

# HEADWALL EROSION RATES

from cosmogenic  $^{10}\text{Be}$  in medial moraine debris of five adjacent Swiss valley glaciers



HELMHOLTZ

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Foto 2019: K. Wetterauer

### headwalls ...

- are steep ice-free rock walls at glacier heads
  - erode and deposit material onto the ice
- supraglacial debris cover



Foto 2019: K. Wetterauer



Foto 2019: D. Gök



Foto 2018: D. Gök



Foto 2019: L.S. Anderson





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- are steep ice-free rock walls at glacier heads
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→ supraglacial debris cover

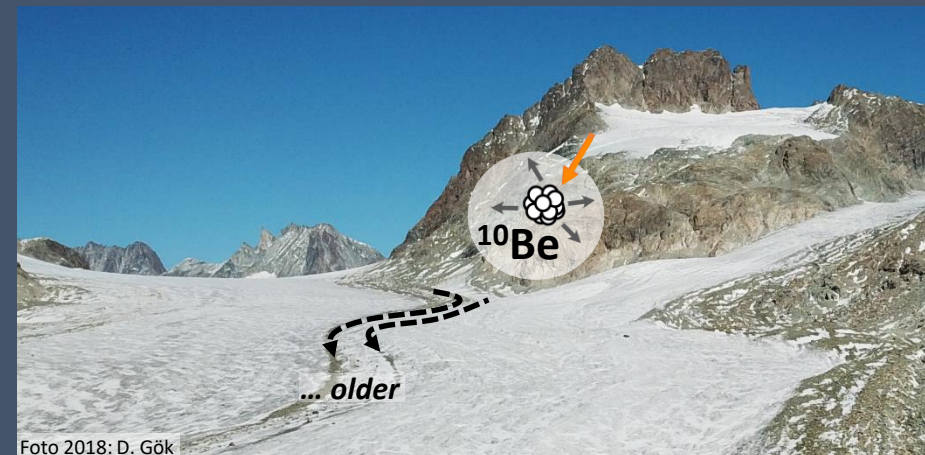
## headwall erosion rates ...

- inverse relation

↑  $^{10}\text{Be}$  concentration [ $^{10}\text{Be}$ ]

↓ headwall erosion rate

"in-situ"  
 $^{10}\text{Be}$







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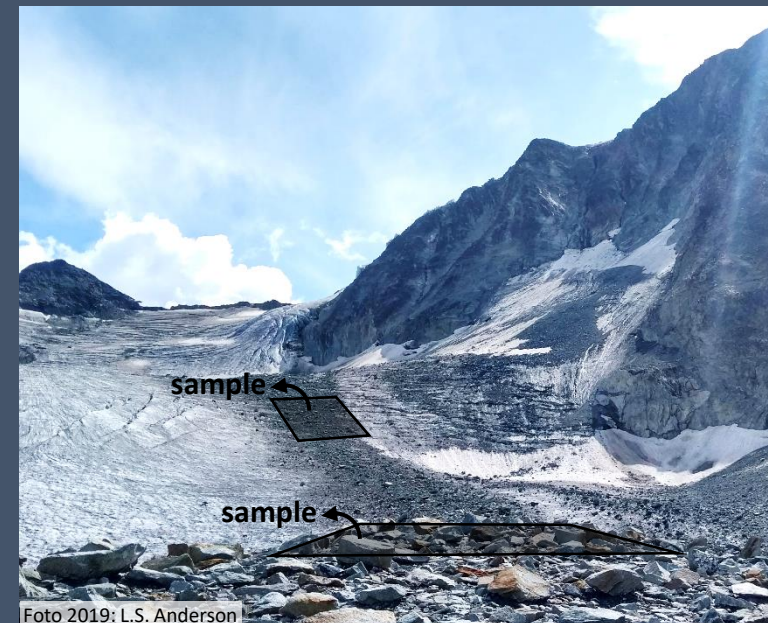
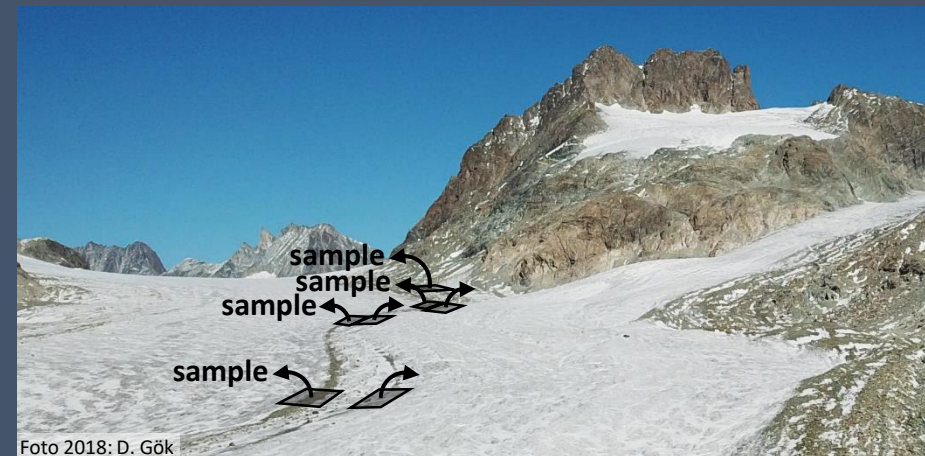
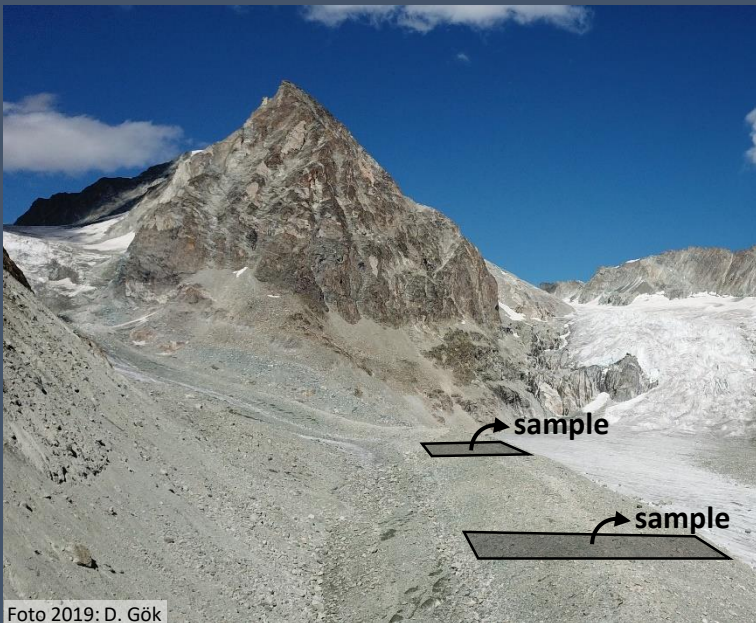
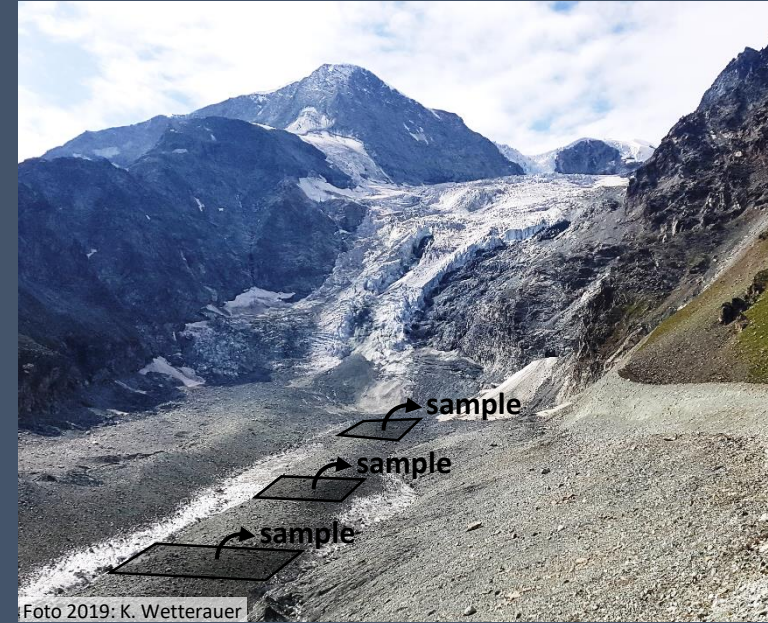
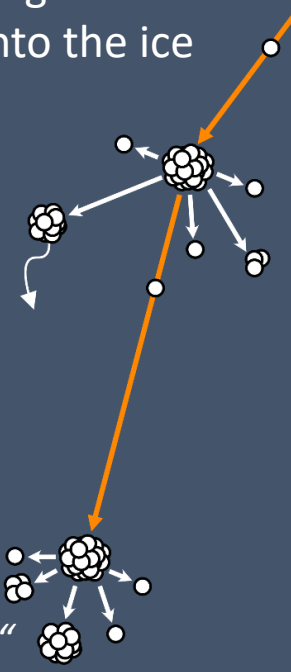
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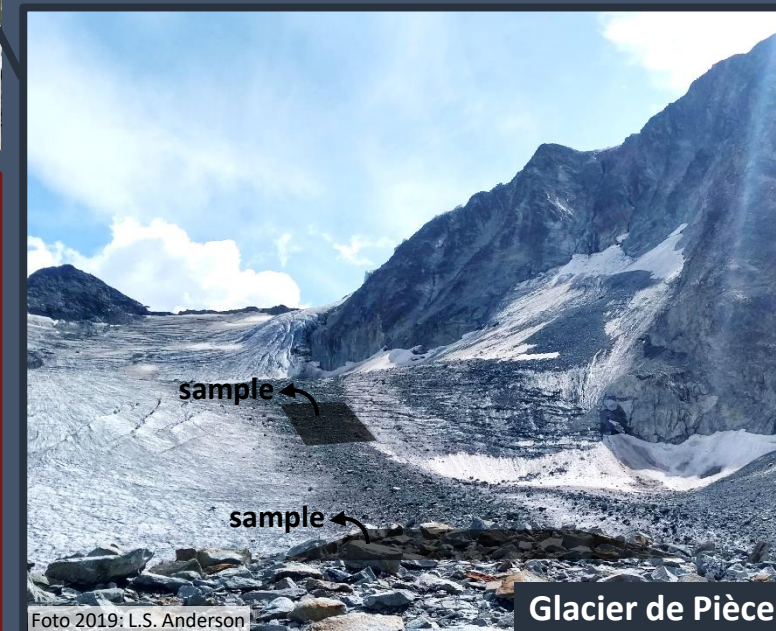
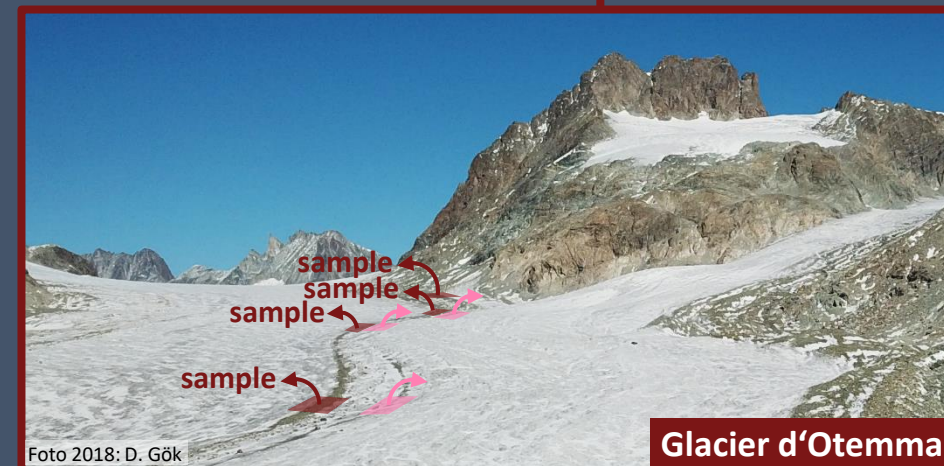
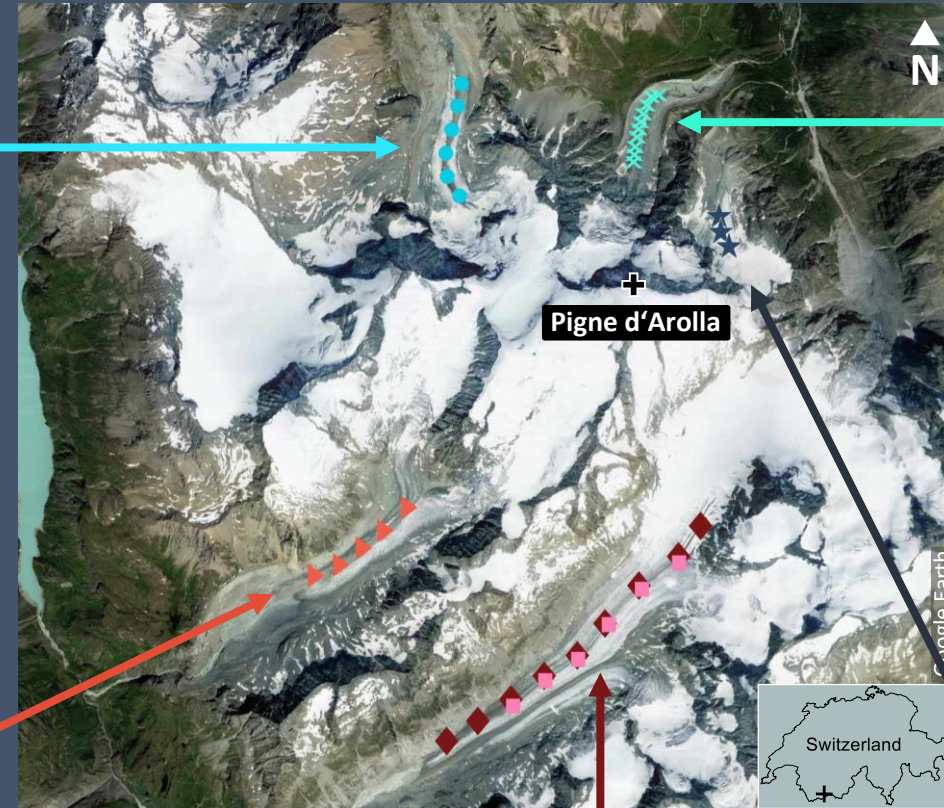
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↓ headwall erosion rate

"in-situ"  
 $^{10}\text{Be}$











Are differences  
between medial  
moraine records

relatable to

distinct source  
area  
characteristics ?

Glacier de Cheilon

Foto 2019: K. Wetterauer

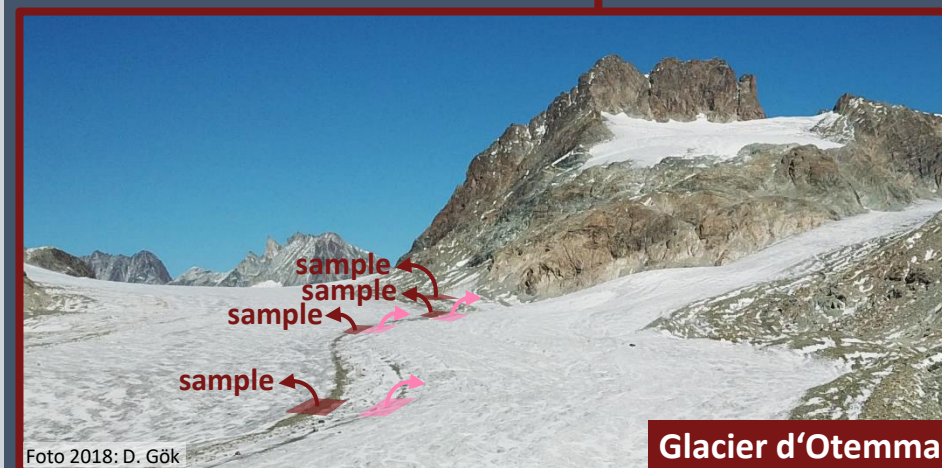
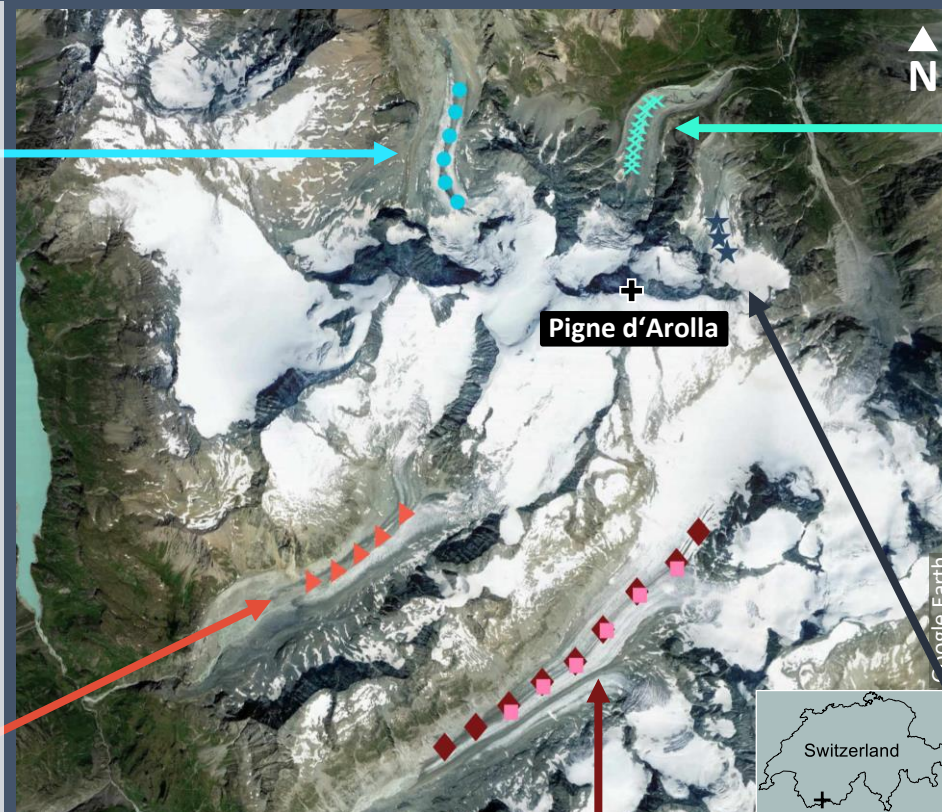


Foto 2018: D. Gök

Glacier d'Otemma

Are there  
temporal trends  
in headwall  
erosion

Glacier de Tsijiore Nouve

Foto 2019: K. Wetterauer

and do they  
correlate with  
climatic changes?

sample

Foto 2019: L.S. Anderson

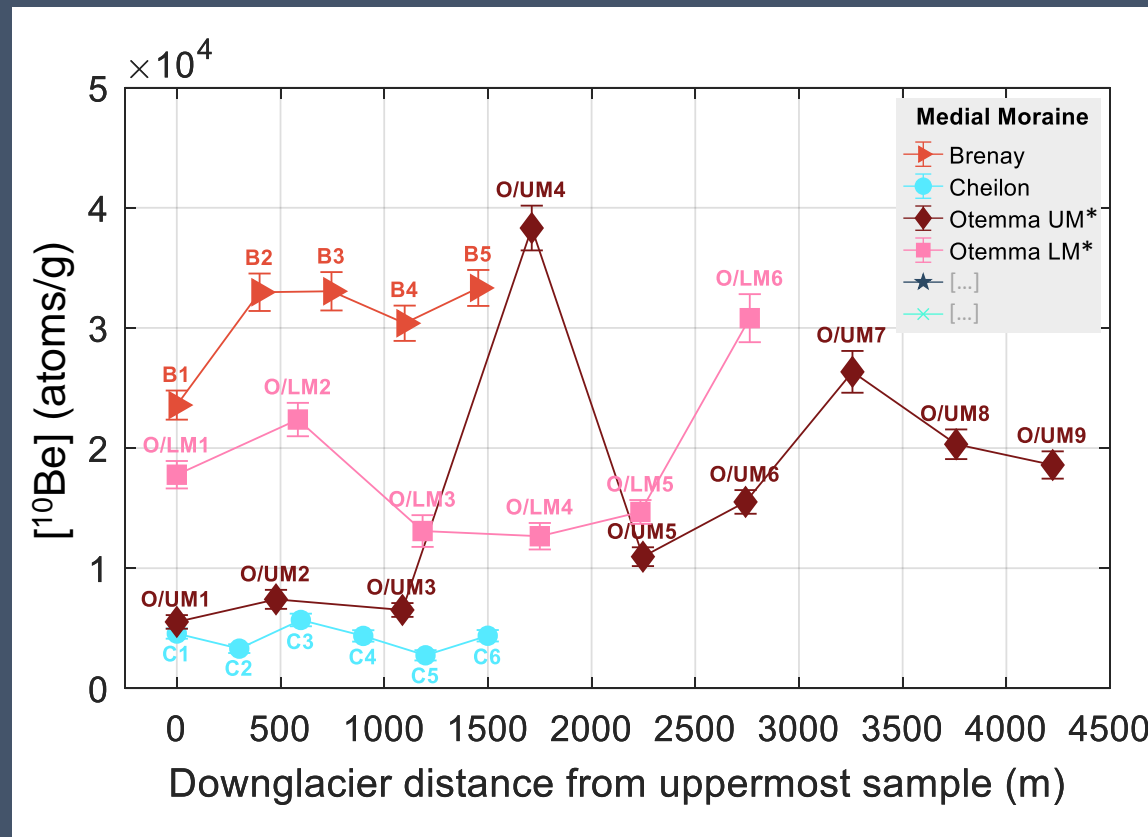
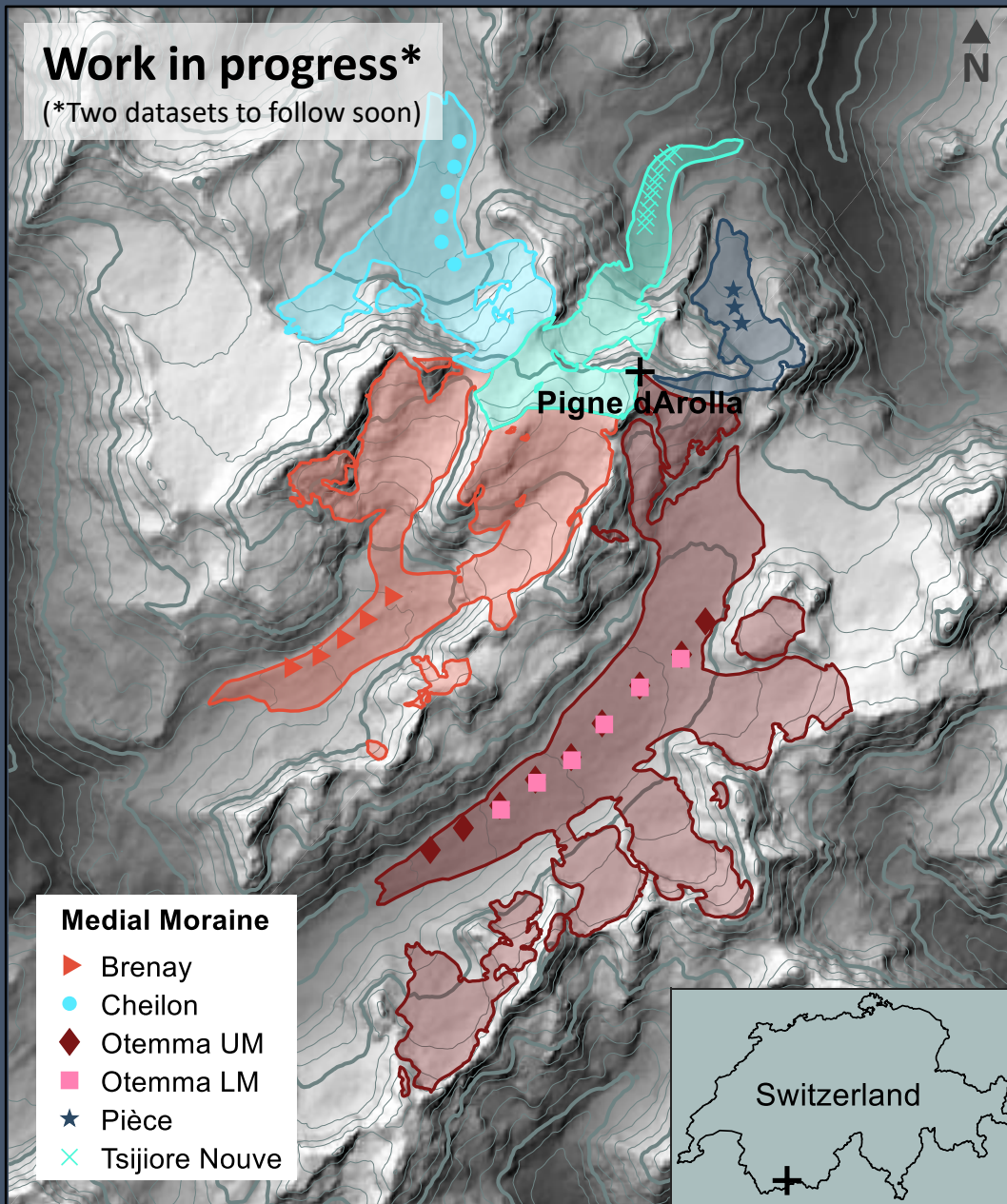
Glacier de Pièce





## Work in progress\*

(\*Two datasets to follow soon)

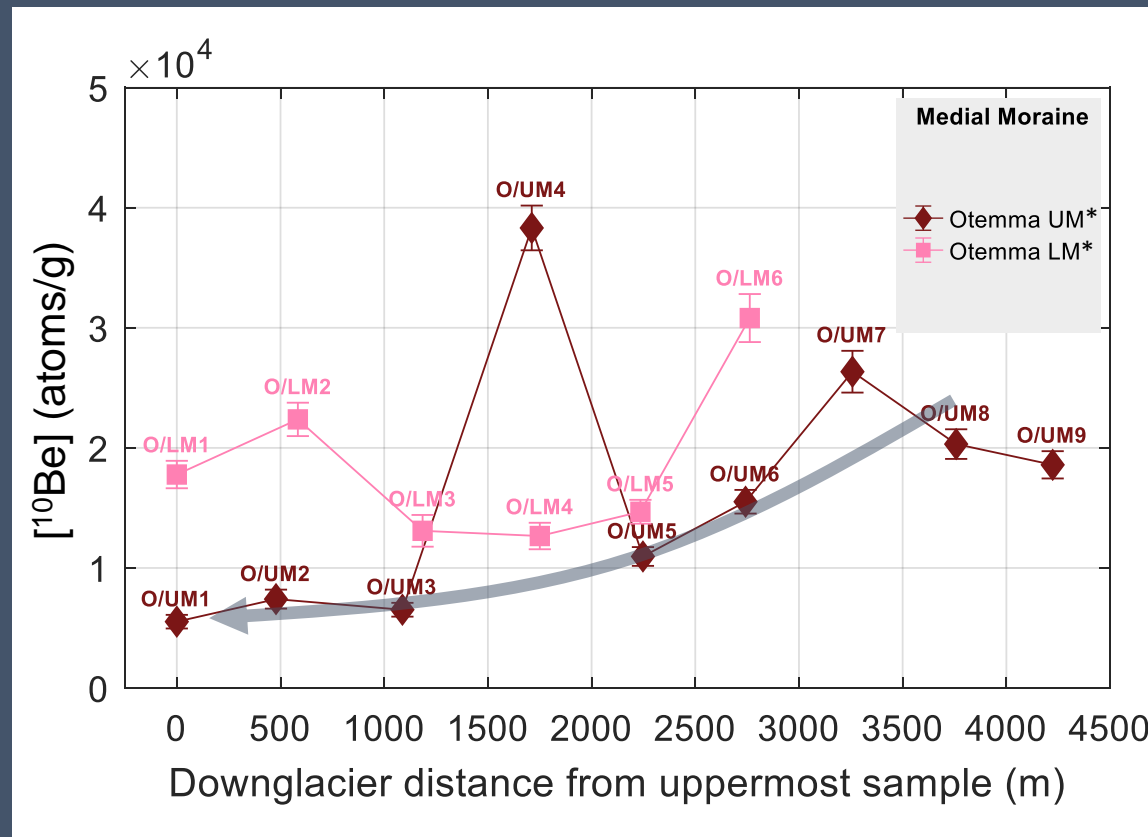
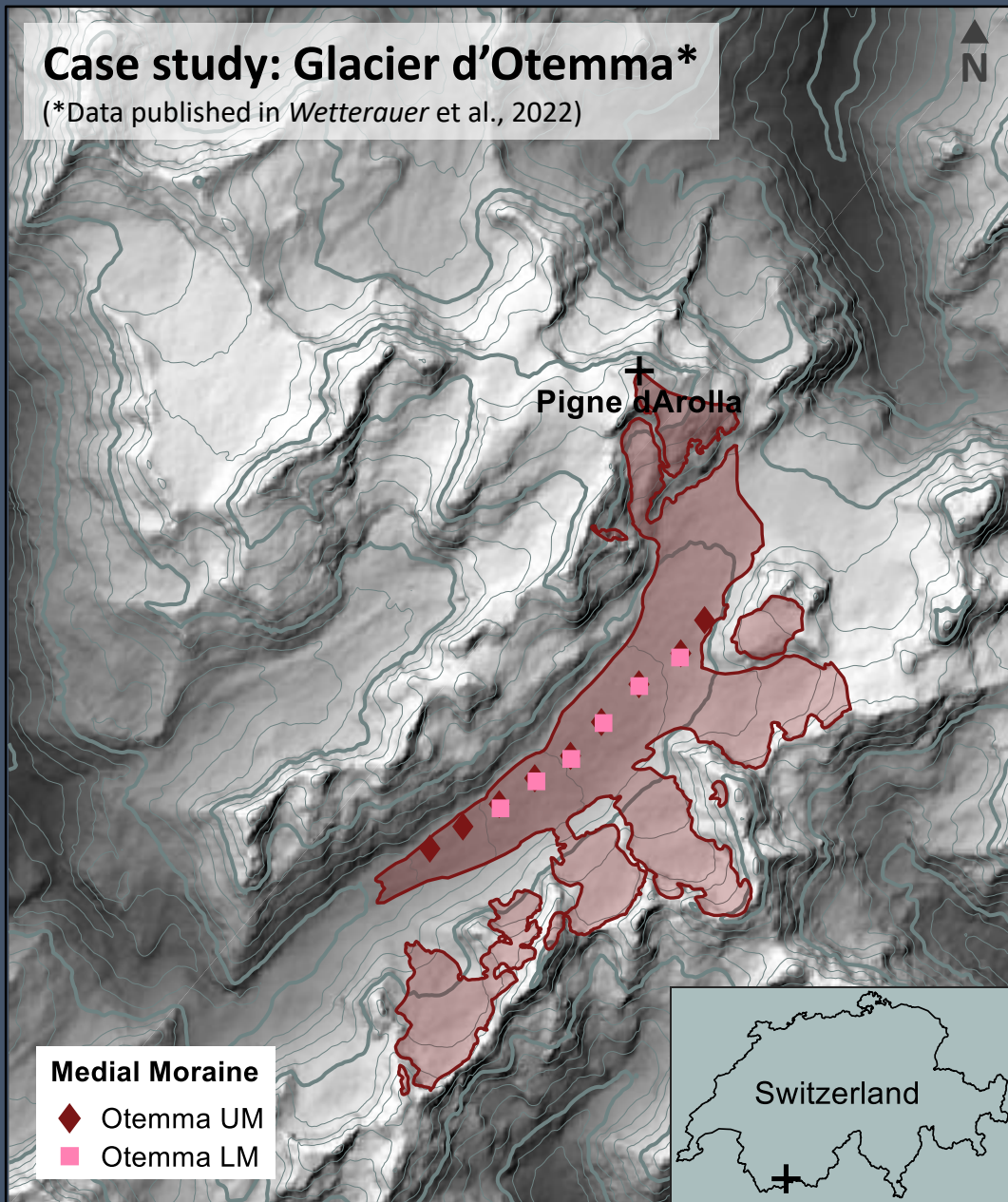


\* Data published in Wetterauer et al., 2022

erosion  
rate

## Case study: Glacier d'Otemma\*

(\*Data published in Wetterauer et al., 2022)



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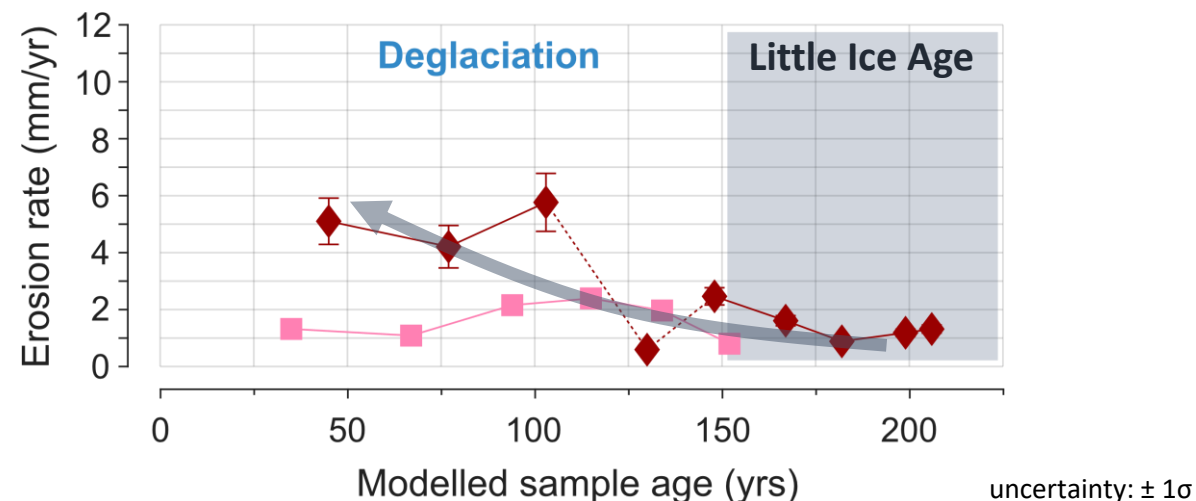
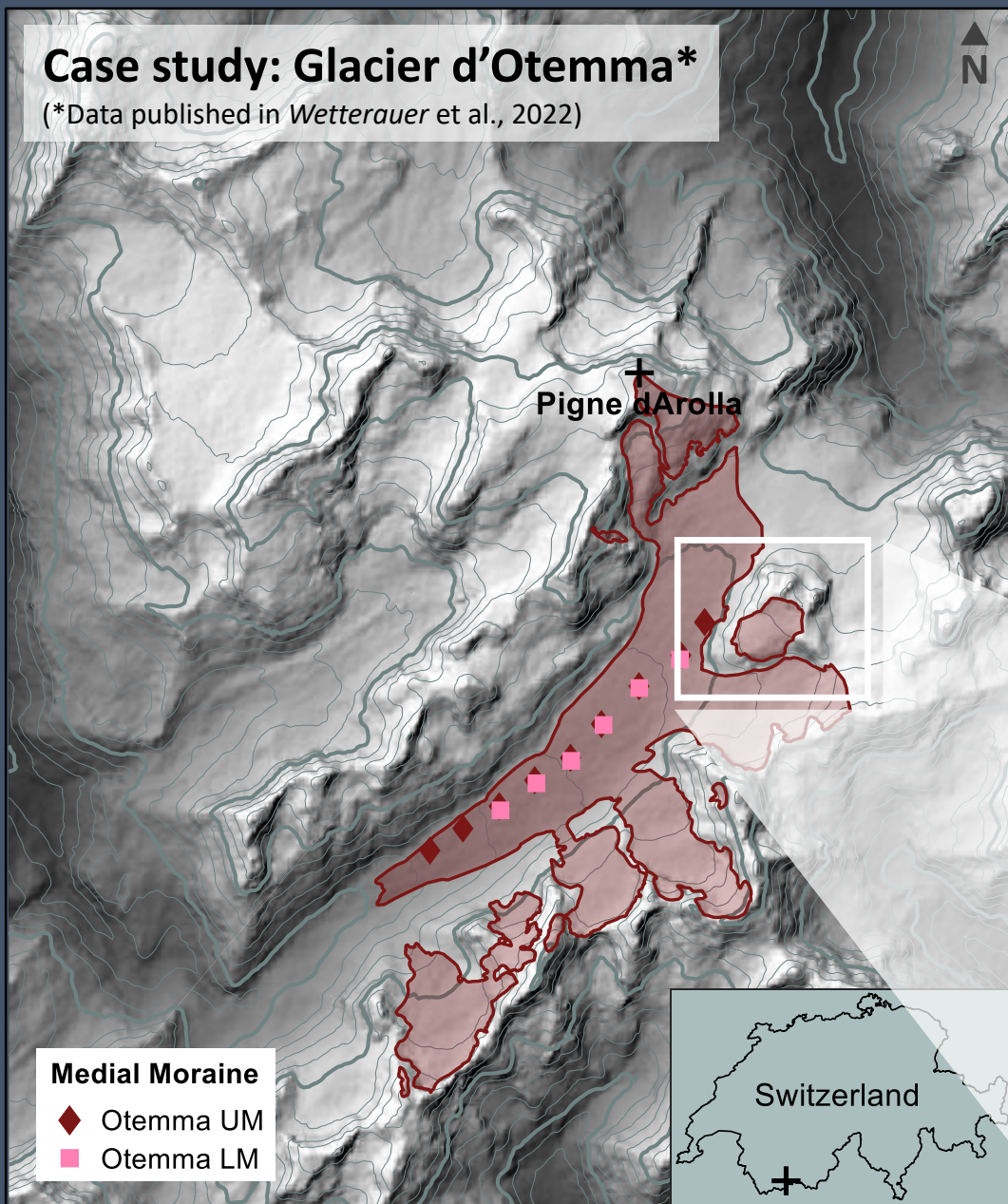
erosion  
rate



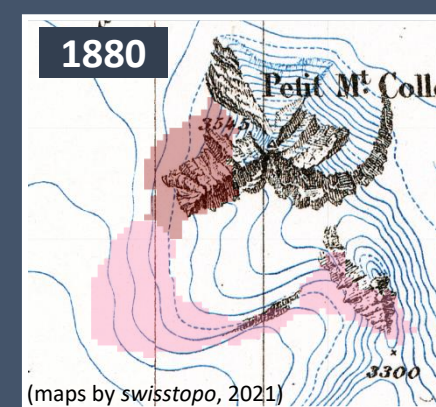
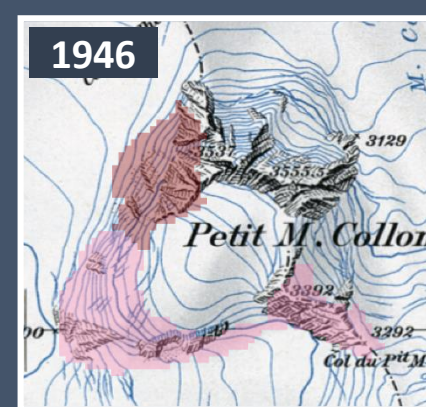
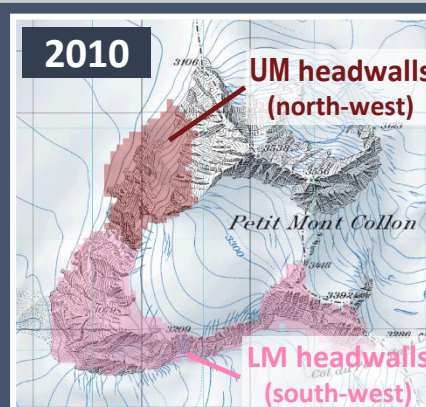


## Case study: Glacier d'Otemma\*

(\*Data published in Wetterauer et al., 2022)



1. accelerating headwall erosion towards the present as glaciers degrade and permafrost thaws
2. bedrock contribution of varied (inherited)  $[^{10}\text{Be}]$  as ice cover changes and debris source areas expand







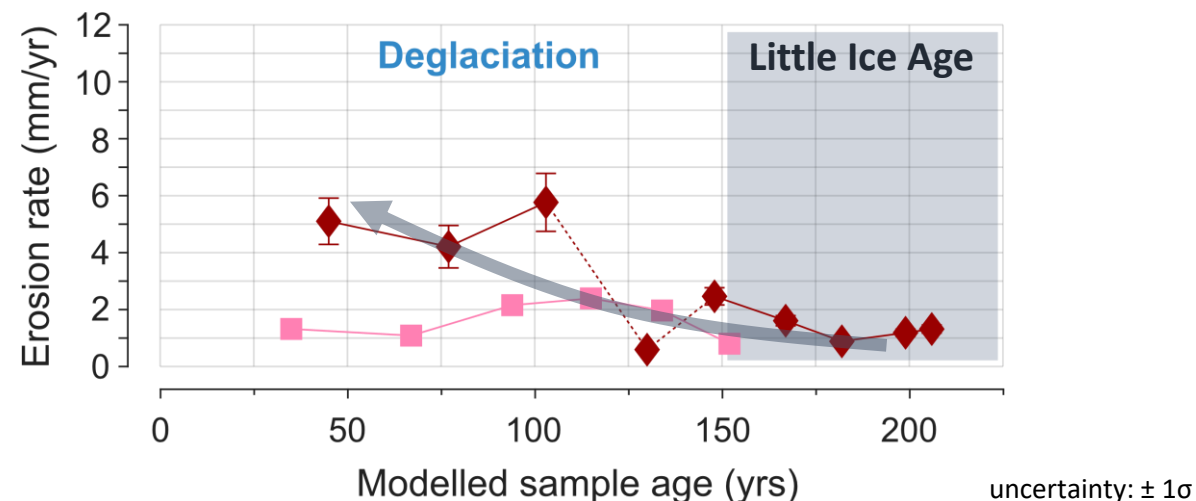
## Case study: Glacier d'Otemma\*

(\*Data published in Wetterauer et al., 2022)

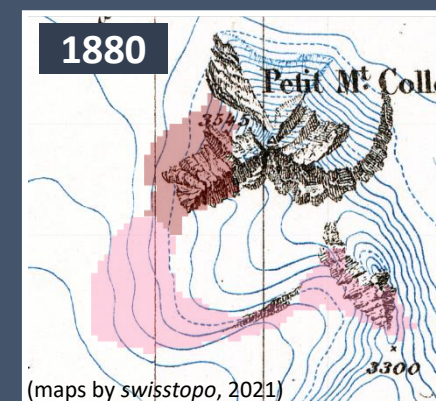
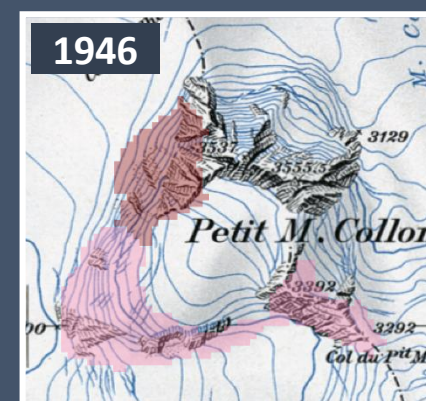
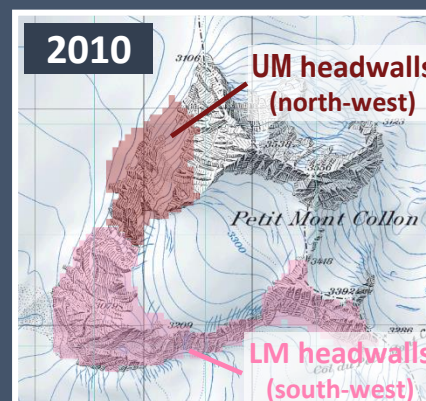
2016



1934



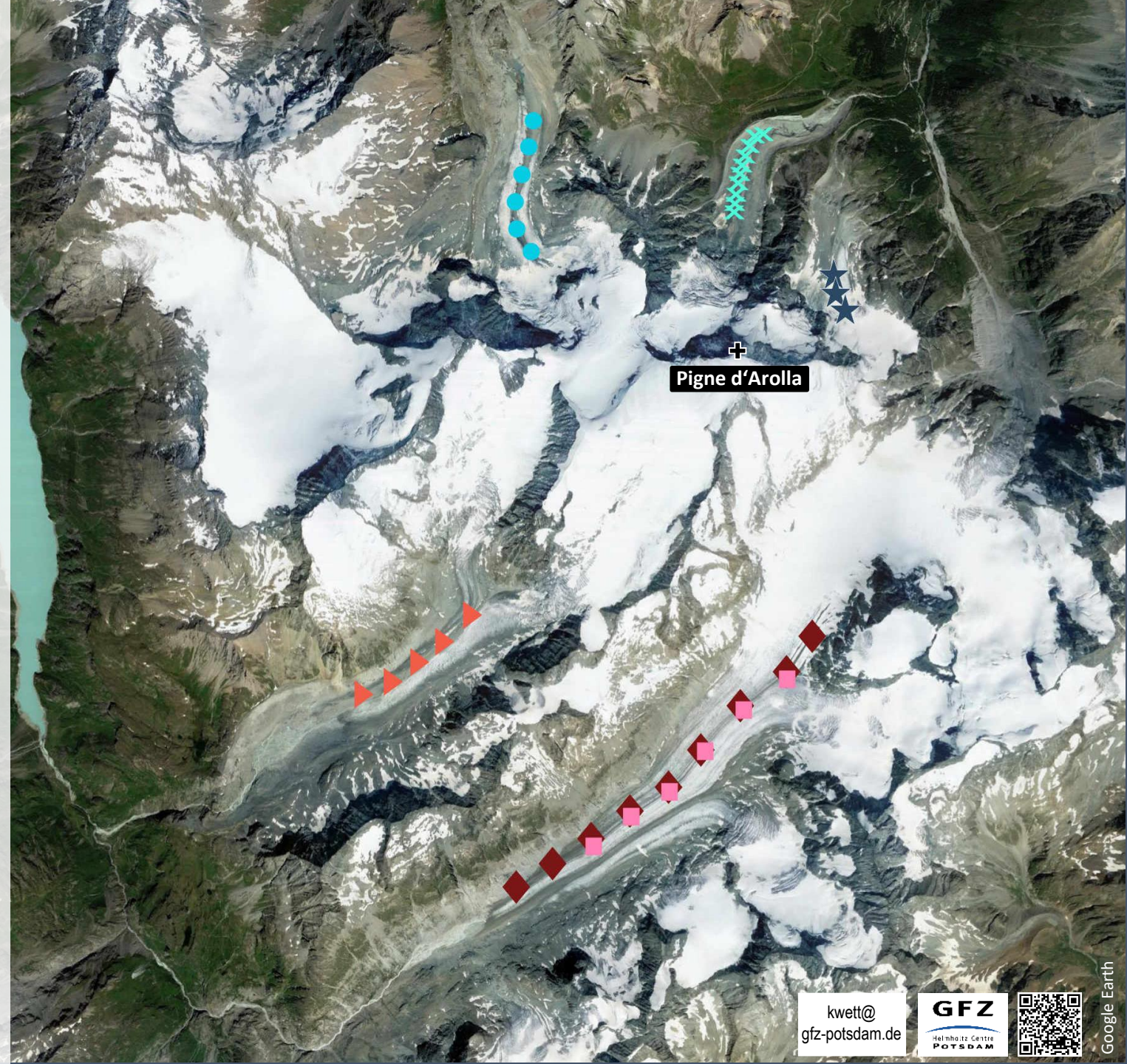
3. adjacent records may differ due to differences in deglaciation histories, permafrost occurrence and slope angles at NW- versus SW-oriented headwalls





so far ...

- systematic temporal trends in [ $^{10}\text{Be}$ ] exist and may reflect a combination of processes that can be associated with the deglaciation of headwalls since the end of the Little Ice Age
- spatial variations in headwall erosion and ice cover retreat may be important factors to consider when comparing medial moraine [ $^{10}\text{Be}$ ] records





# Thank you!

## Curious? Check out our recent publication ...

Wetterauer, K., Scherler, D., Anderson, L.S. & Wittmann, H. (2022).  
Temporal Evolution of Headwall Erosion Rates derived from Cosmogenic Nuclide Concentrations  
in the Medial Moraines of Glacier d'Otemma, Switzerland.  
*Earth Surface Processes and Landforms.*

<https://doi.org/10.1002/esp.5386>

## Get in contact? ...

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