Complex basal motion of a GrIS *tidewater* glacier

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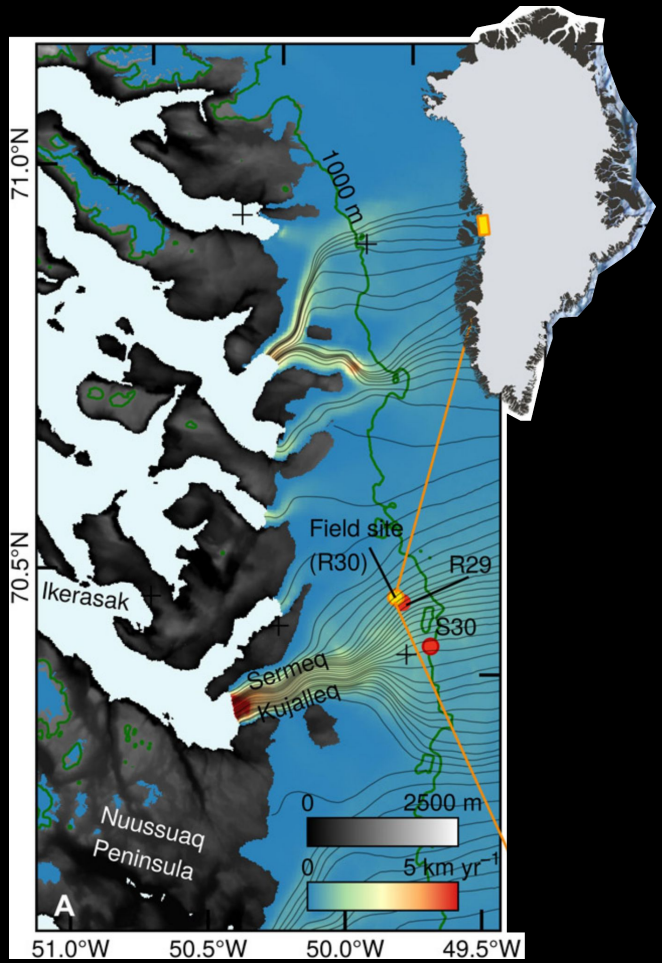
[4]Department of Geography and Environmental Sciences, Northumbria University

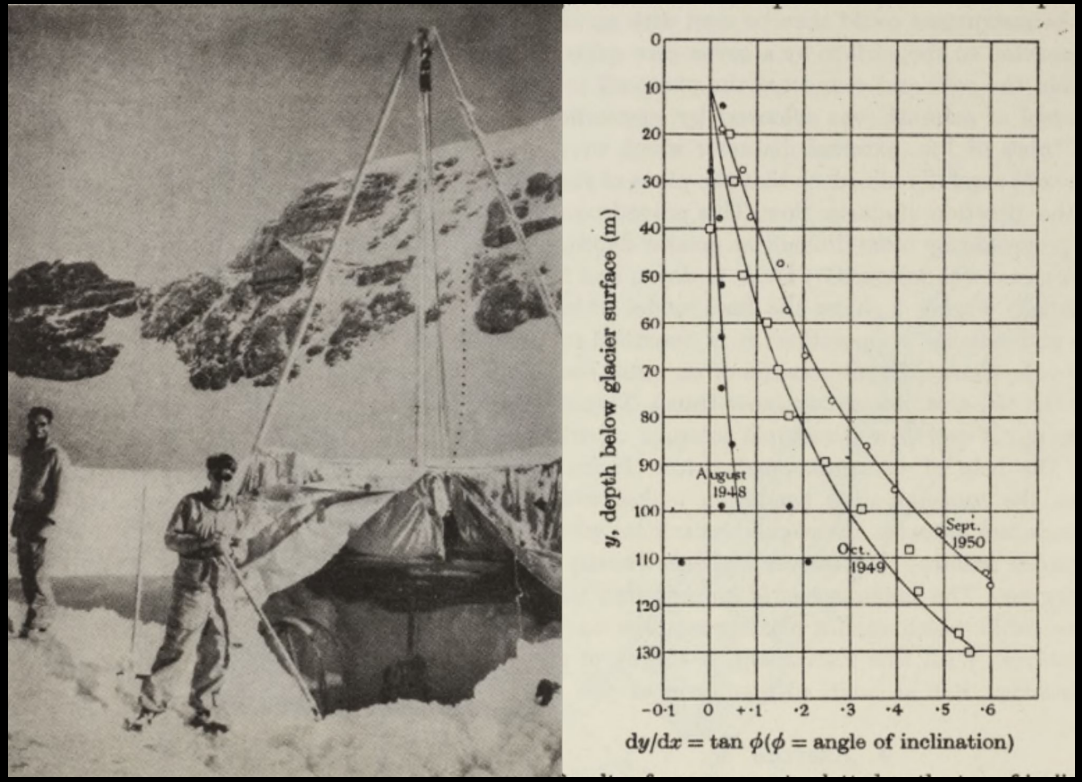
Questions or want to talk more? Email me at rl491@cam.ac.uk.



Sermeq Kujalleq, or *Store Glacier*, specifically

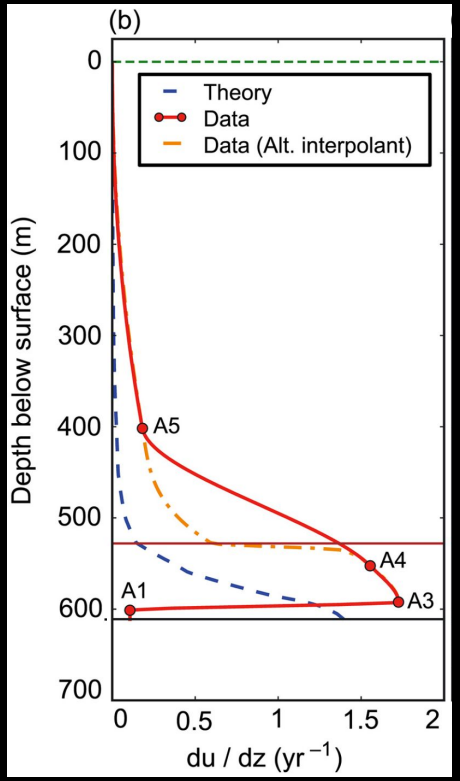
Why?

Why?



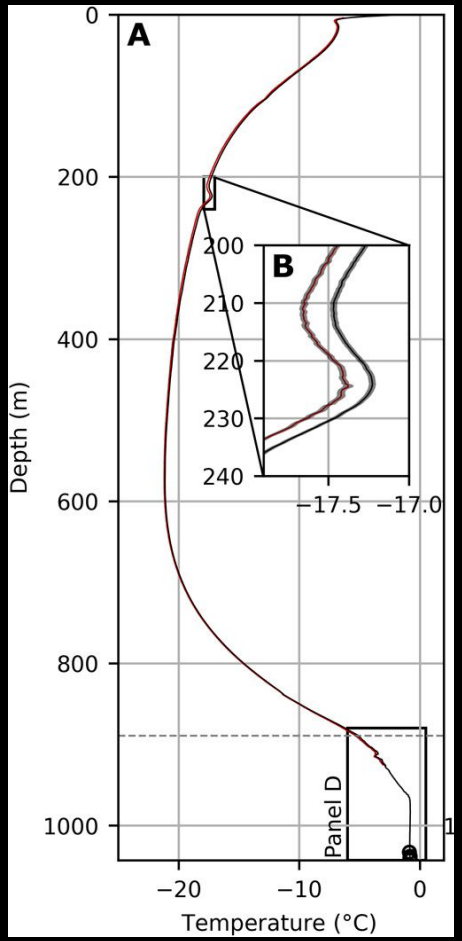
Early borehole work at Jungfraujoch (Gerrard et al., 1952)

Why?



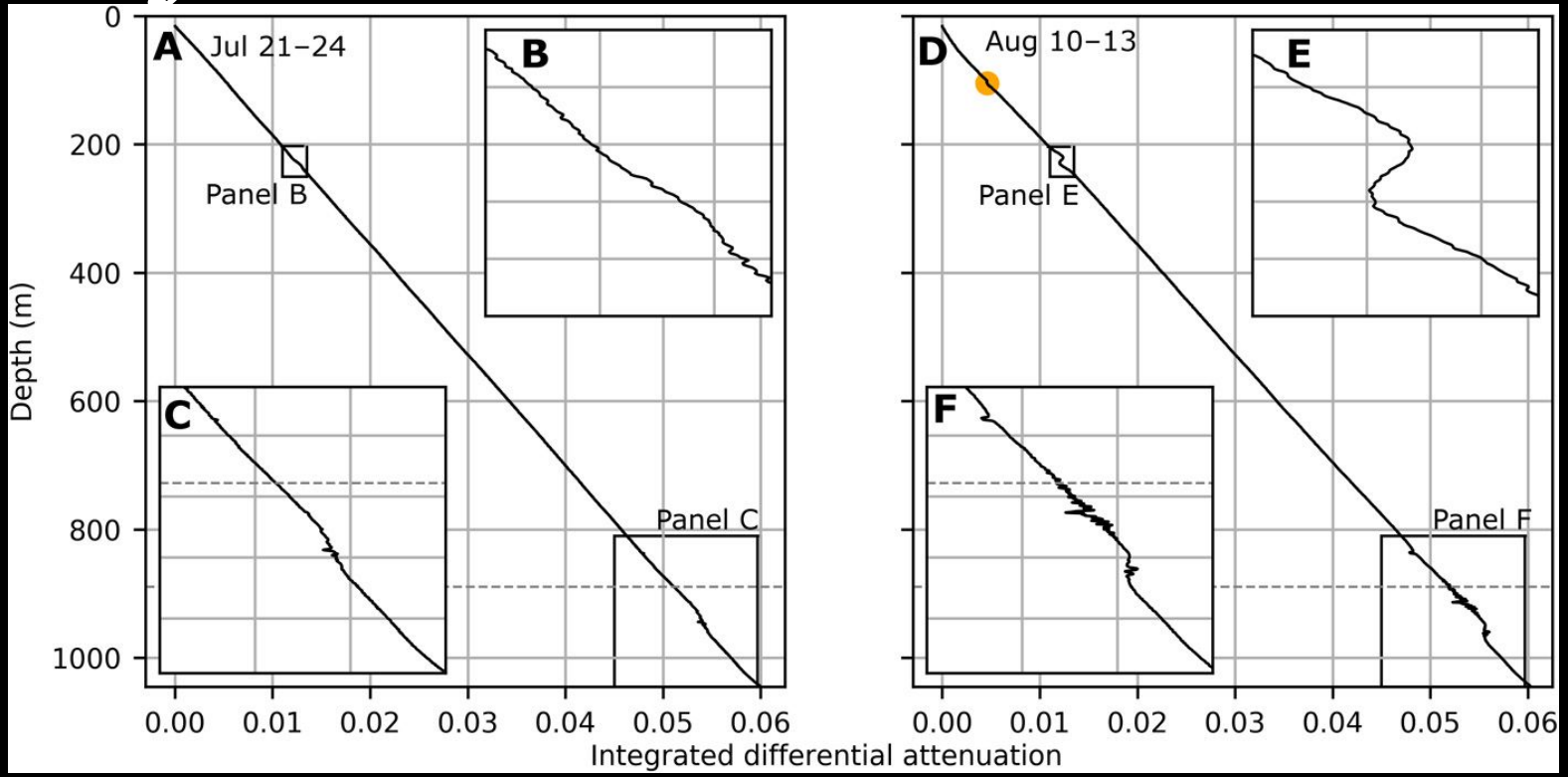
Tilt-sensor measurements from Sermeq Kujalleq (Doyle et al., 2018)

Why?



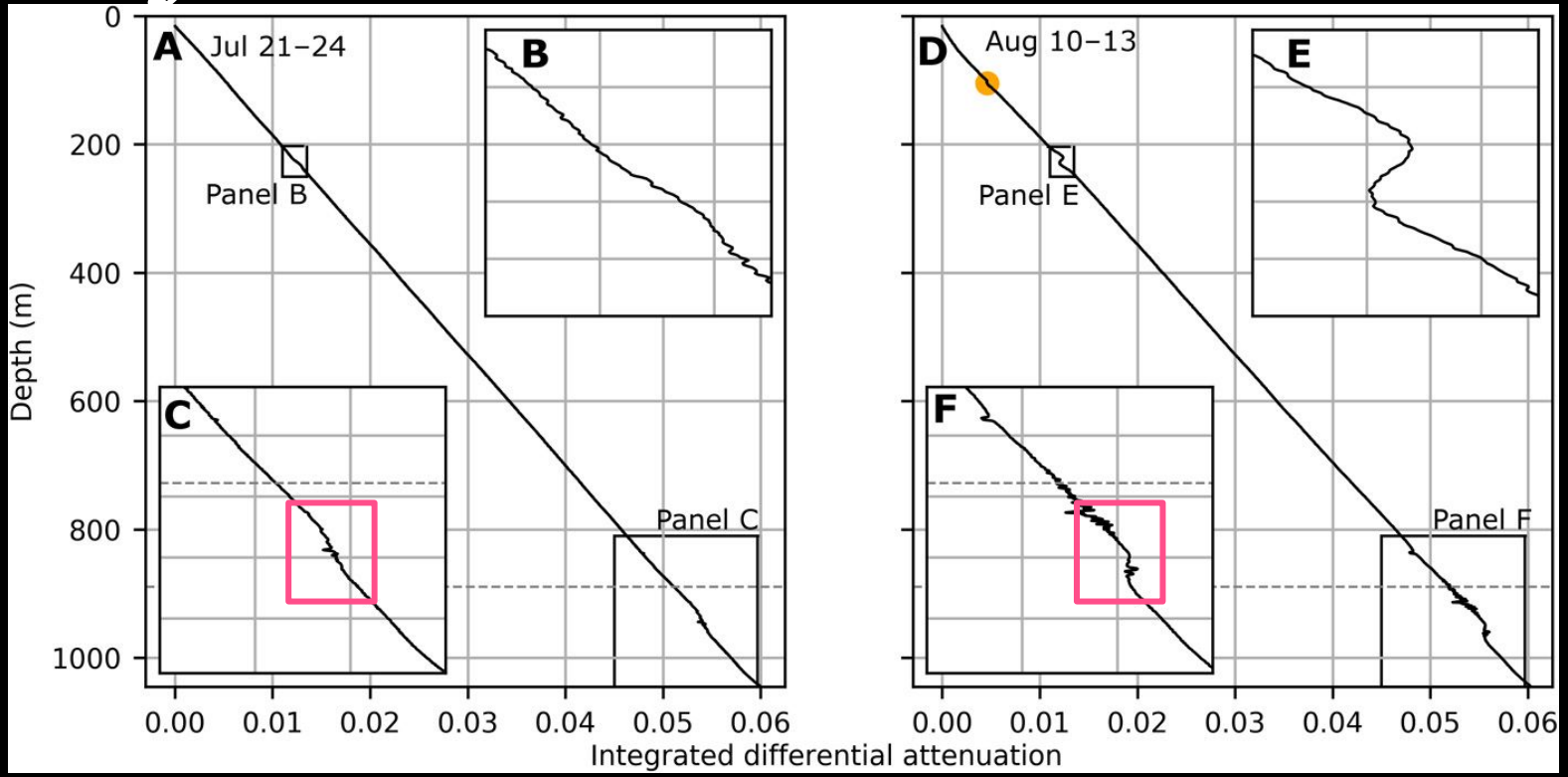
Fibre-optic temperature measurements from Sermeq Kujalleq (Law et al., 2021)

Why?



Fibre-optic damage at Sermeq Kujalleq (Law et al., 2021)

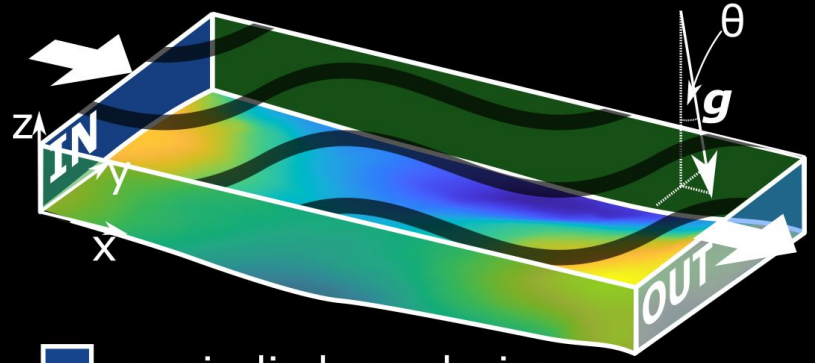
Why?



Fibre-optic damage at Sermeq Kujalleq (Law et al., 2021)

How..

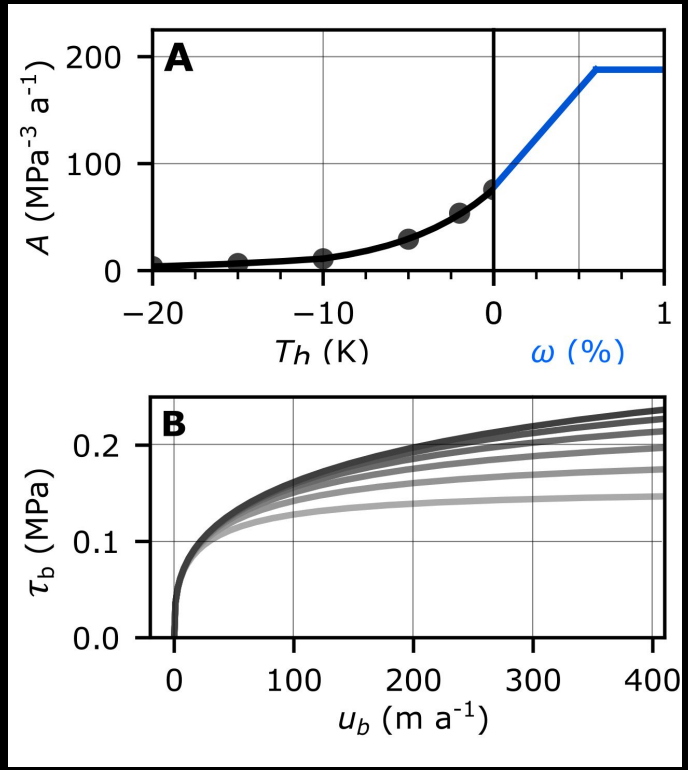
How.. *model in Elmer/Ice*



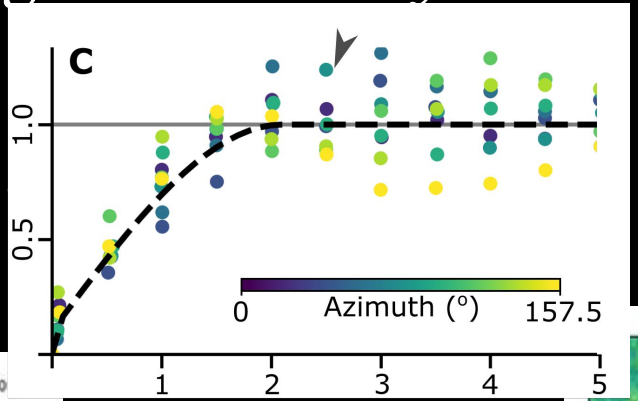
periodic boundaries

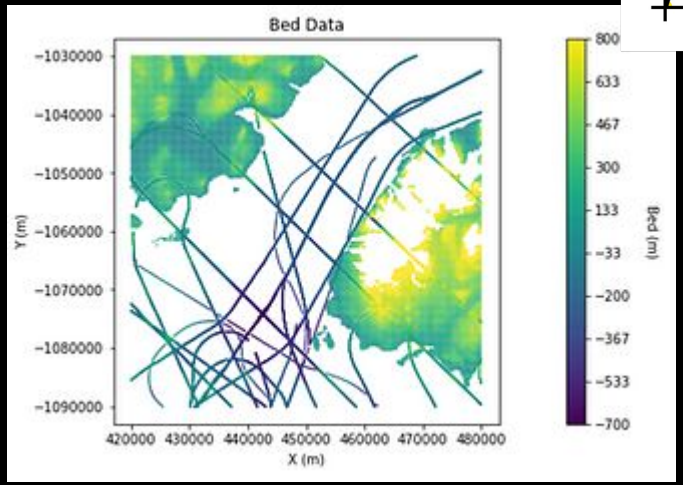
zero flux boundaries

free surface boundary

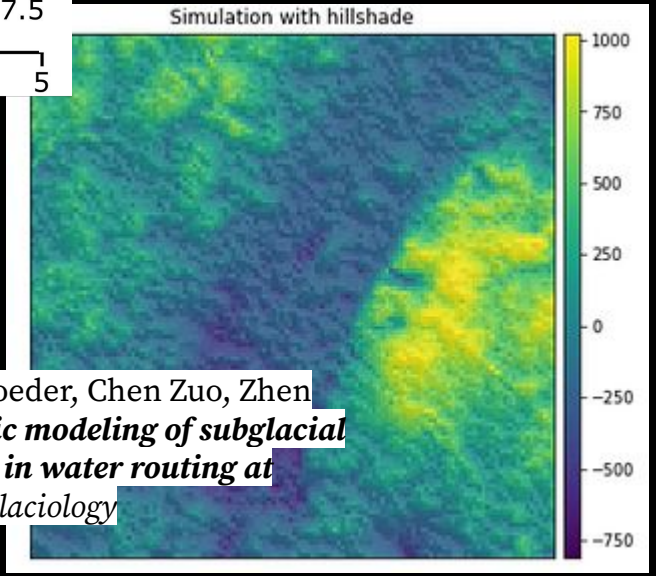


How.. *add geostatistically realistic topography*



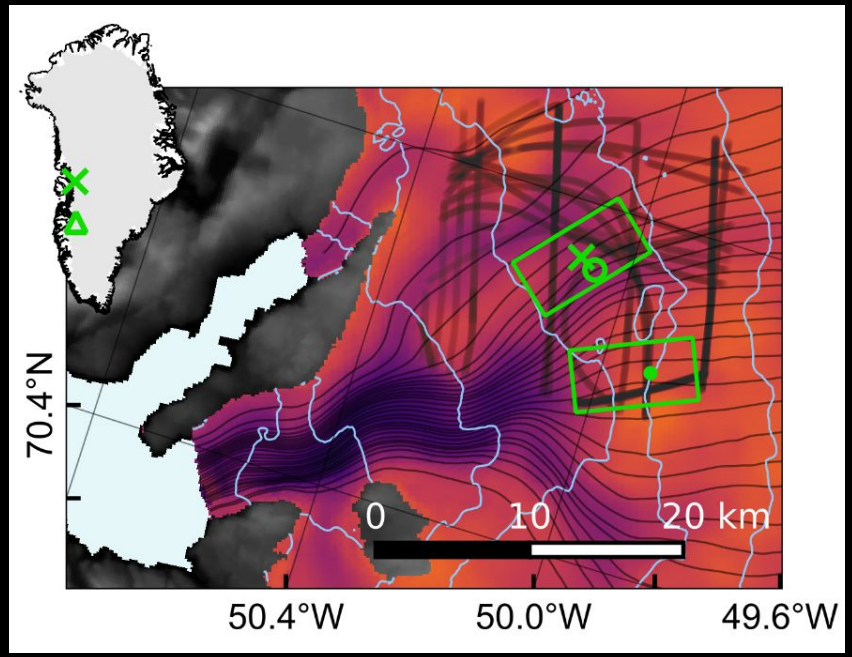


i



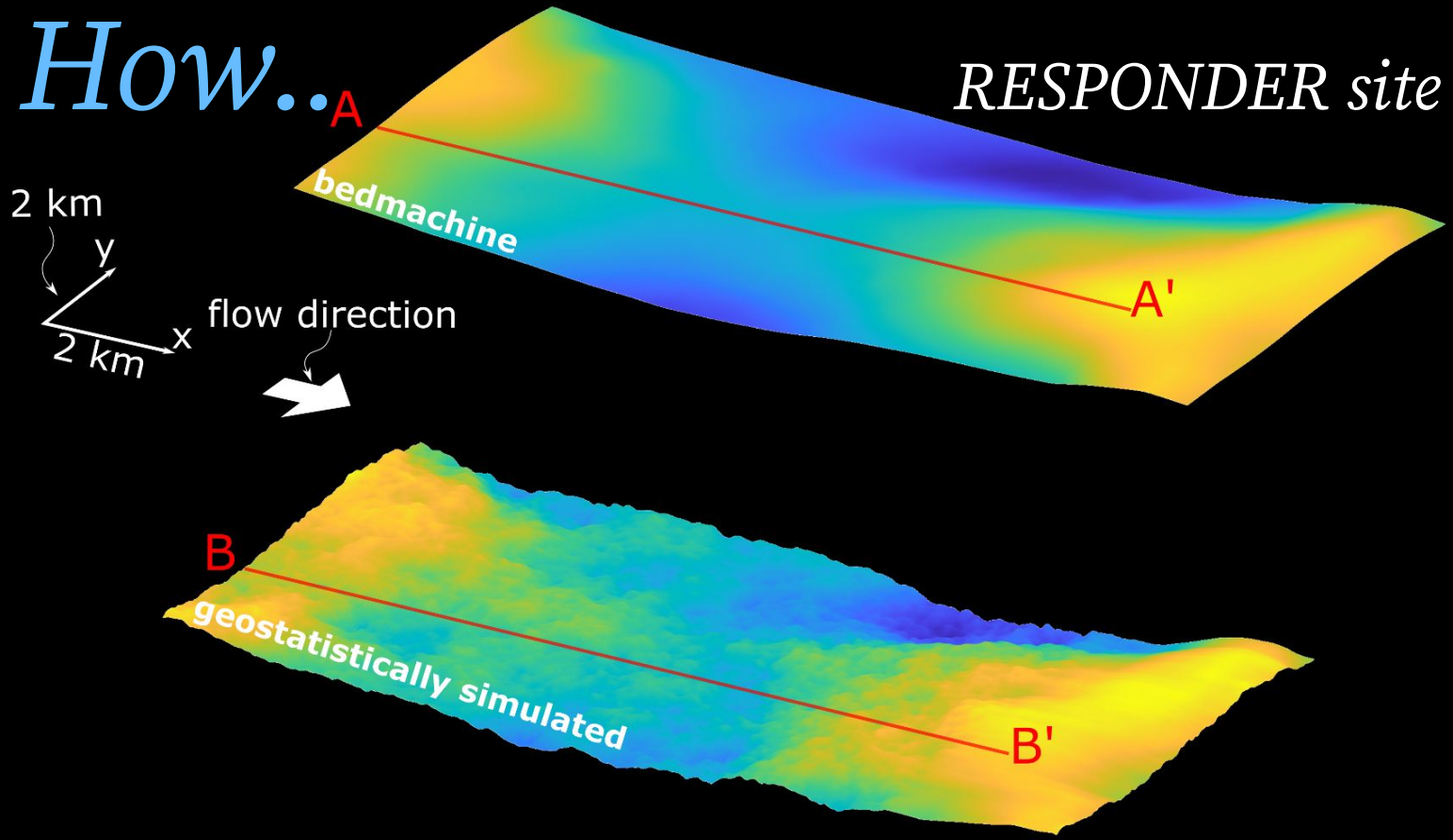
Emma J MacKie, Dustin M Schroeder, Chen Zuo, Zhen Yin, & Jef Caers (2021). ***Stochastic modeling of subglacial topography exposes uncertainty in water routing at Jakobshavn Glacier***. *Journal of Glaciology*

How.. *apply to borehole sites*

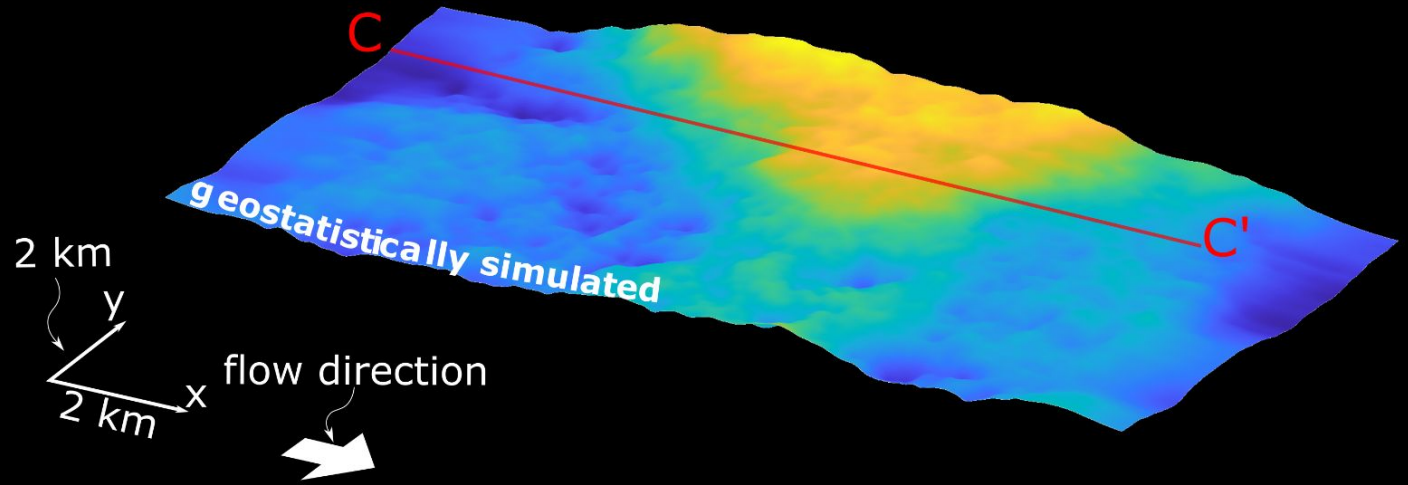


How..

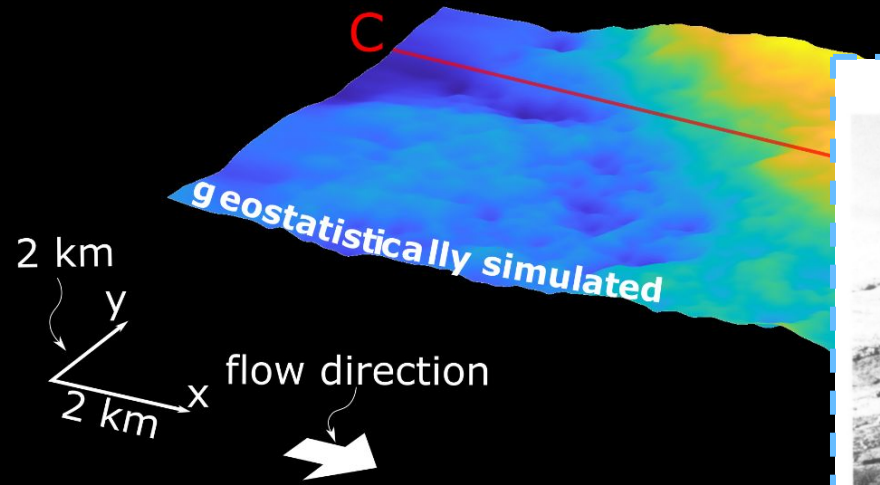
RESPONDER site



How.. *SAFIRE site*



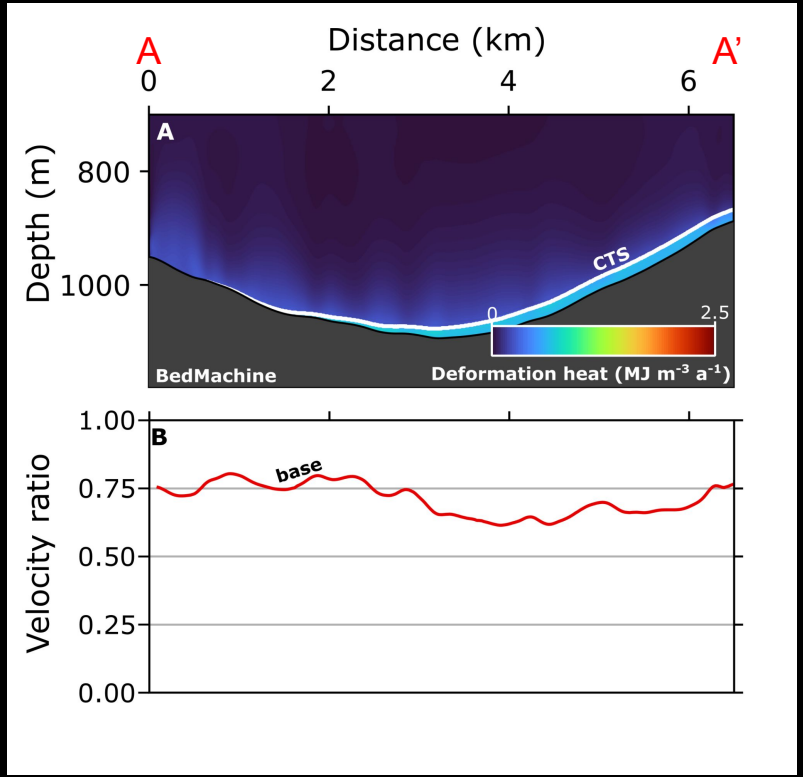
How.. *SAFIRE site + quick comparison to deglaciated terrain*



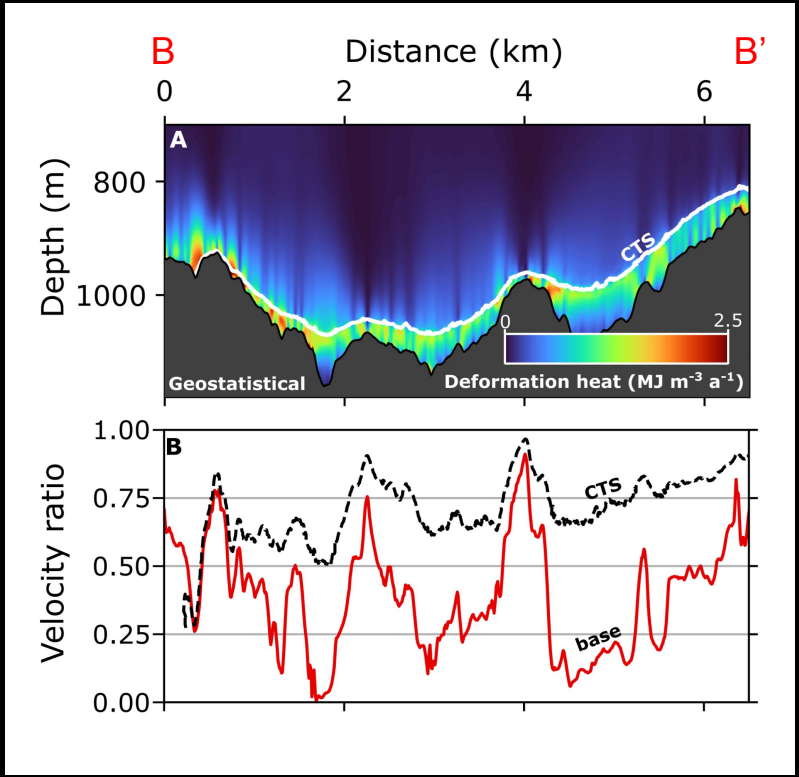
JOHN E. GORDON

Fig. 8. Fractured boss in massive gneiss near Søndre Strømfjord, West Greenland. A curvilinear fracture delimits the lee side quarried face and hollow beside the figure, while a second occurs in the rock boss to his right. The former ice movement was from right to left.

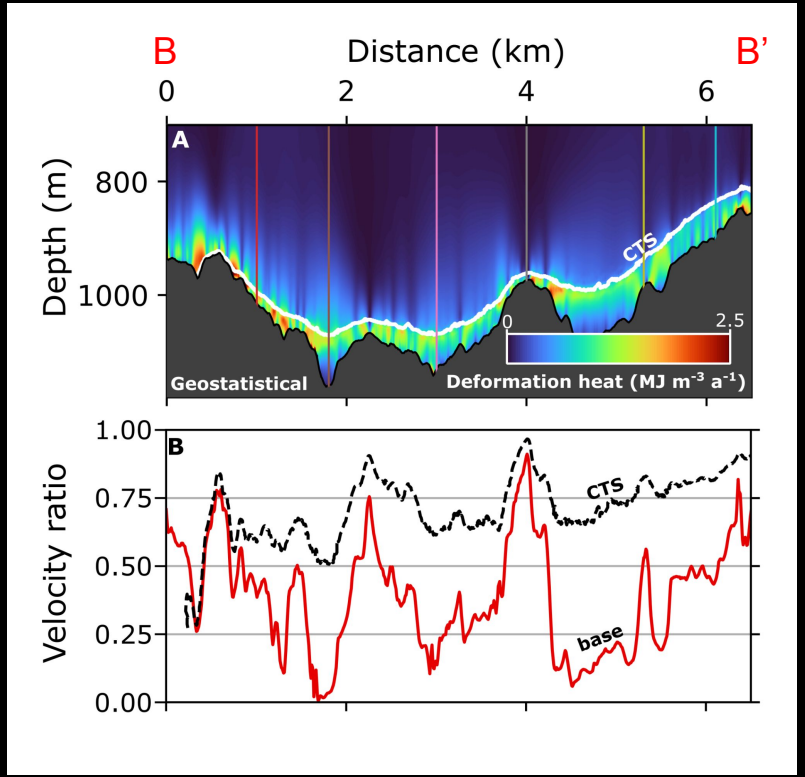
And... at RESPONDER site (topographic saddle)

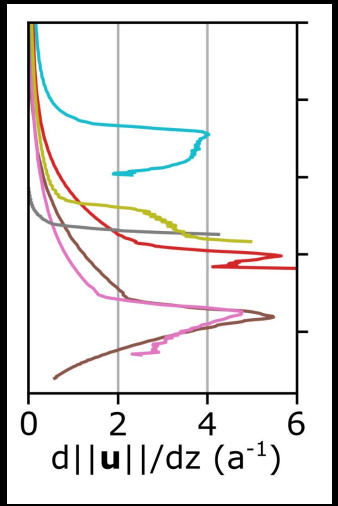


And... *at RESPONDER site (topographic saddle)*

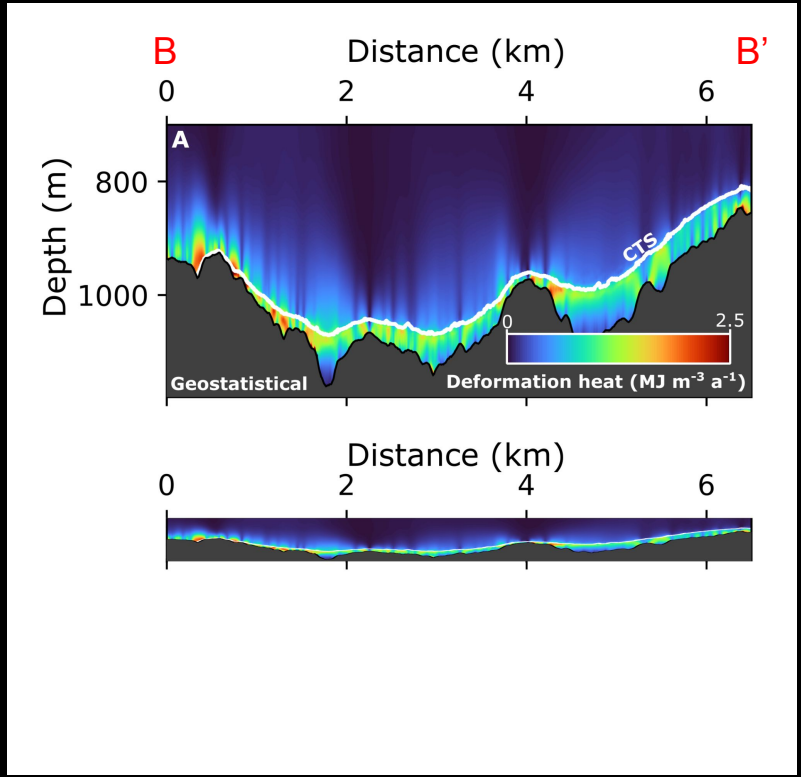


And... *at RESPONDER site (topographic saddle)*

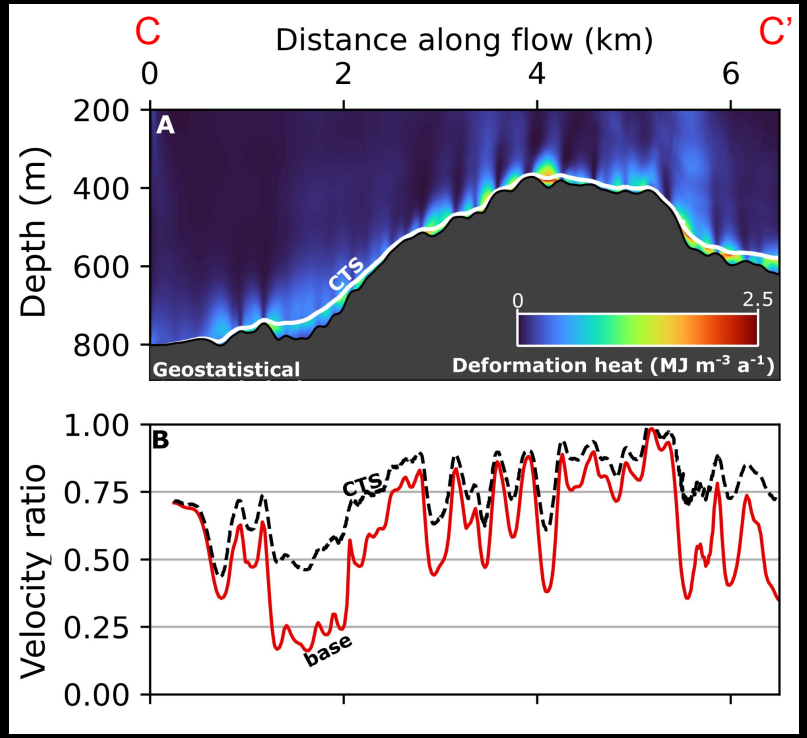




And... *at RESPONDER site (topographic saddle)*

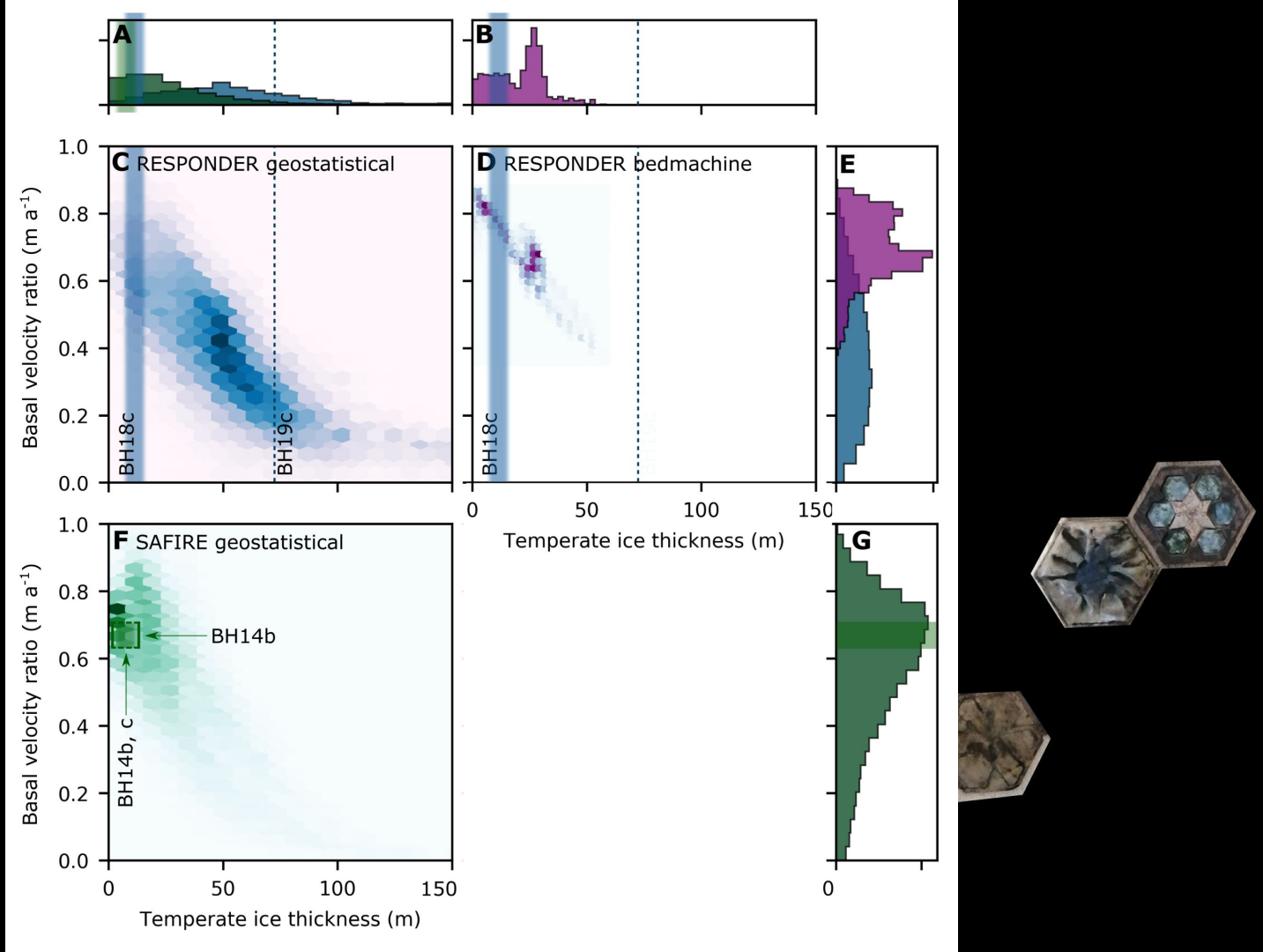


And... *at SAFIRE site (topographic rise)*

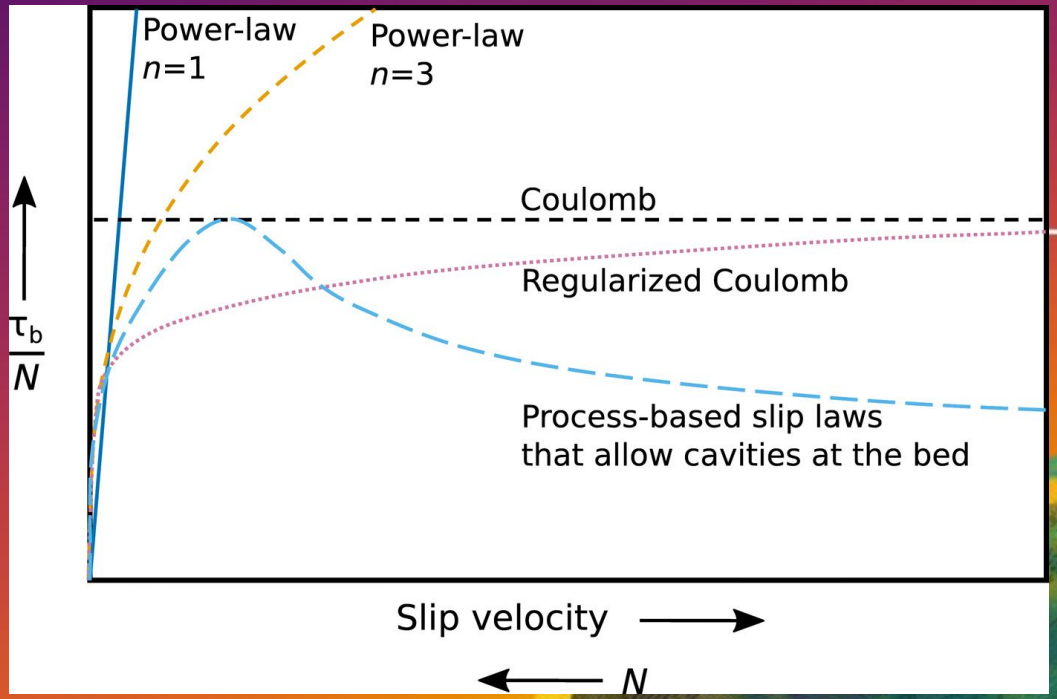


And... *regional characteristics (they differ a lot!)*

(and also agree well with borehole observations)

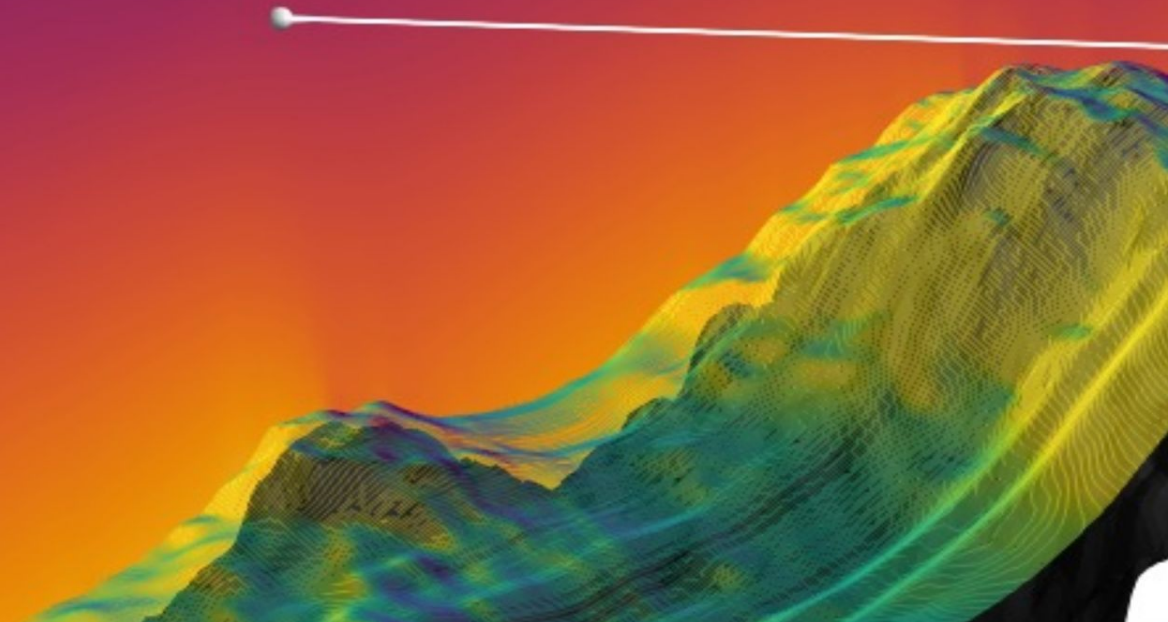

A
B
C RESPONDER geostatistical
D RESPONDER bedmachine
E
F SAFIRE geostatistical
G
Basal velocity ratio (m a-1)
Temperate ice thickness (m)
BH18c
BH19c
BH14b
BH14b, c
0.0
0.2
0.4
0.6
0.8
1.0
0
50
100
150

Concluding remarks *- intermediate-scale complexity and implications for basal motion relationships*



Concluding remarks --

Preprint on EarthArXiv now!
https://eartharxiv.org/repository/view/3331/



Concluding remarks --

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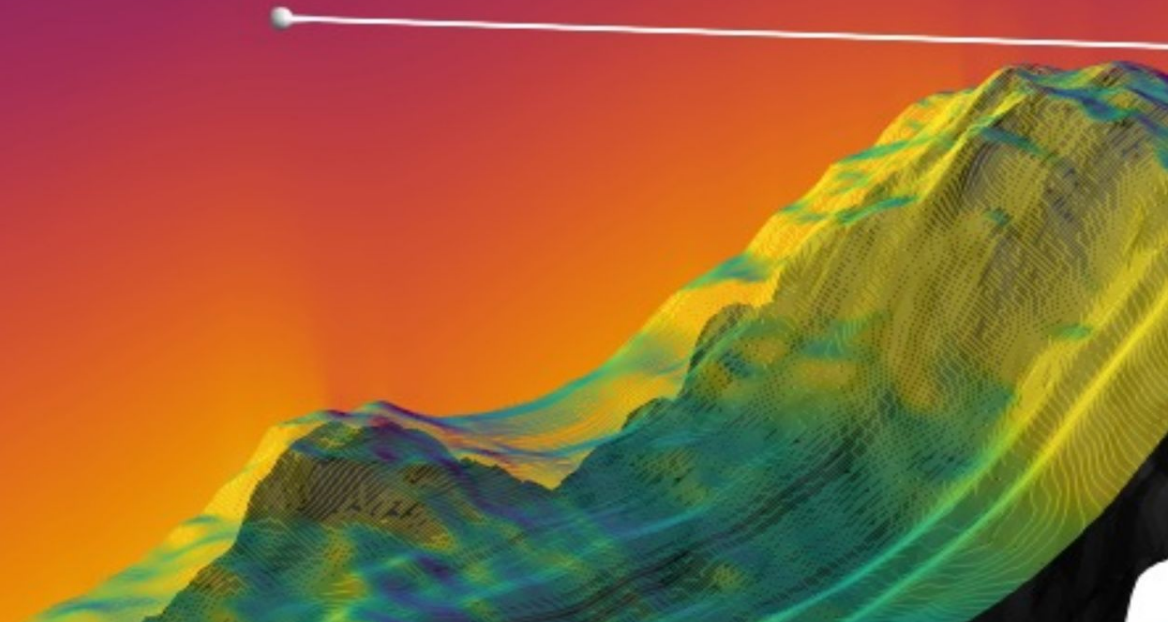

***Concluding remarks** --*

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https://eartharxiv.org/repository/view/3331/

And -- I'm very happy to share this model setup for other applications, please get in touch!

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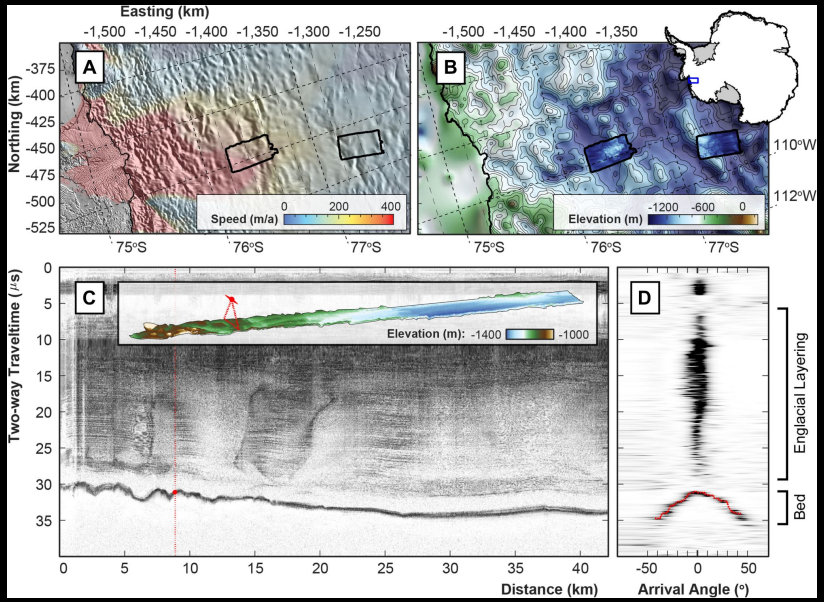
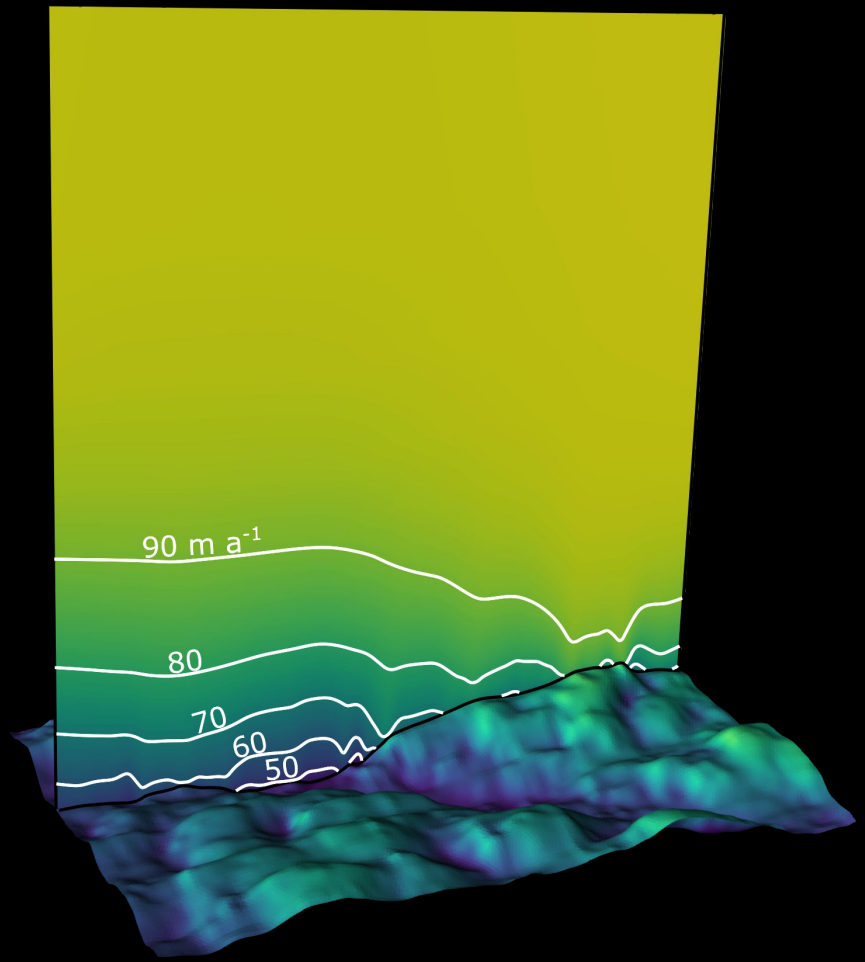
Concluding remarks - *similar behaviour is occurring at parts of Thwaites! (upcoming work)*





Resolution tests