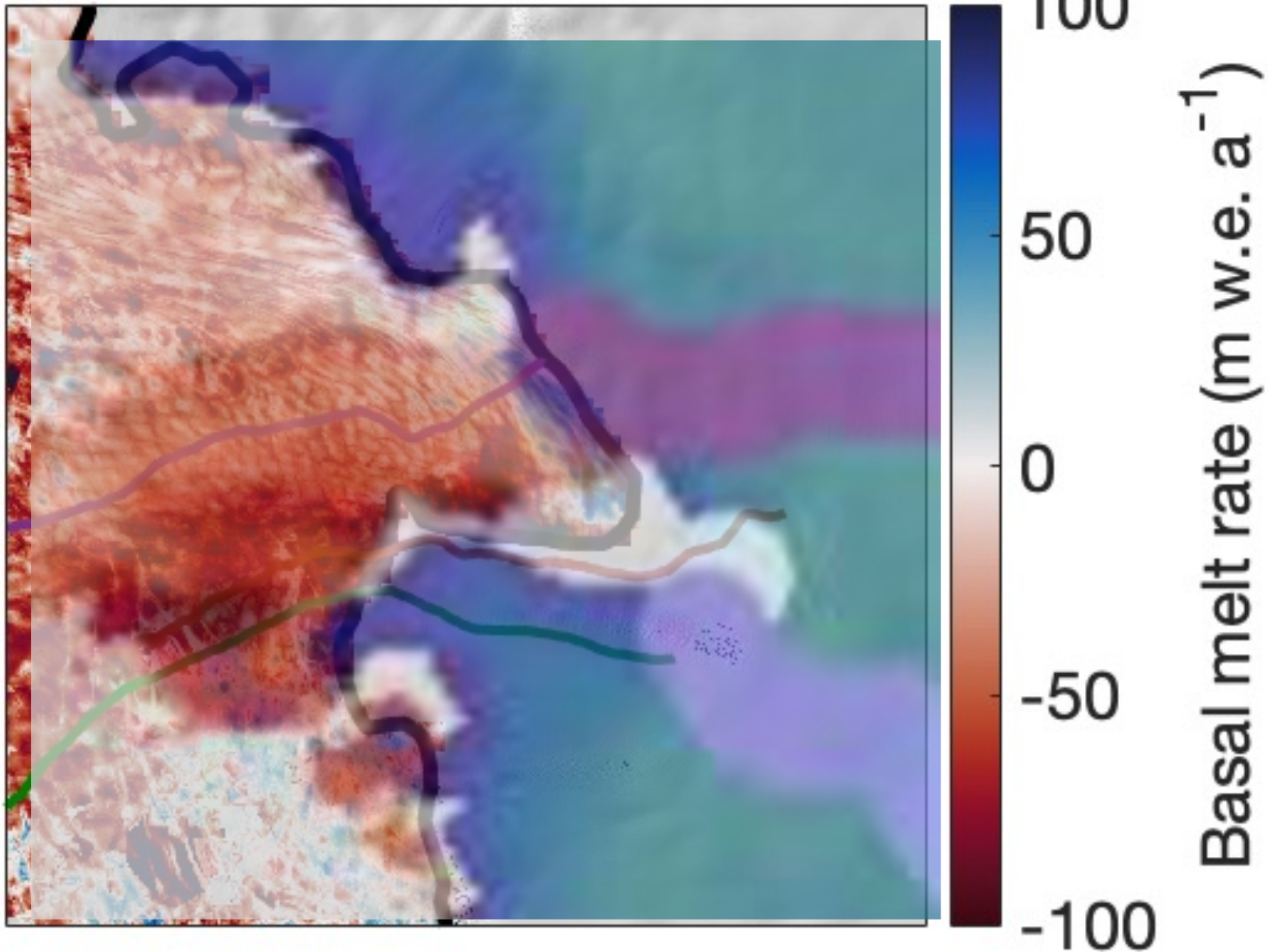
Basal melt rate (m w.e. a⁻¹)





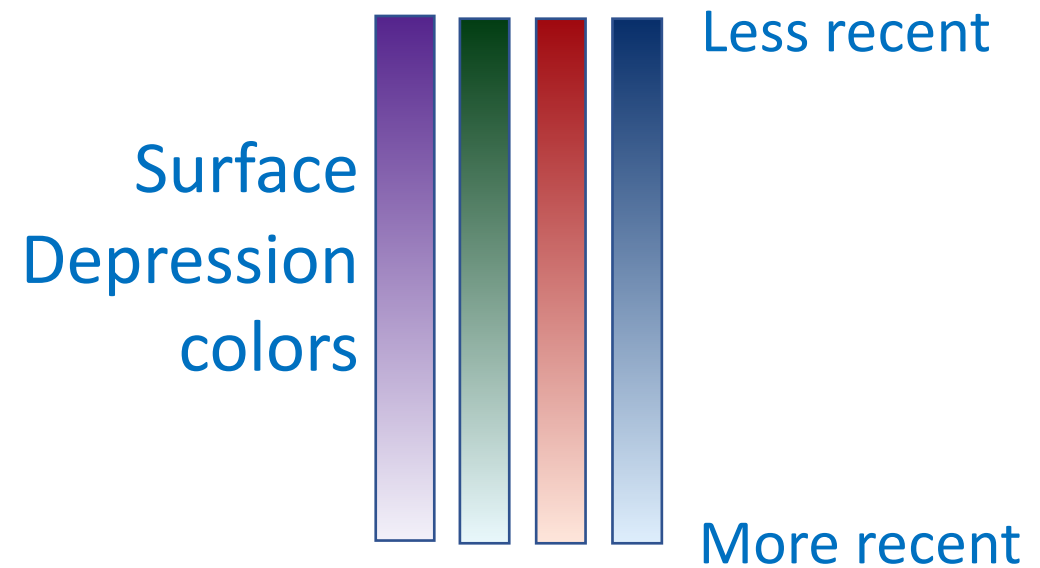
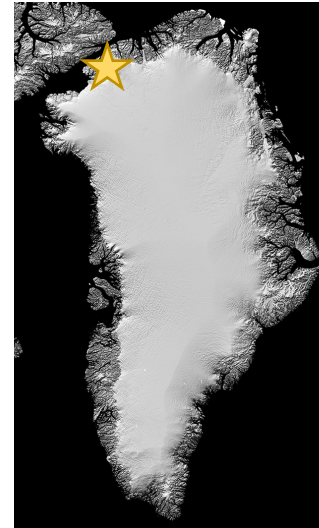
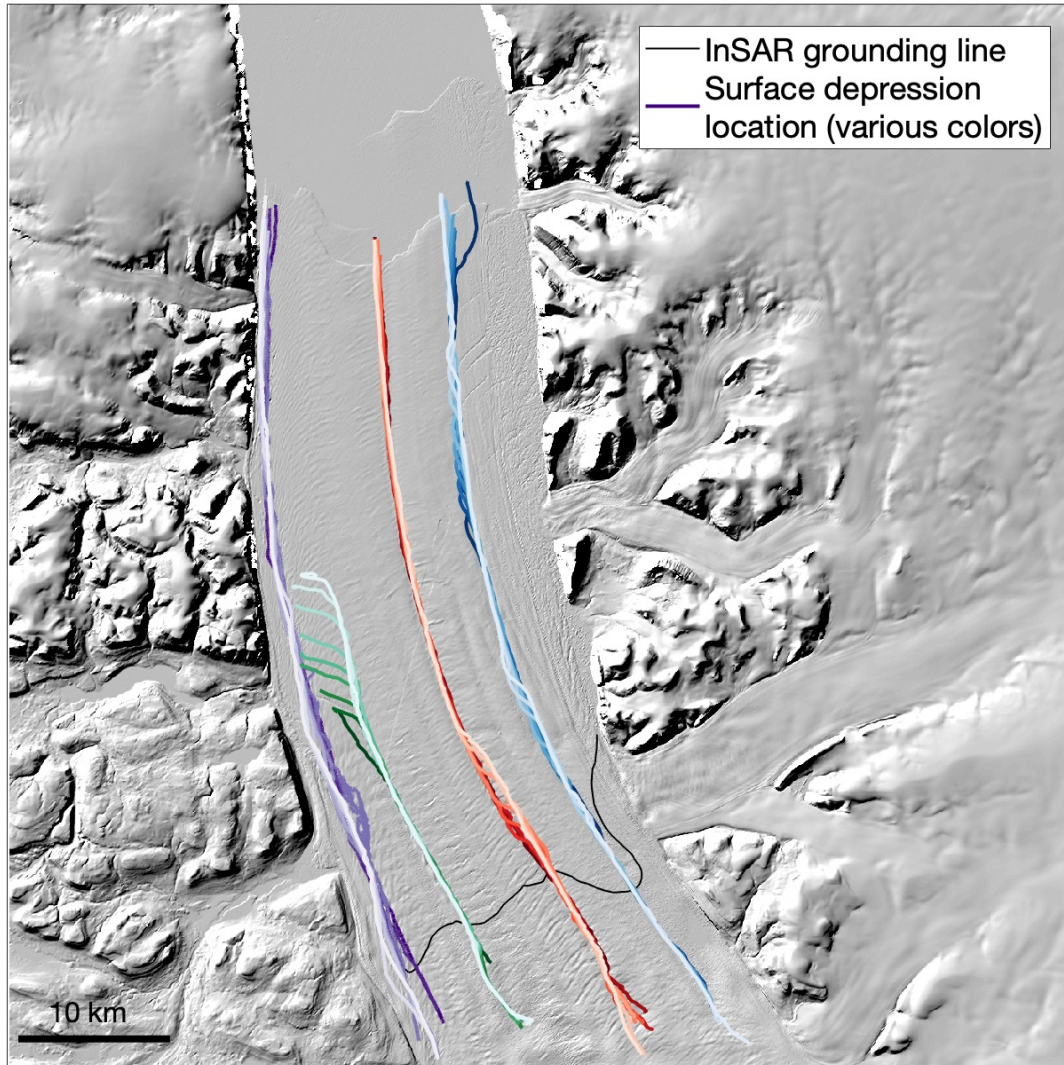
Hager et al., In review, TC



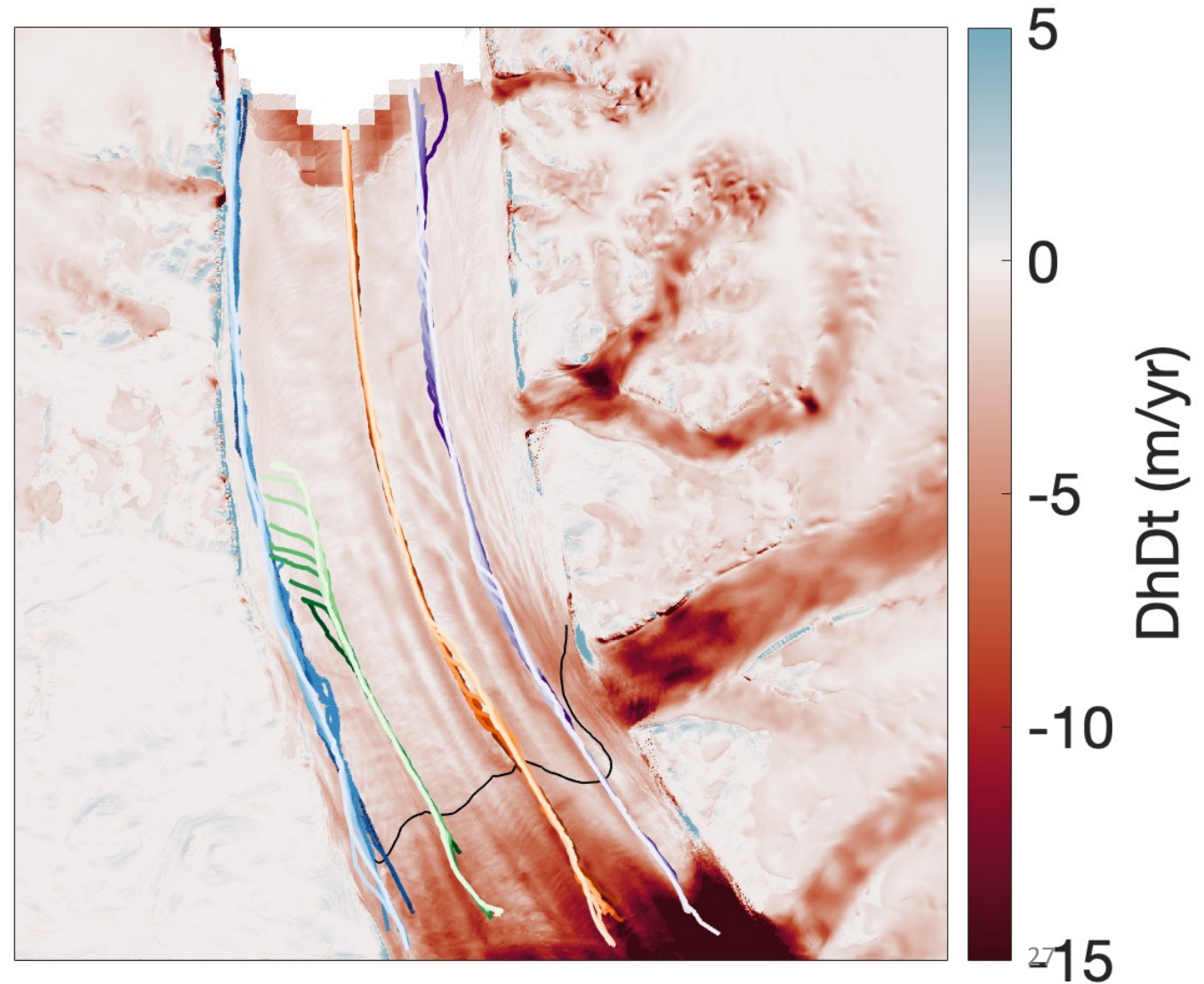
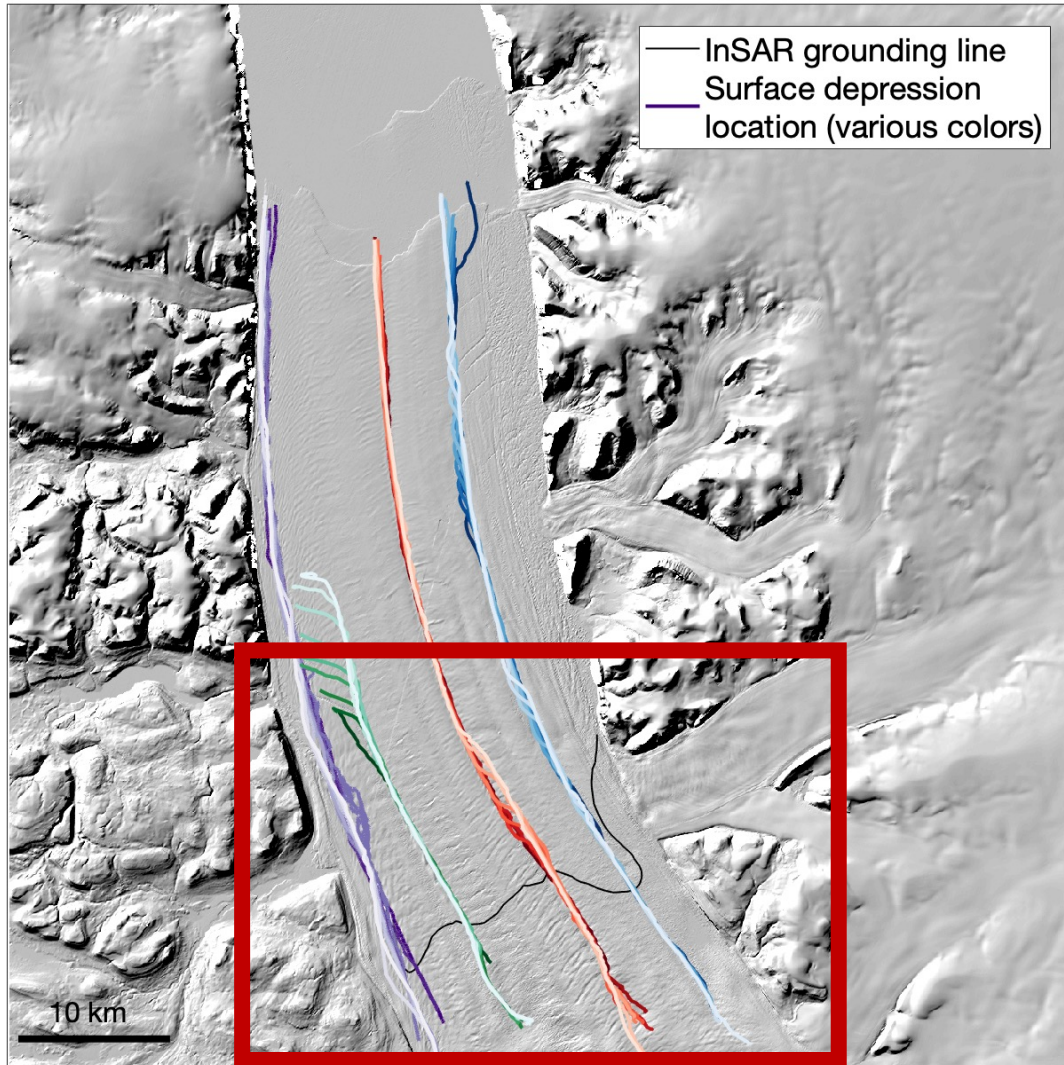


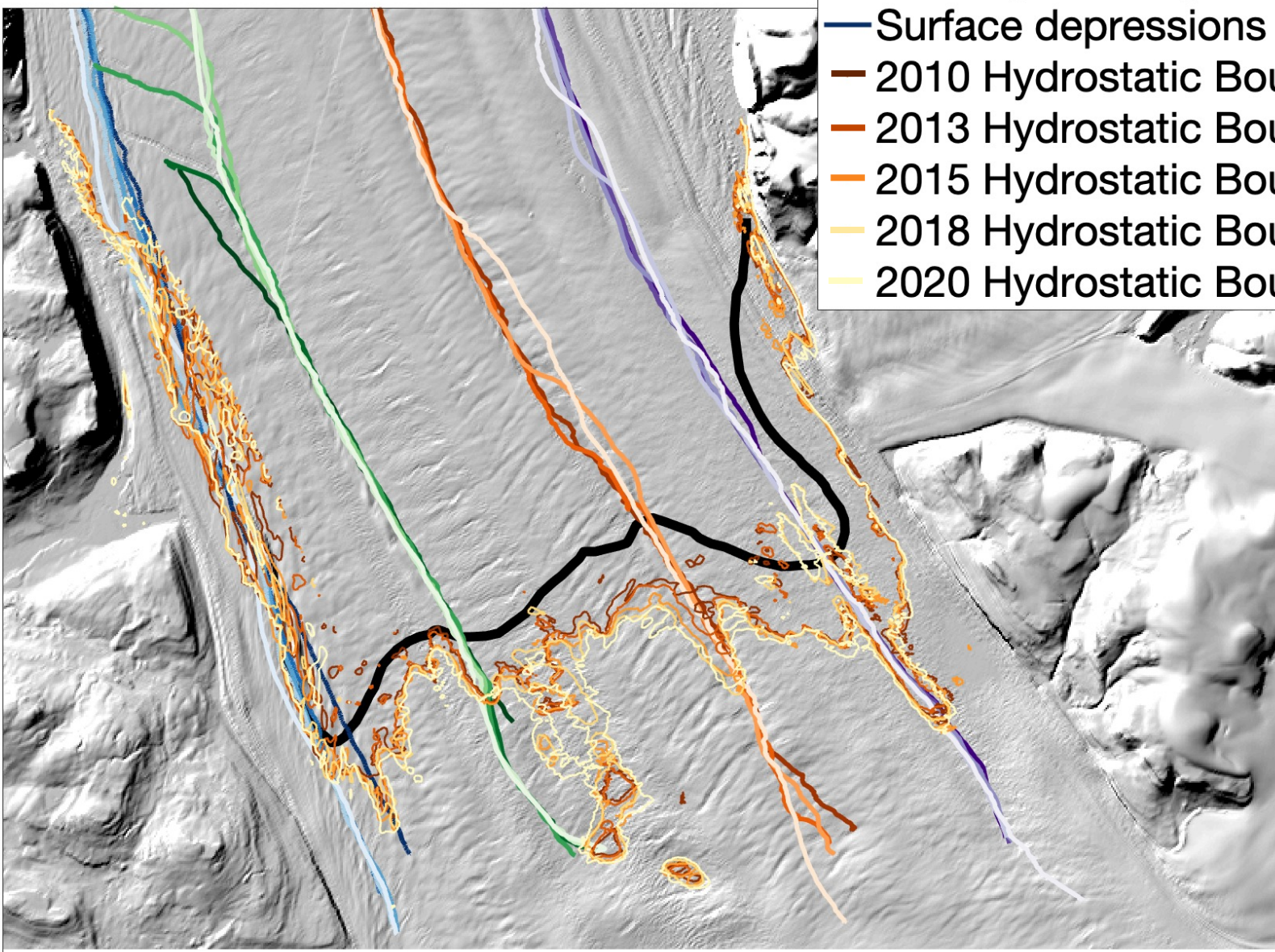
Hager et al., In
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Petermann Ice Shelf

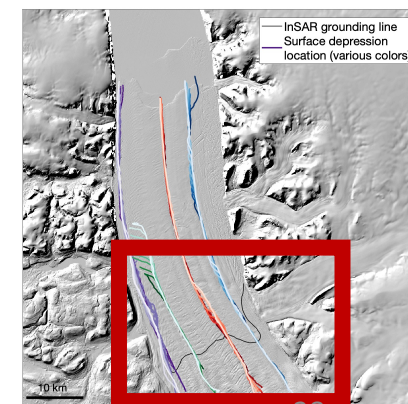


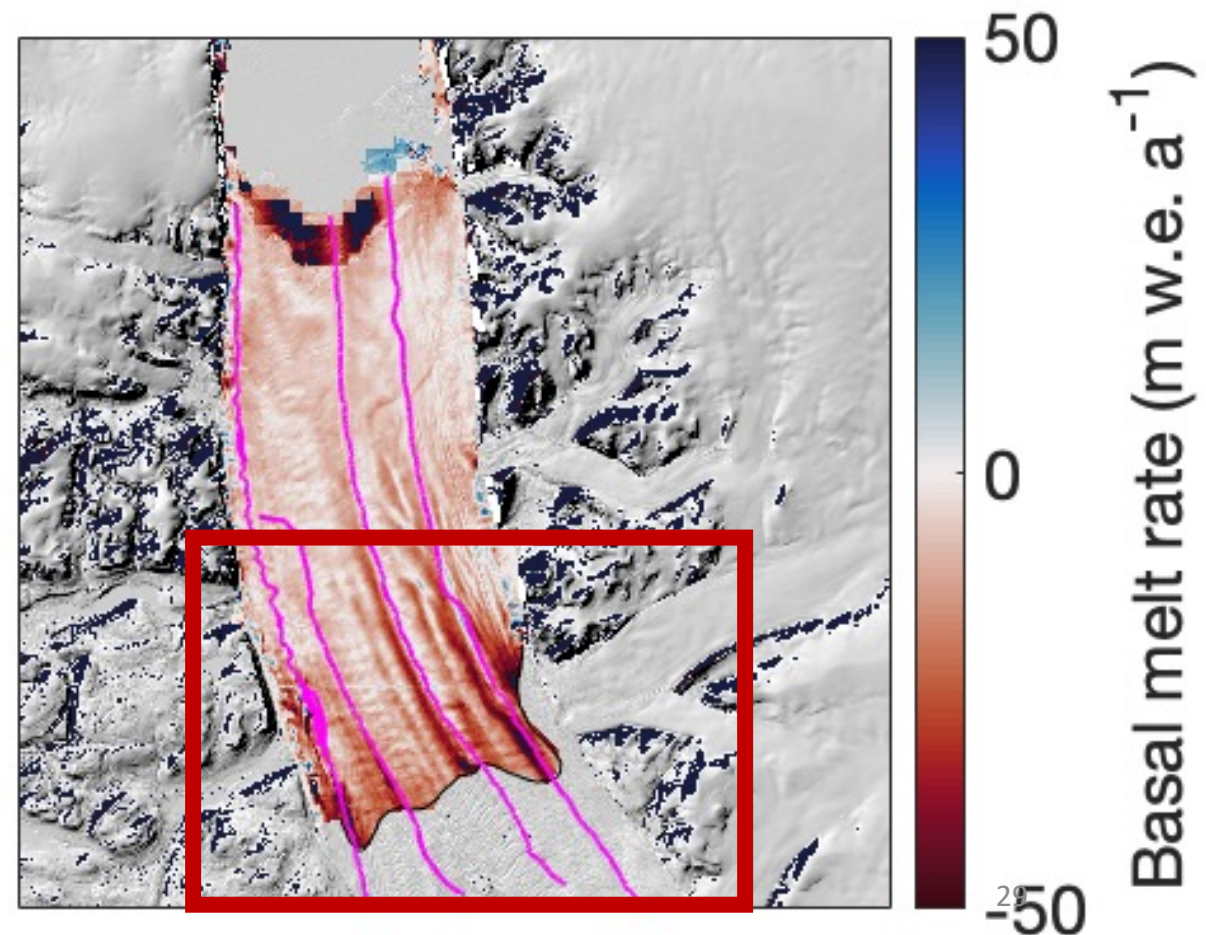
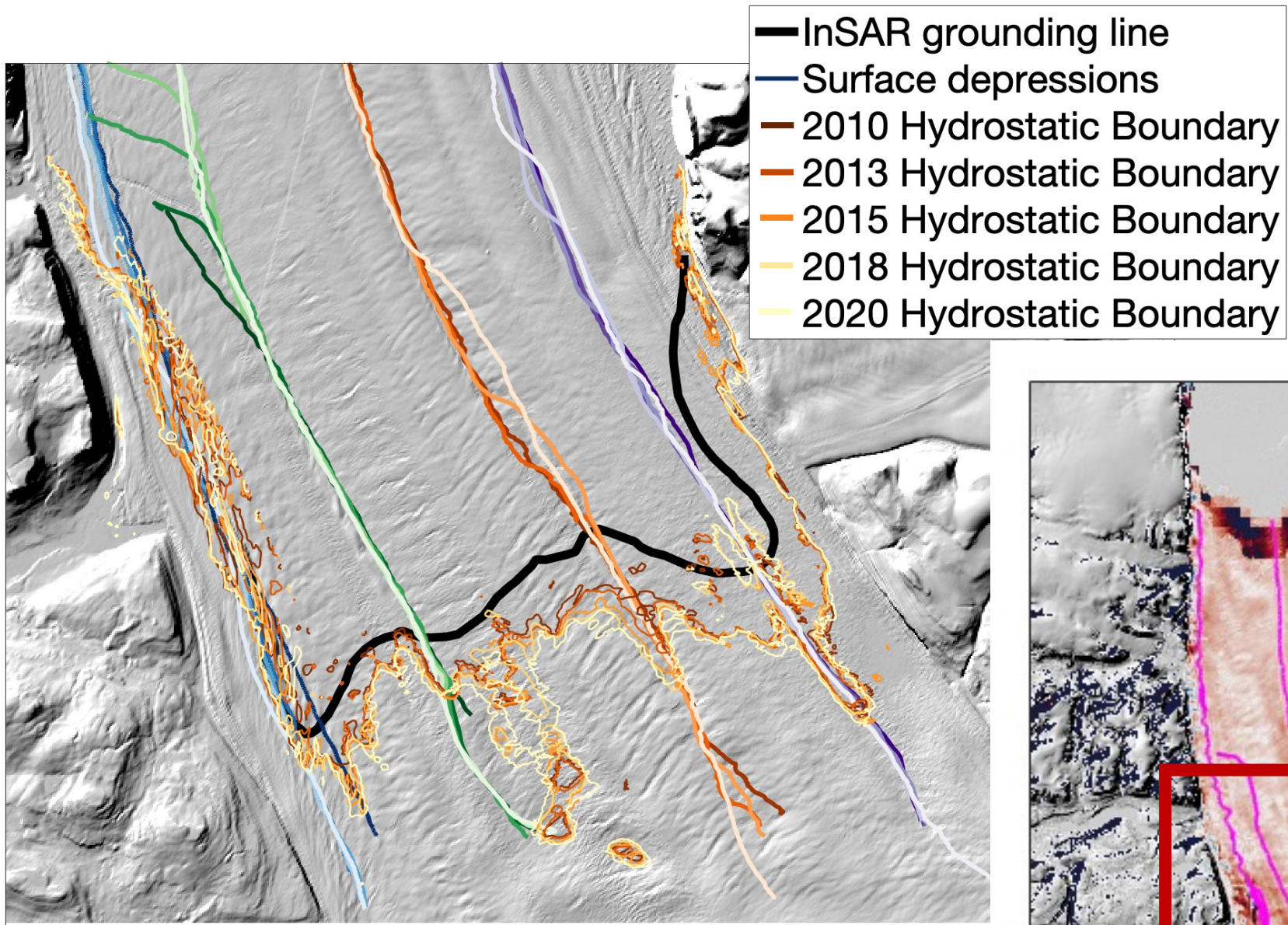
Petermann Ice Shelf





- InSAR grounding line
- Surface depressions
- 2010 Hydrostatic Boundary
- 2013 Hydrostatic Boundary
- 2015 Hydrostatic Boundary
- 2018 Hydrostatic Boundary
- 2020 Hydrostatic Boundary





Takeaways

- Several channels observed to be lengthening landward are associated with high basal melt rates, rapid thinning of grounded ice, and retreat of the hydrostatic boundary
 - What do these changes in ice shelf structure mean for ice shelf stability?
- Several channels previously thought to be ocean-sourced line up with modeled channelized subglacial discharge