



# 15 years of glacier monitoring in NE Greenland. Freya Glacier update

Bernhard Hynek<sup>1</sup>, Daniel Binder<sup>1,2</sup>, Michele Citterio<sup>2</sup>, Gernot Weyss<sup>1</sup>, Jakob Abermann<sup>3</sup>, Gernot Resch<sup>3</sup>, Signe H. Larsen<sup>2</sup>, Marc Olefs<sup>1</sup>, Wolfgang Schöner<sup>3</sup>

<sup>1</sup> Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Wien

<sup>2</sup> Geological Survey of Denmark and Greenland (GEUS), Copenhagen

<sup>3</sup> Universität Graz, Institut für Geographie und Raumforschung,



Grönland / Freya Gletscher  
24.11.22 12:00 UTC -10.6°C







Initiated by Wolfgang Schöner In the International Polar Year 2007/08

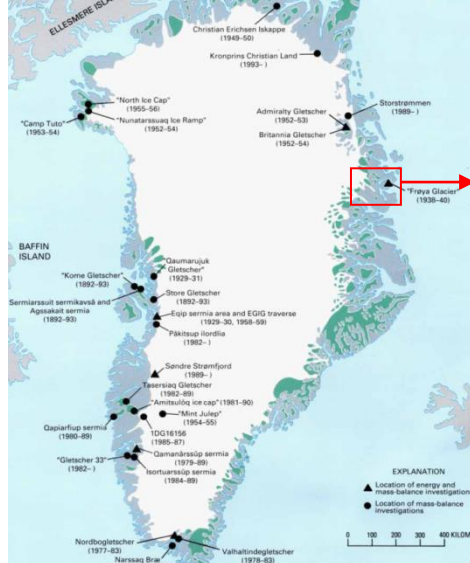


## NEWS:

- Fieldwork April 2022 together with GEUS, and funded for 2023
- Elevation Changes 2013-2022: Pub. in work
- Mass Balance Report 2016-2021 in work
- Quality control of the AWS data - 2021
- New Master Thesis on long term mass balance reconstruction (Anna Rohrböck, RG Haimberger)
- Comparison of surface melt factors Freya A.P. Olsen (Sonika Shahi, RG Schöner)











### A.P. Olsen SE outlet glacier

Monitoring by GEUS

Since 2007

Zackenberg River Catchment

~100 km<sup>2</sup>

550-1450 m a.s.l. SE

~15 stakes

3 AWS

GLOF: camera, passive seismic, GPS

Fieldwork in May

### Freya Glacier

Monitoring by ZAMG

Since 2007

IPY – studies by Ahlmann in late 1930s

5.3km<sup>2</sup>

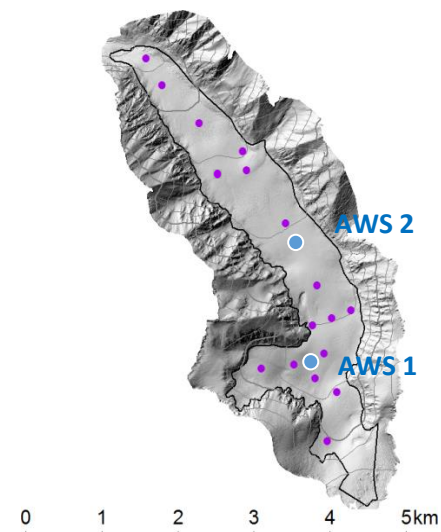
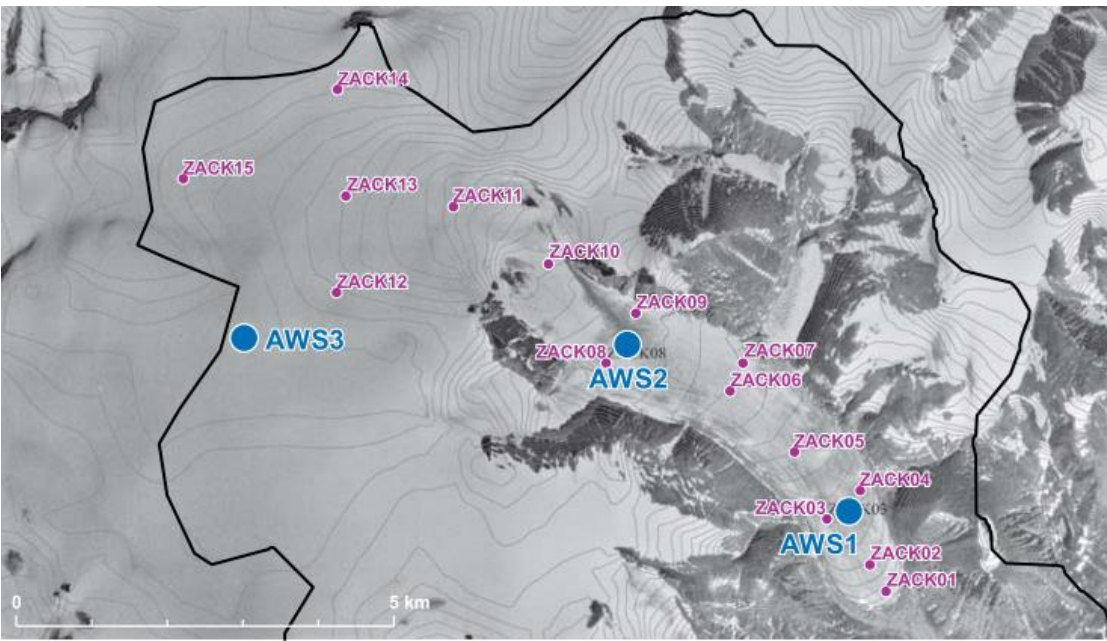
270-1300 m a.s.l. NW

~15 stakes

1 AWS

2 Cameras for snowline monitoring

Fieldwork in August and May



Fieldwork 2022



















Thanks to the APRI Media Team!





# Elevation Changes



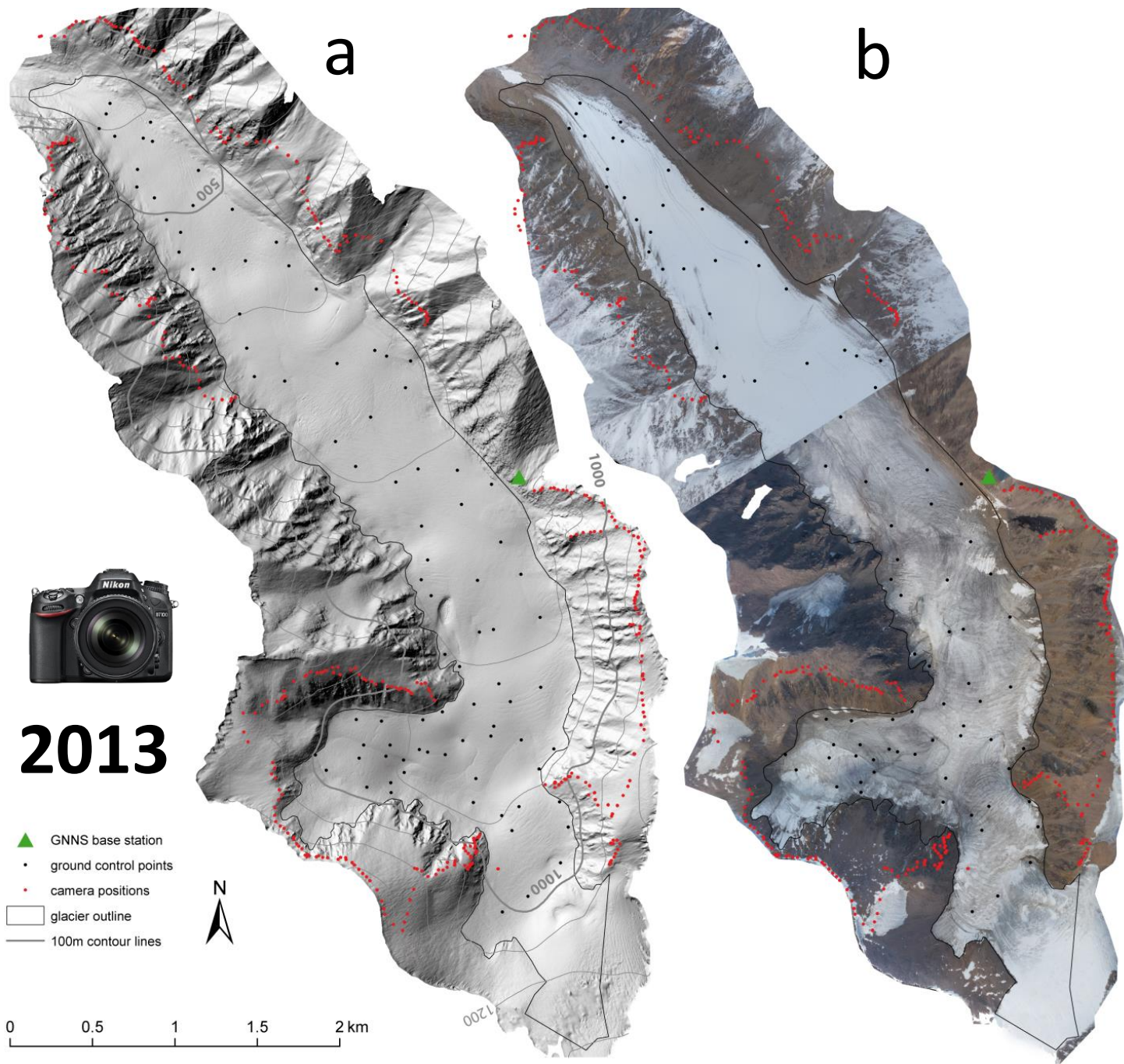


Figure: a) Hillshade of the DEM in 1m resolution and b) Orthofoto of the of the survey in August 2013 showing the location of the photo points, the GCPs and the GNNS base station. The upper part of the glacier was photographed on 11.8. and 12.8. the lower part of the glacier was surveyed on 18.8. after a snow fall event.



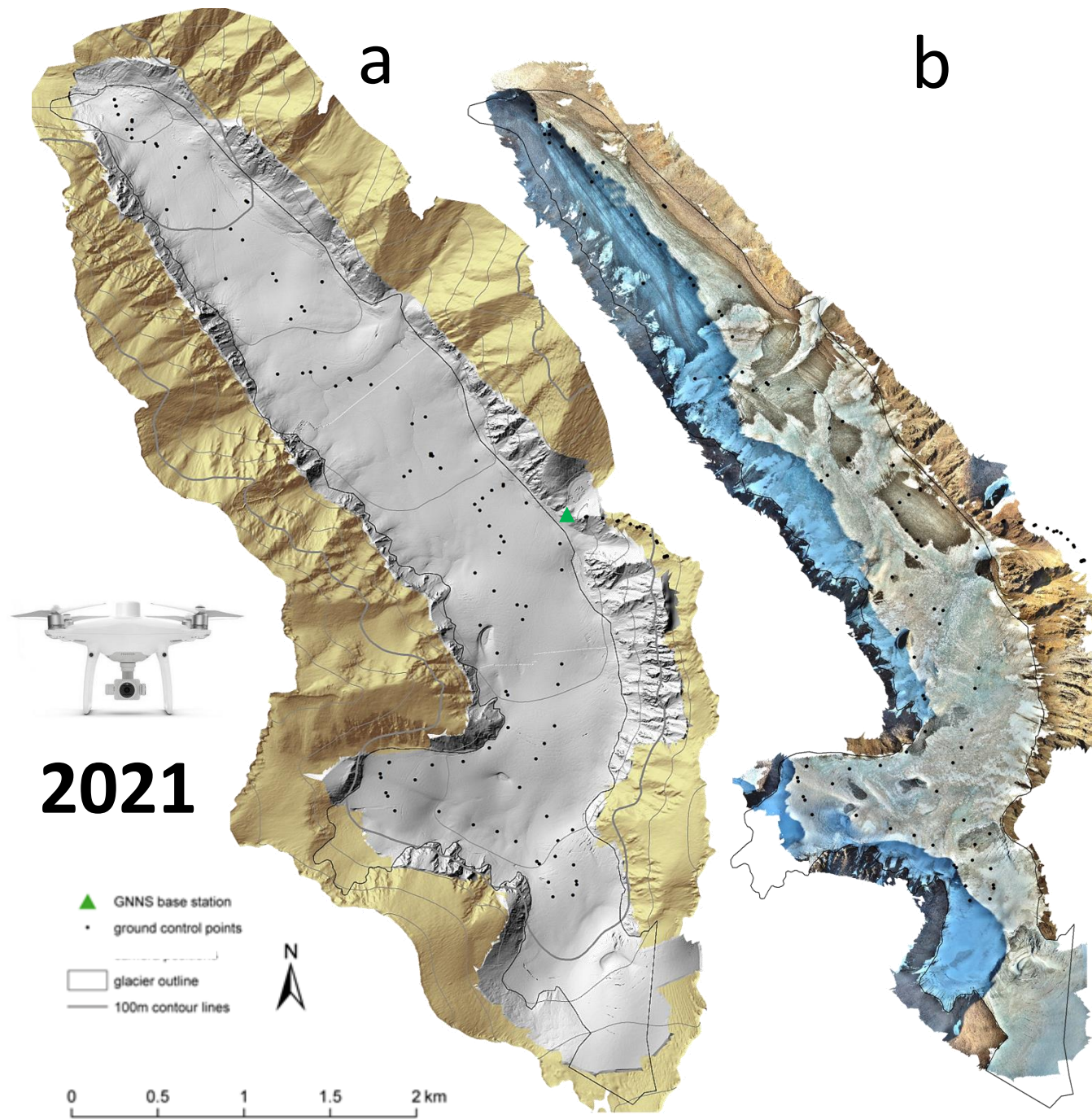
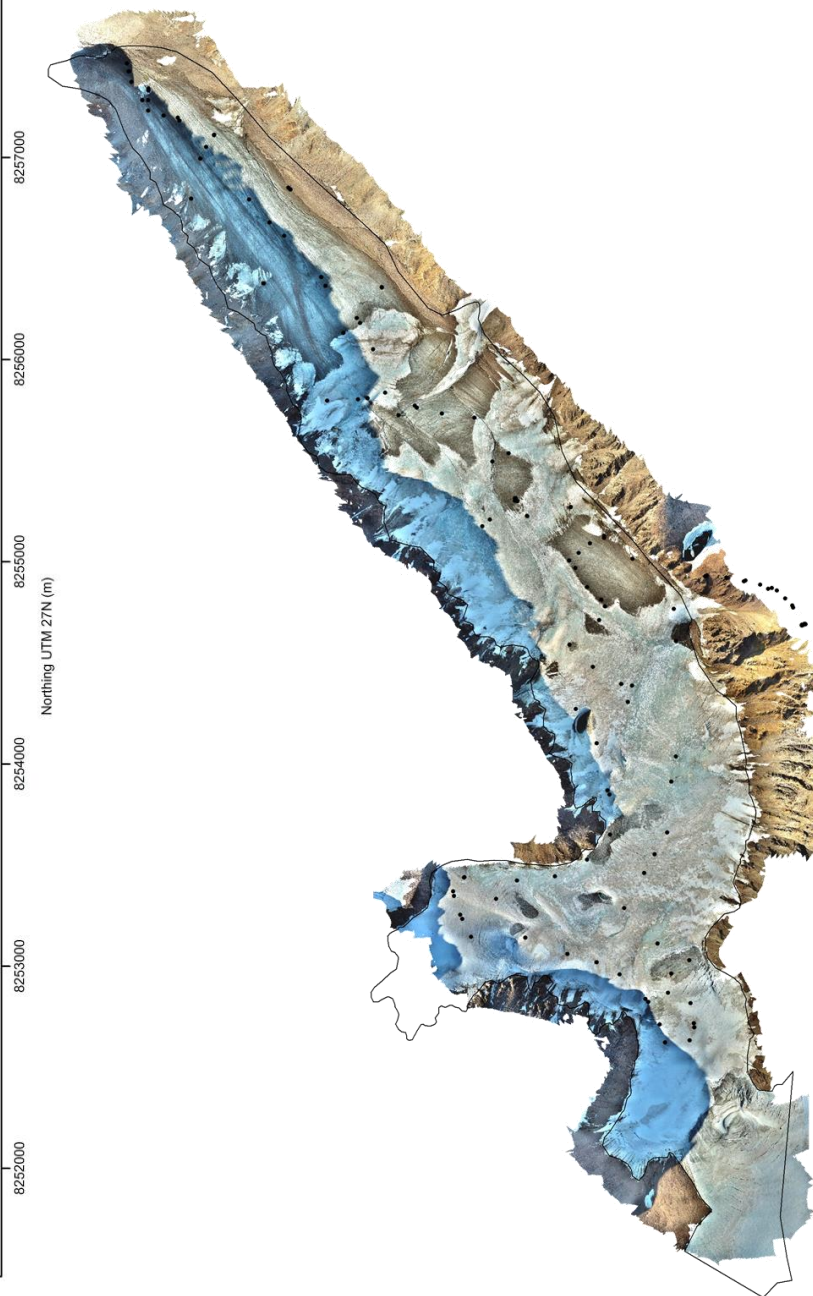
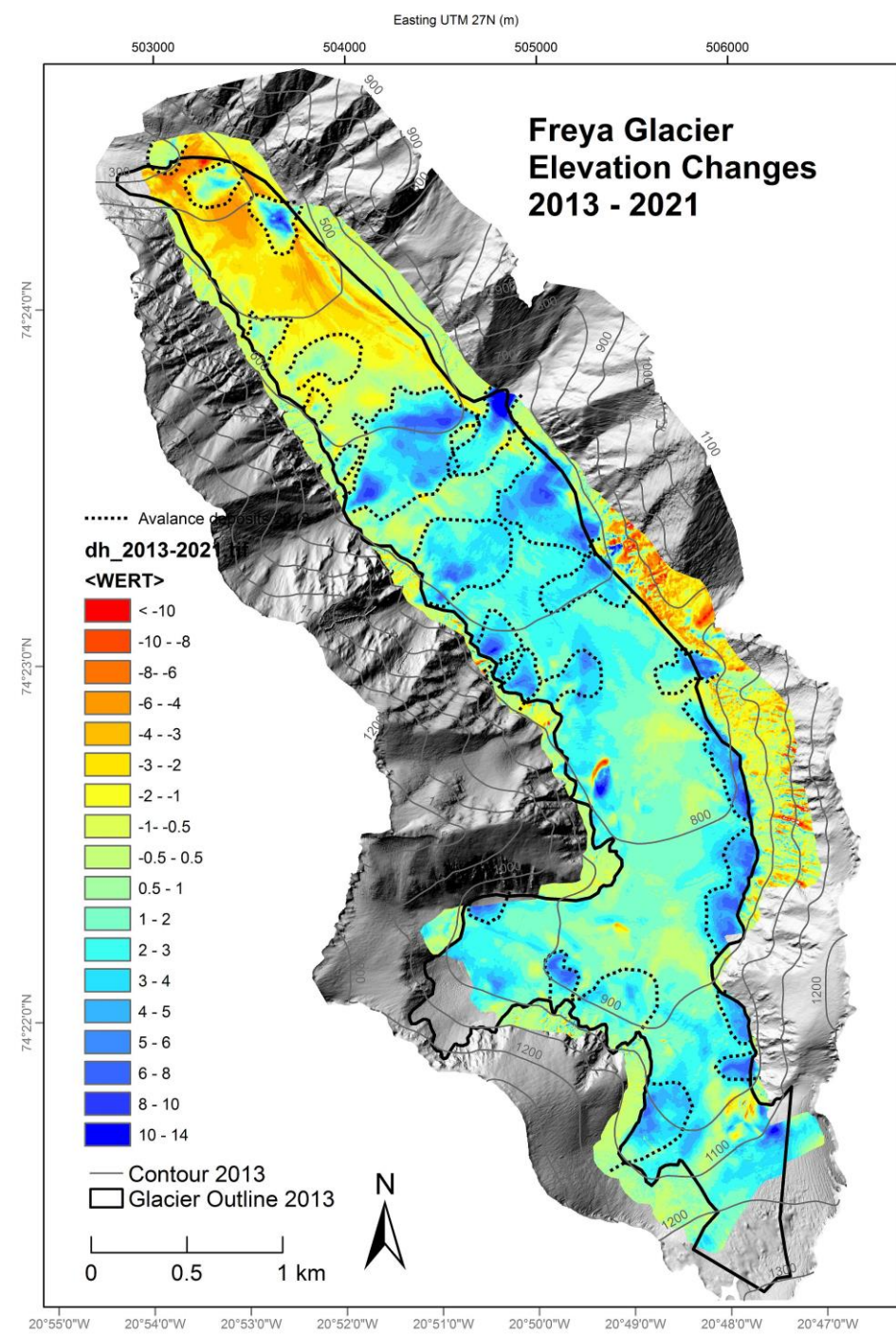
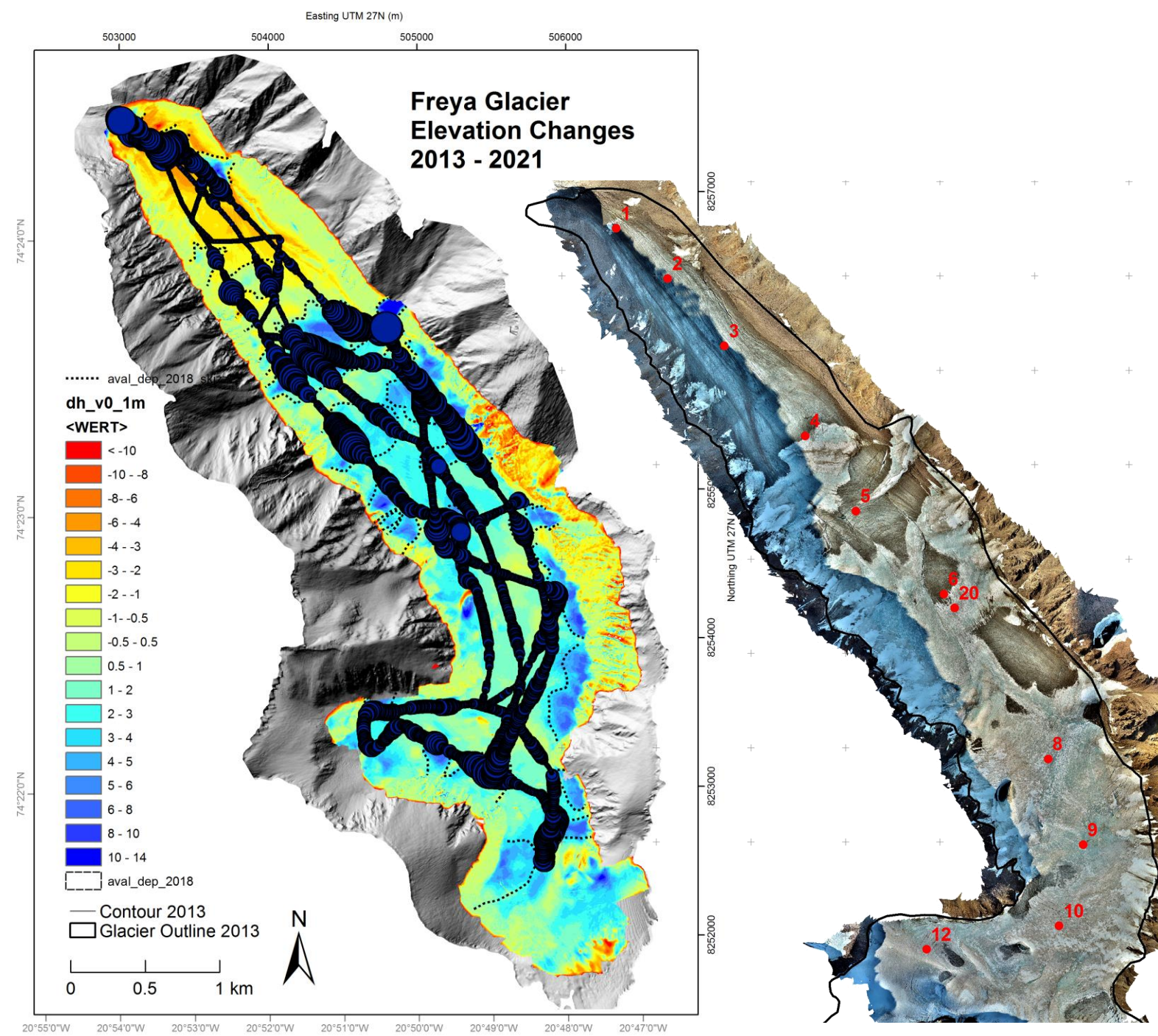


Figure: a) Hillshade of the DEM in 1m resolution and b) Orthofoto of the of the survey in July 2021 showing the location of the photo points, the GCPs and the GNNS base station. The upper part of the glacier was photographed on 31.7. and the lower part of the glacier was surveyed on 27.7.







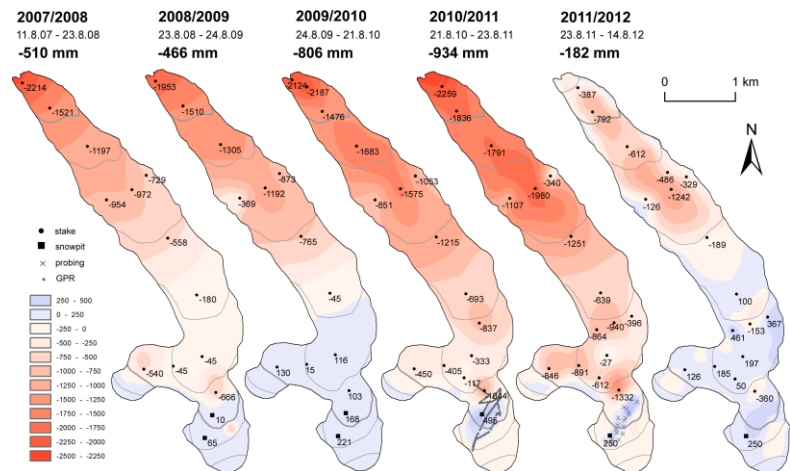






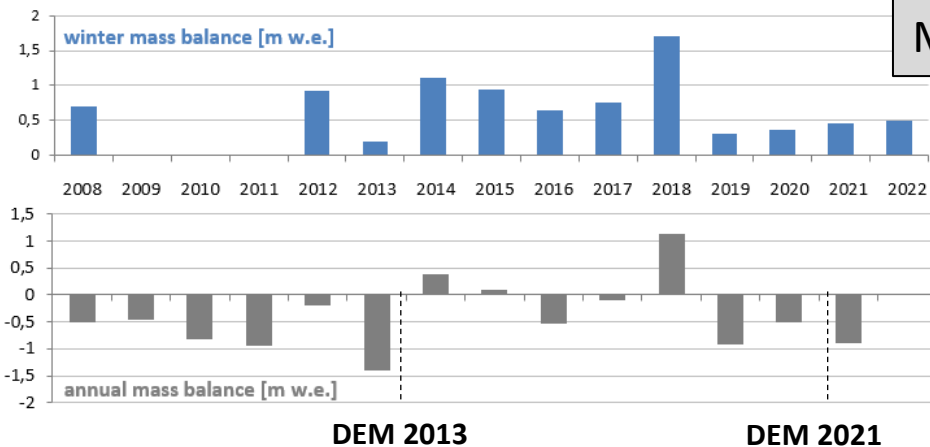


# Comparison of geodetic and direct mass balance: in work



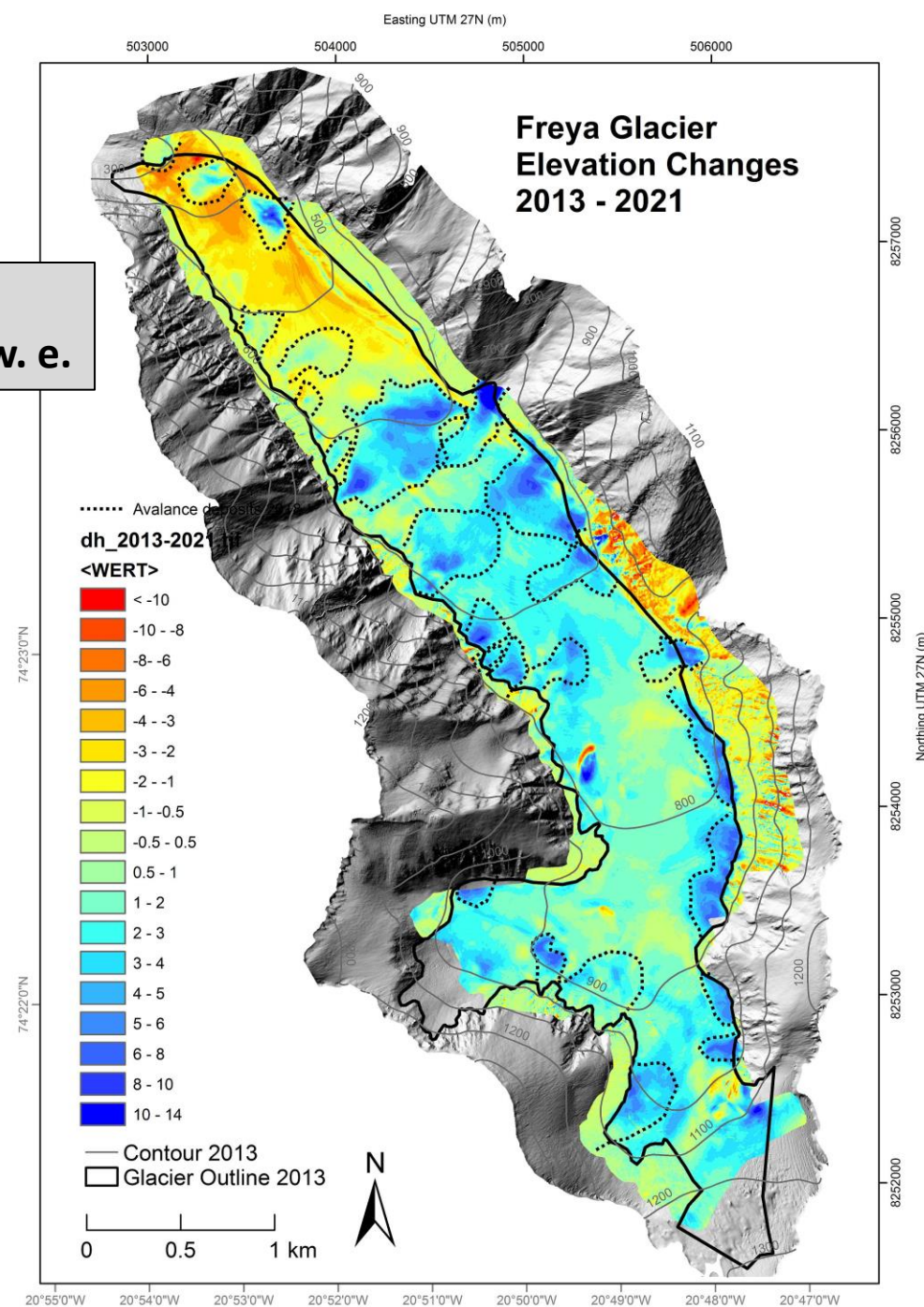
Elevation Changes:  
MB 13-21: **+1.3 m w. e.**

Stake data:  
MB 13-21: **-0.4 m w. e.**



## Differences:

- Spatial extrapolation of stake data
- Accumulation by valanches









Quality Controlled  
AWS data timeseries  
for reasearch projects

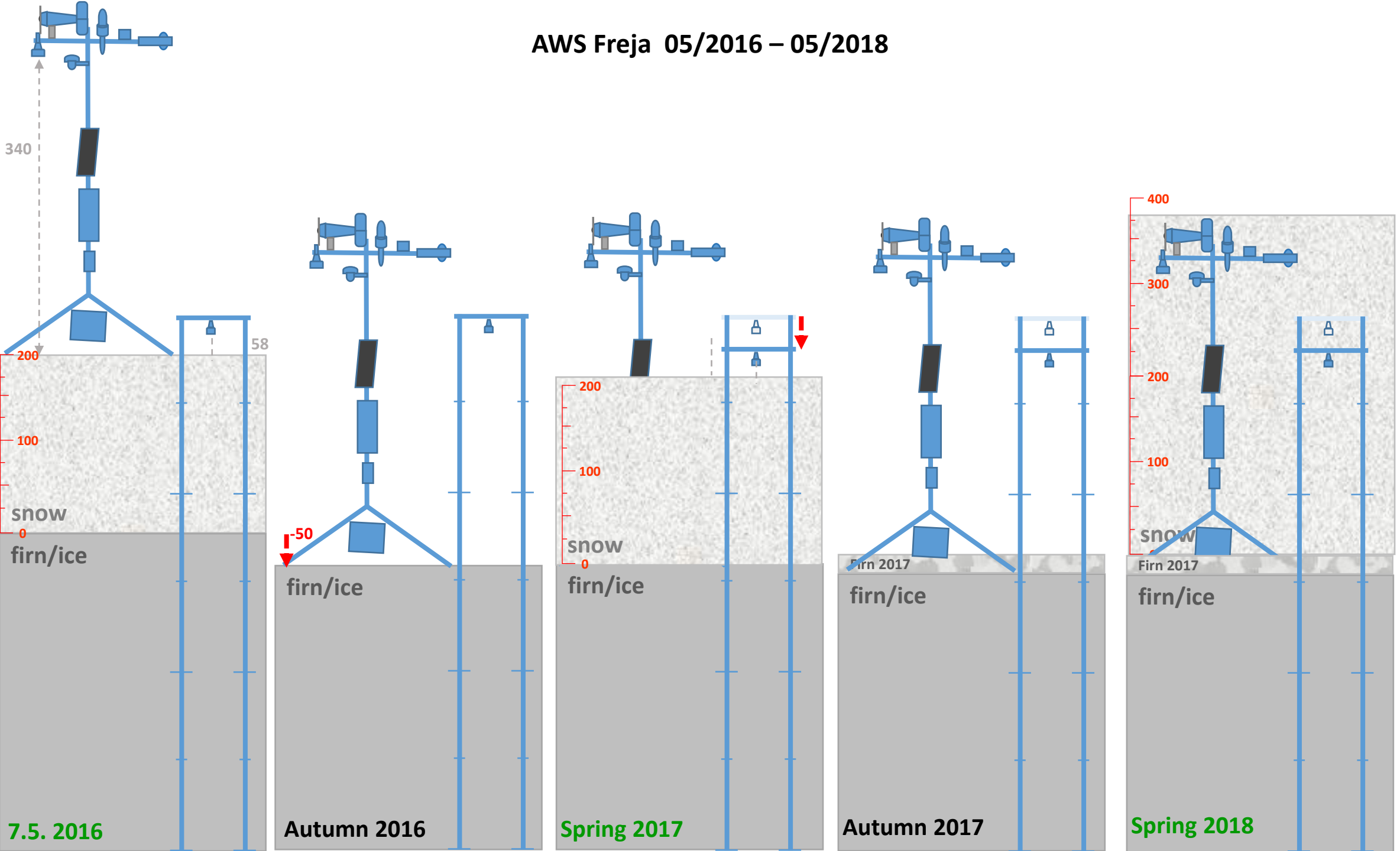


**AWS-Maintenance 2022**





# AWS Freja 05/2016 – 05/2018





AWS FREYA 2016/05-2021/07/27

Snow height

Ice/firn height

Station im  
Schnee.  
Neu  
aufgestellt.

Online data:

Update dh 22:

- 0.7 m

Fixer  
Ultraschall-  
Sensor  
Out of range  
oder um-  
gefallen.

Fixer  
Ultraschall-  
Sensor  
Out of range  
oder um-  
gefallen.

dh16:  
-0.5 m

dh17:  
+0.2 m

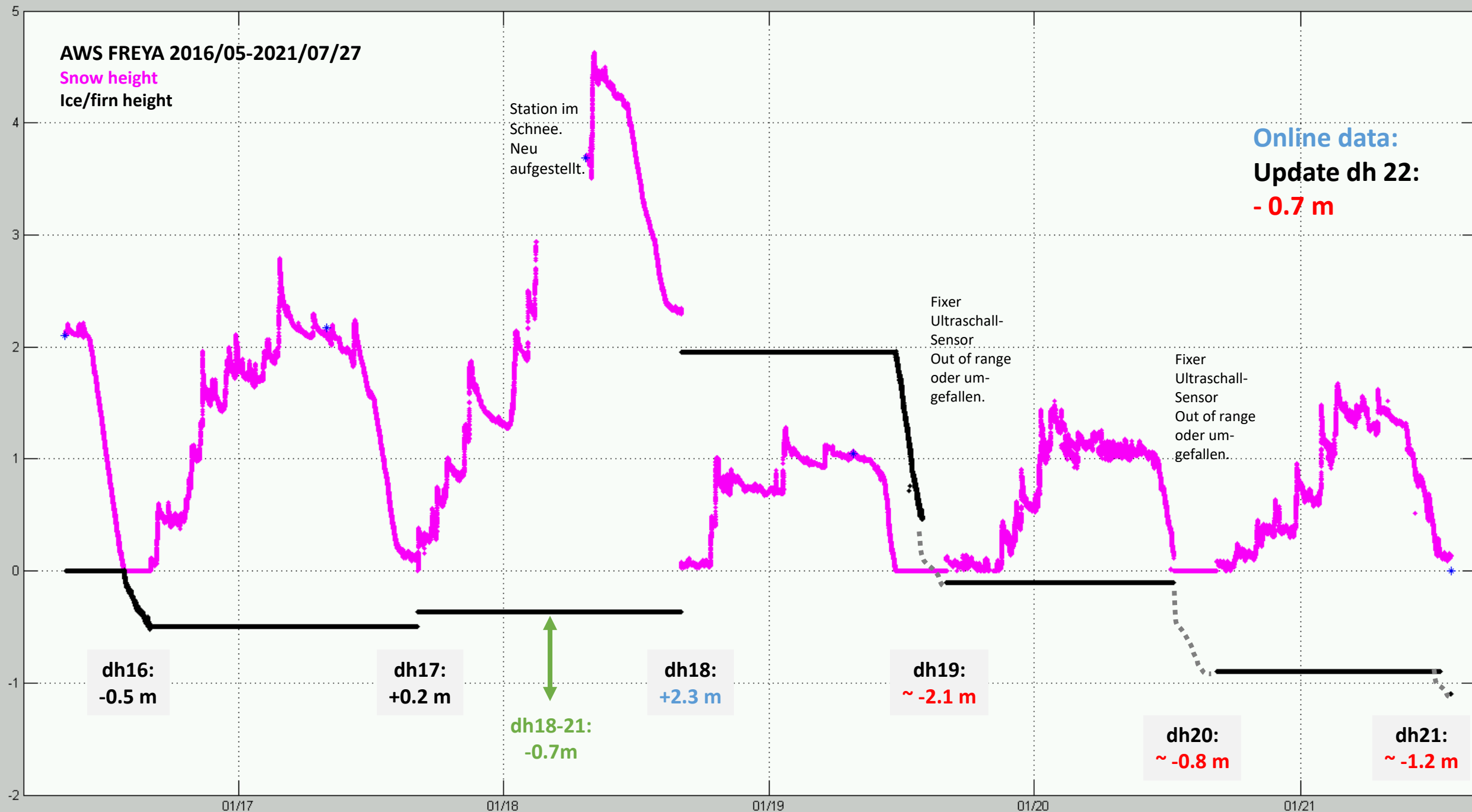
dh18-21:  
-0.7m

dh18:  
+2.3 m

dh19:  
~ -2.1 m

dh20:  
~ -0.8 m

dh21:  
~ -1.2 m





Thank you for your attention!

Contact: [b.hynek@zamg.ac.at](mailto:b.hynek@zamg.ac.at)

