



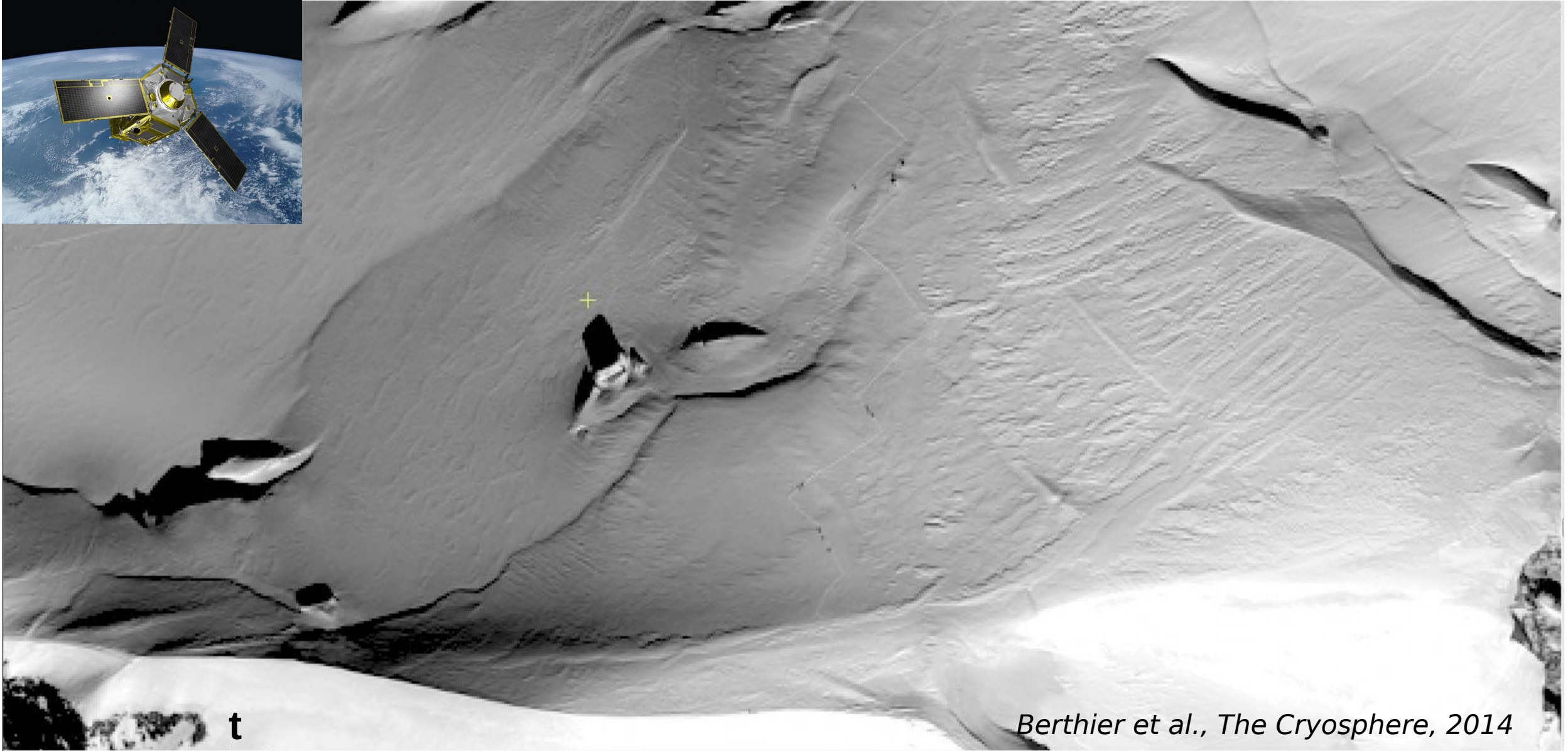
Natural Science
Institute of Iceland

Mapping and monitoring of Iceland with Pléiades since 2013: applications in geosciences

Joaquín M.C. Belart, Etienne Berthier, Eyjólfur Magnússon, Tómas Jóhannesson,
Hrafnhildur Hannesdóttir, Virginie Pinel, Magnús T. Guðmundsson

Skeiðarárjökull, 2021 © CNES. Distribution Airbus DS

How Pléiades works



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Berthier et al., The Cryosphere, 2014

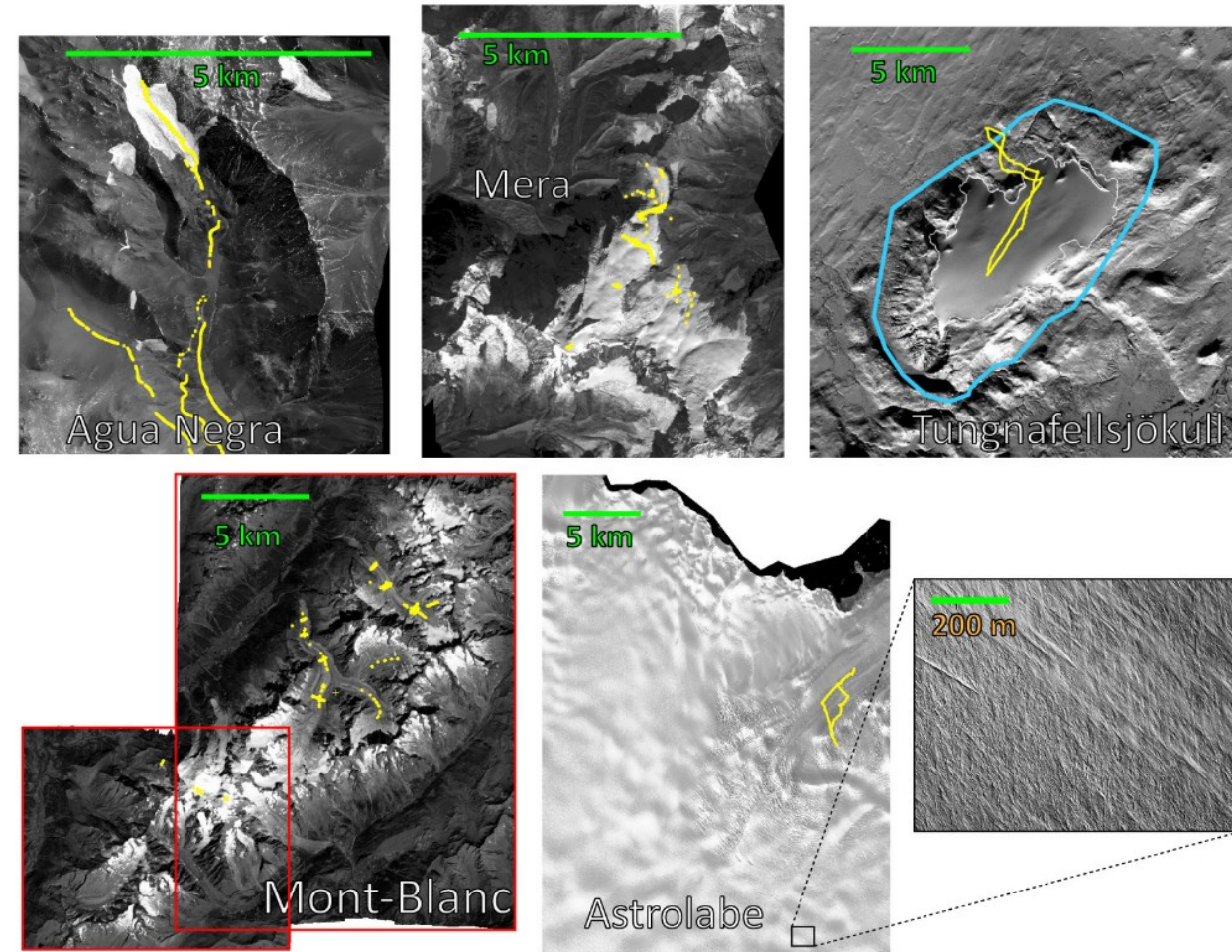
How Pléiades works



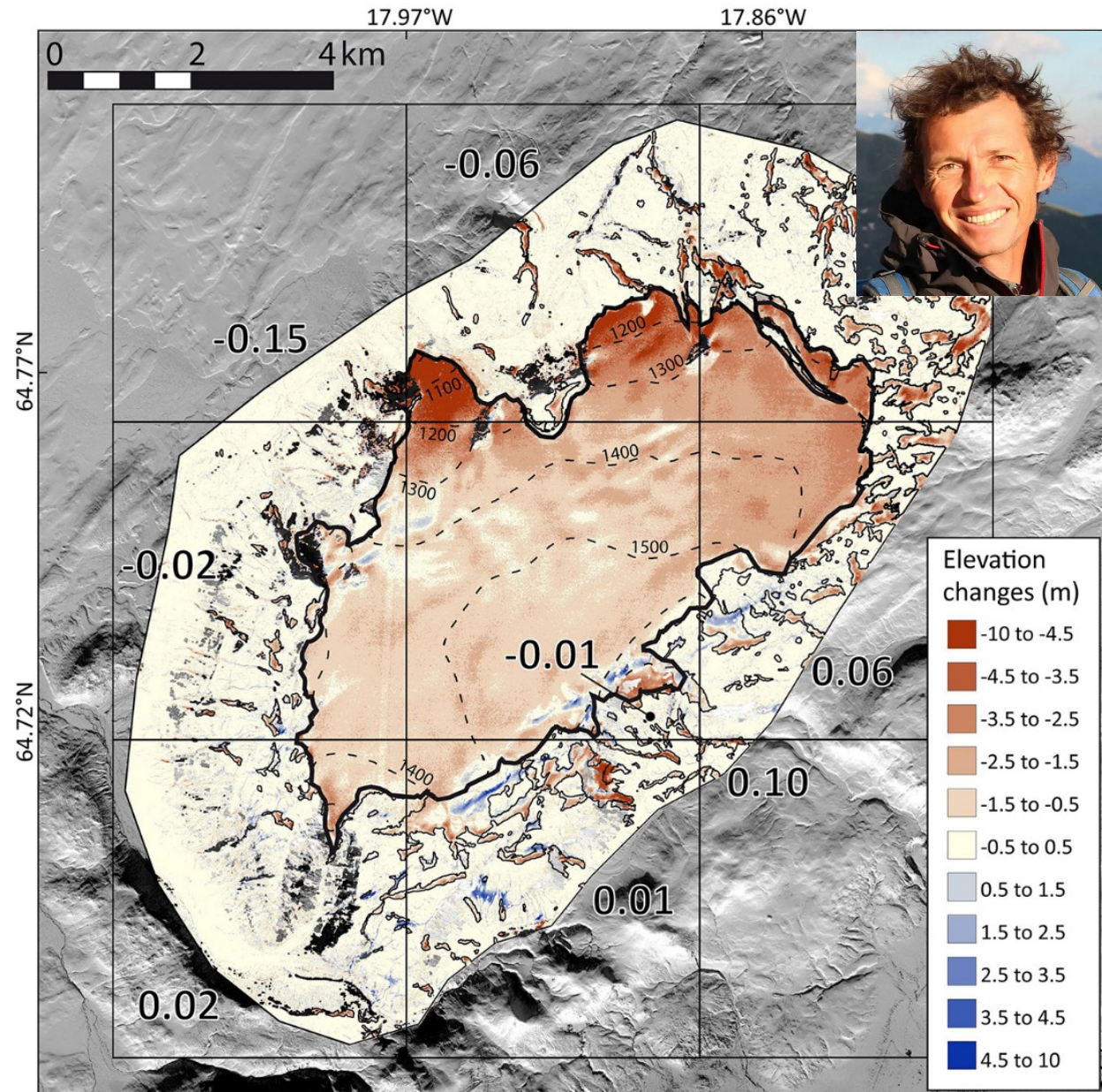
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Berthier et al., The Cryosphere, 2014

First years (2013): Annual glacier elevation changes

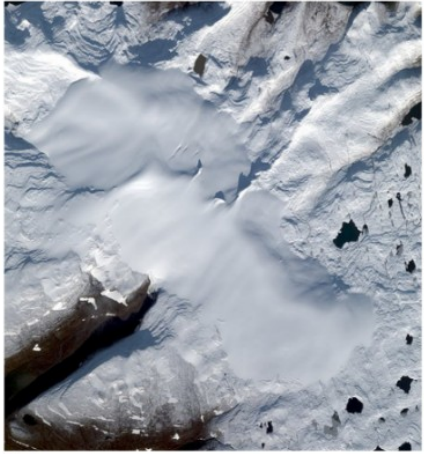


Berthier et al., 2014, *The Cryosphere*

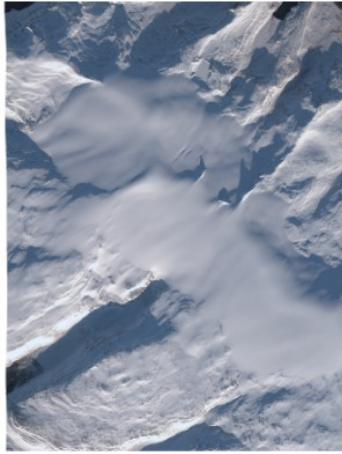


First years (2014-2015): Seasonal elevation changes

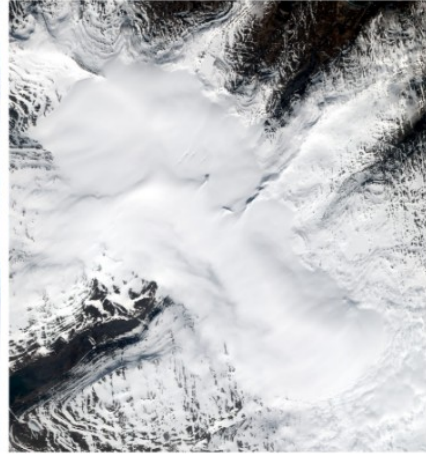
(a) Pléiades 14 October 2014



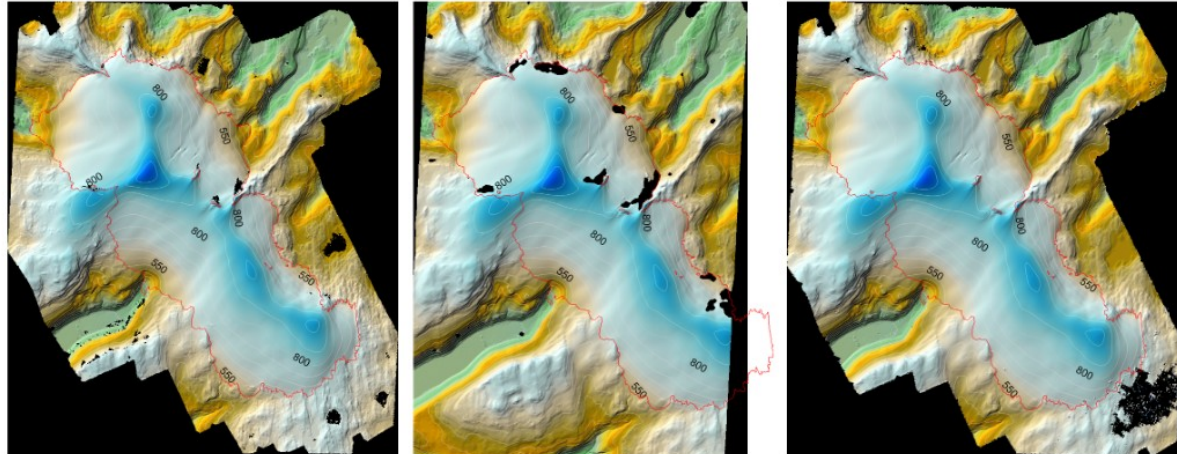
WV2 13 February 2015



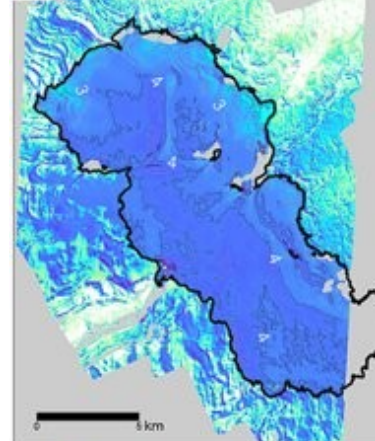
Pléiades 22 May 2015



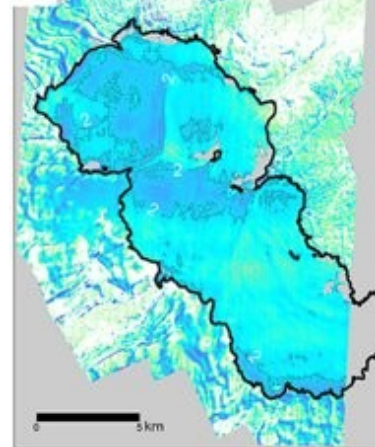
(b)



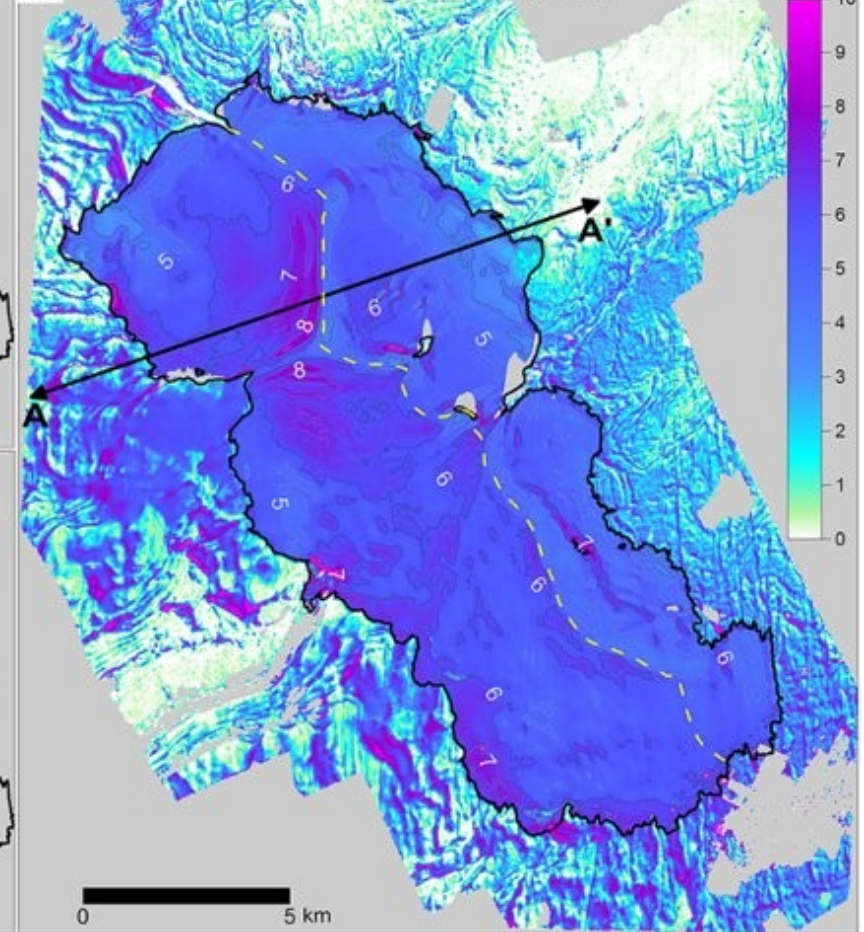
(a) 14 Oct 2014 – 13 Feb 2015



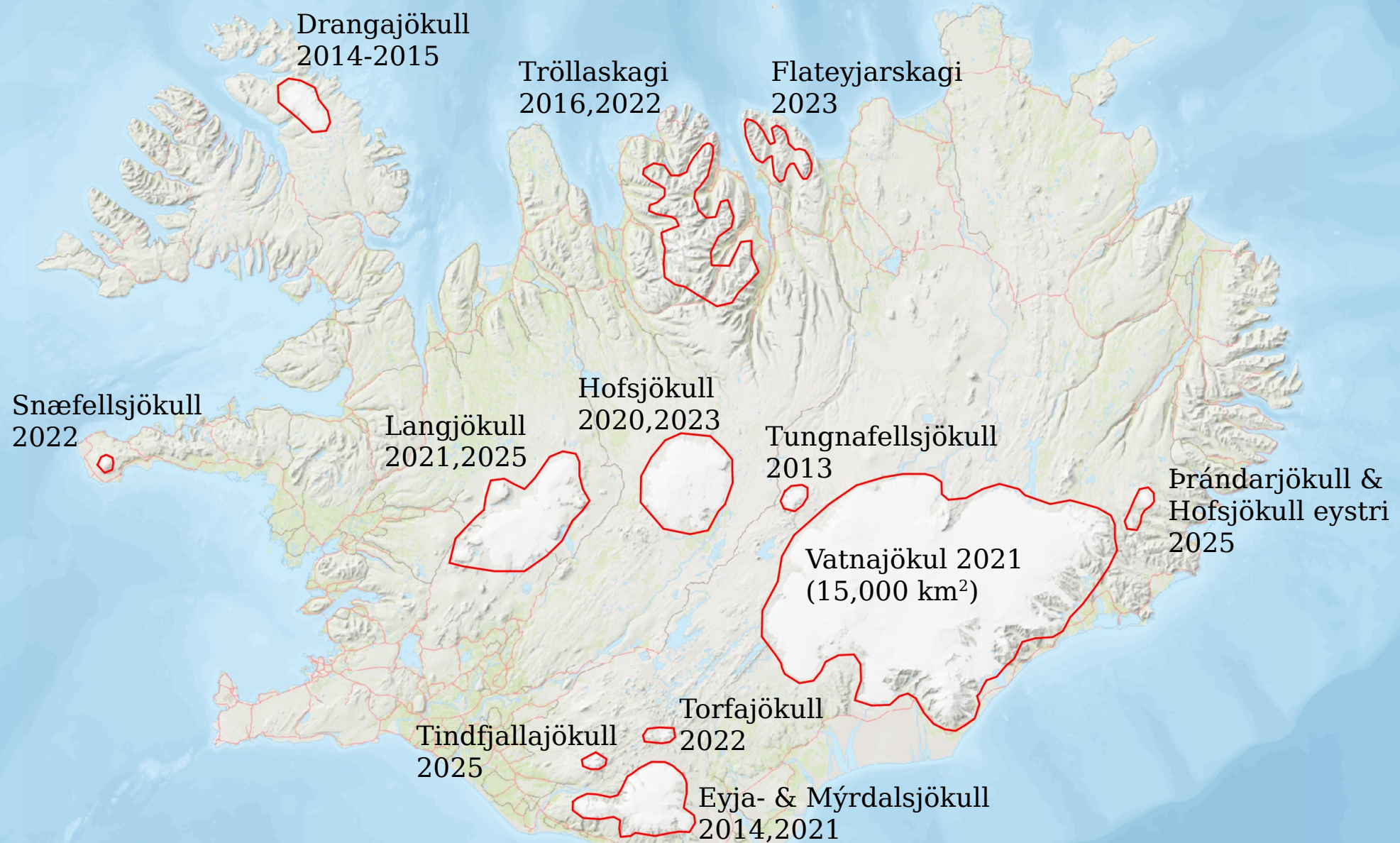
(b) 13 Feb 2015 – 22 May 2015



(c) 14 Oct 2014 – 22 May 2015

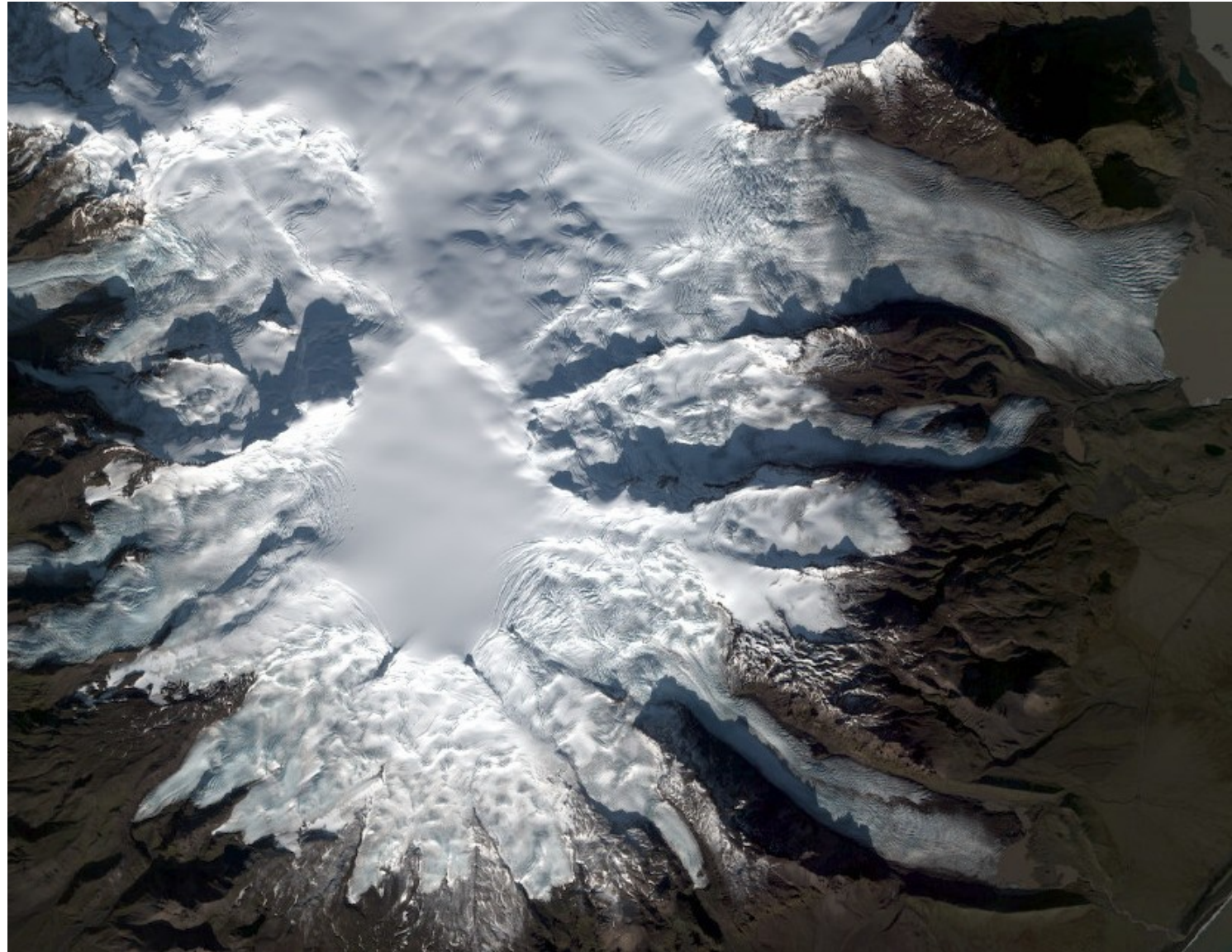


Overview of Pléiades surveys on glaciers



Pléiades surveys as reference for other measurements

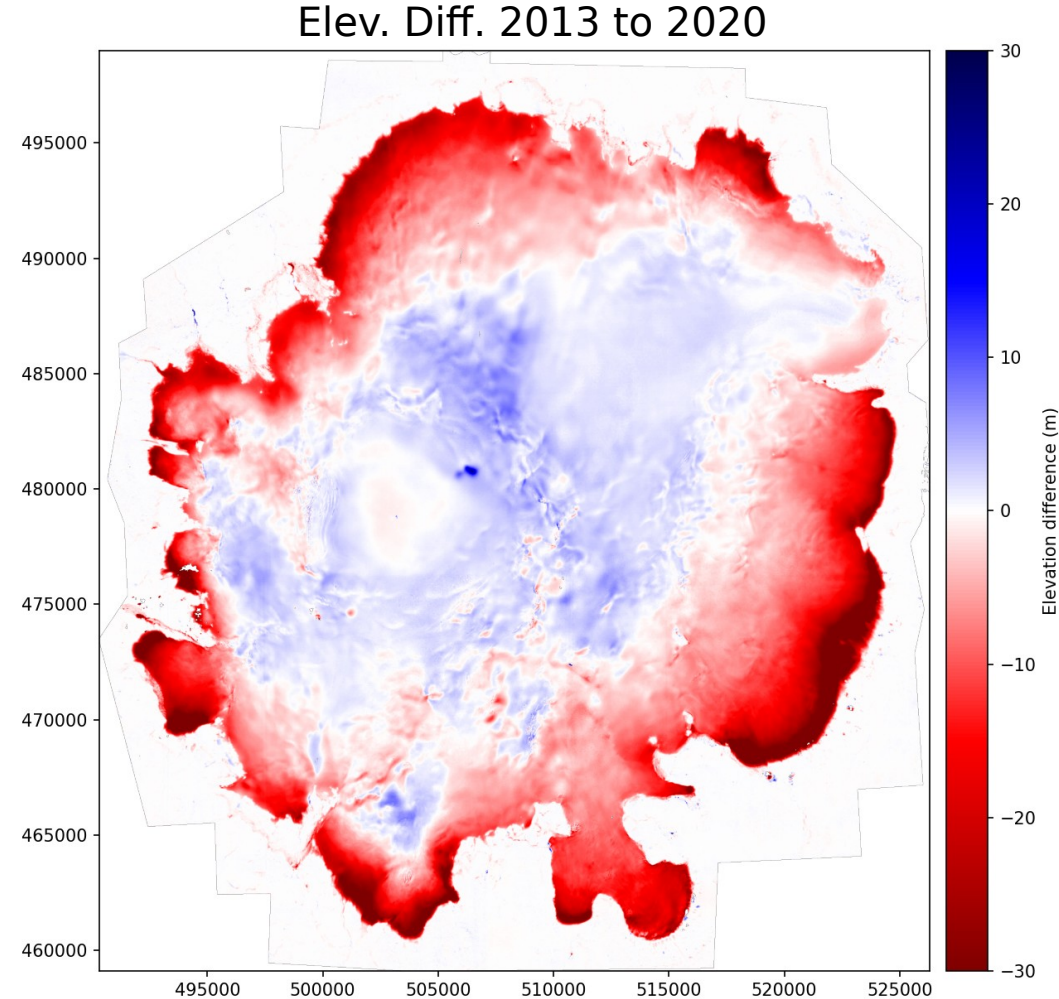
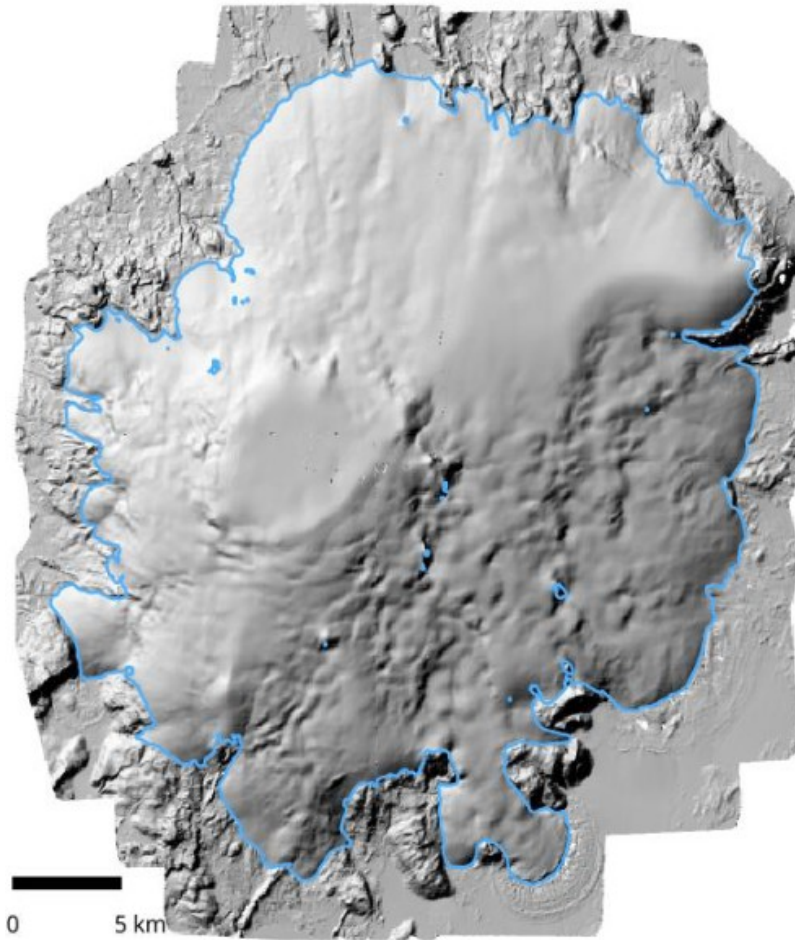
DEMs of glaciers every 3-5 years: calibration of **field measurements**



Öræfajökull ice cap, 2021 © CNES. Distribution Airbus DS



Example of large ($>1000 \text{ km}^2$) survey



Two publications in progress using Pléiades data for calibration/validation:

-Mass balance of Hofsjökull ice cap, Iceland, estimated from repeat **ICESat-2** satellite altimetry observations, Koo et al. (in review)

-Seasonal to decadal geodetic mass balance of Hofsjökull from **SPOT5 and ArcticDEM**, Piermattei et al. (in prep)

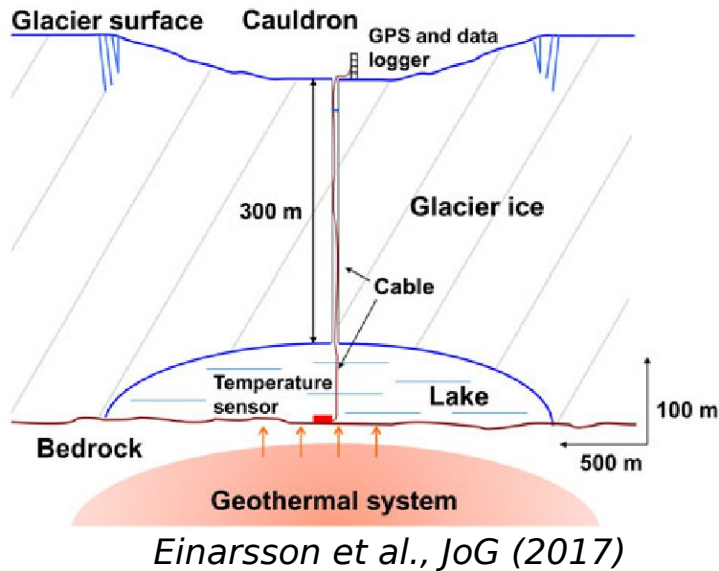
Monitoring of geothermal areas



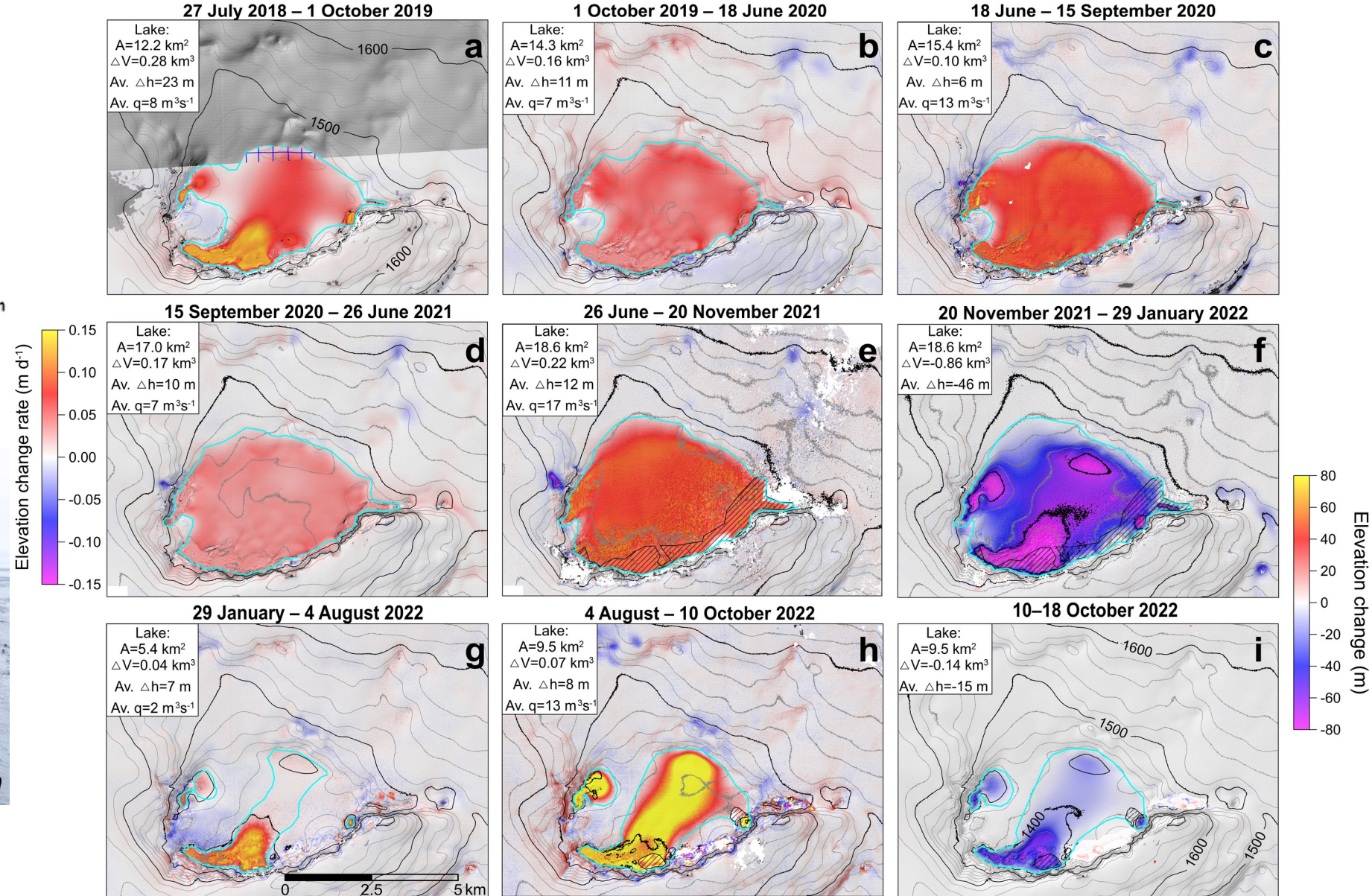
Grímsvötn,
Skaftá,
Öræfajökull

Mýrdalsjökull

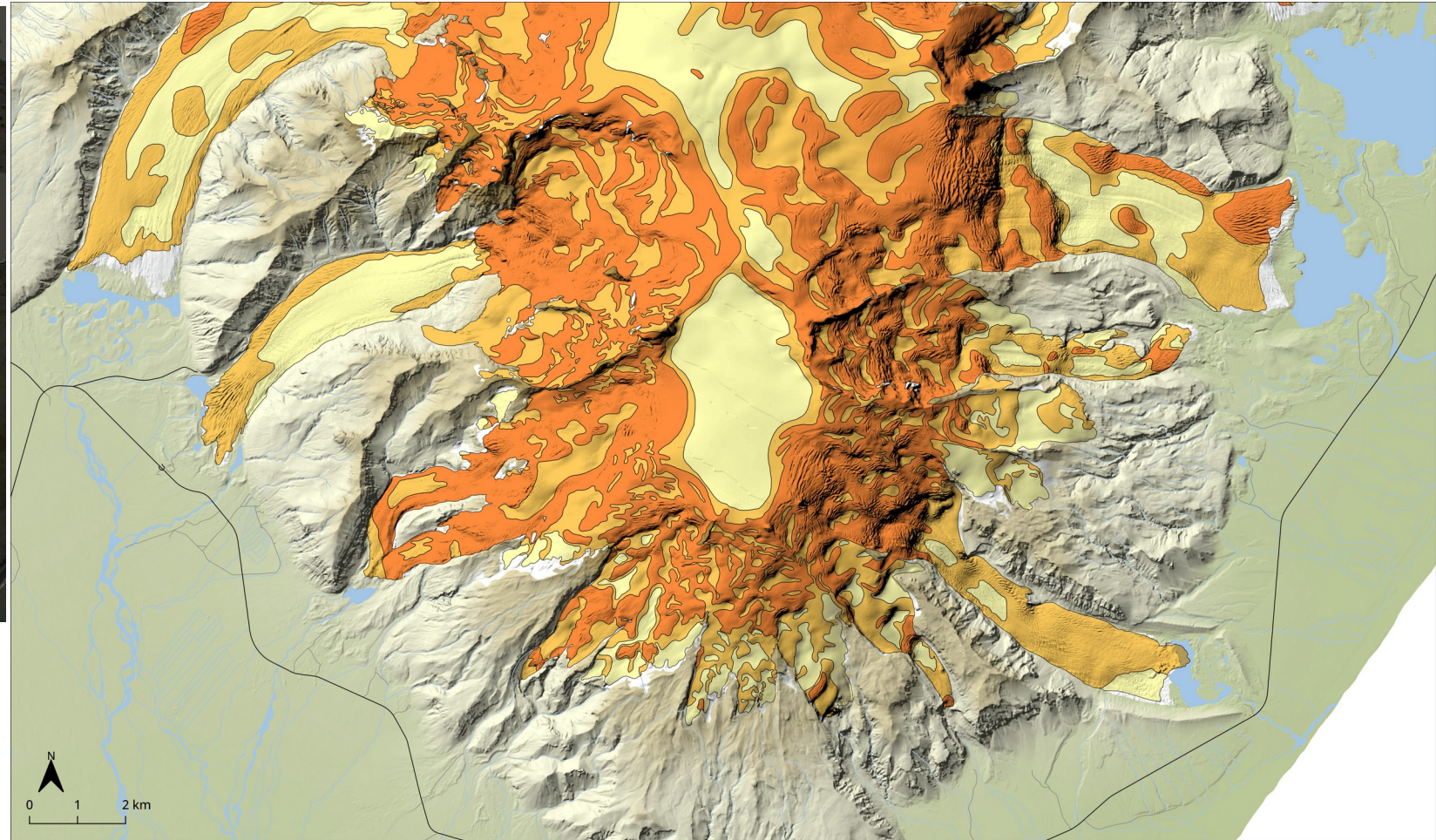
Monitoring of geothermal areas



Flooding in Múlavísl in 2011 from a geothermal area



Pléiades surveys for crevasse mapping



ÖRÆFAJÖKULL

Flokkun sprungusvæða | Crevasse zones

- Lítið sprunginn jökull | Small crevasses
- Mjög sprunginn jökull | Very crevassed area
- Breiðar sprungur og mjög hættuleg svæði | Wide crevasses and very dangerous area

Kortlagning sprungusvæða er að mestu leyti byggð á gervihnatta- og loftmyndum teknum síðsumars og fram á haust þegar snjóbekja er minni. Notaðar eru útlínur jökla haustið 2025 og jökulsker eru einnig sýnd. Gögnin eru uppfærð á nokkurra ára festi, núverandi útgáfa er frá árinu 2025.

Tekió er á móti upplýsingum um nýjar sprungur á netfanginu jokulsprungur@vedur.is Sprungukortin eru ætíð aðeins til hliðsjónar fyrir jökulferðalanga en ábyrgð liggur alltaf í höndum þeirra sem ferðast á jökli, en aðstæður geta breyst fyrirvaralaust.

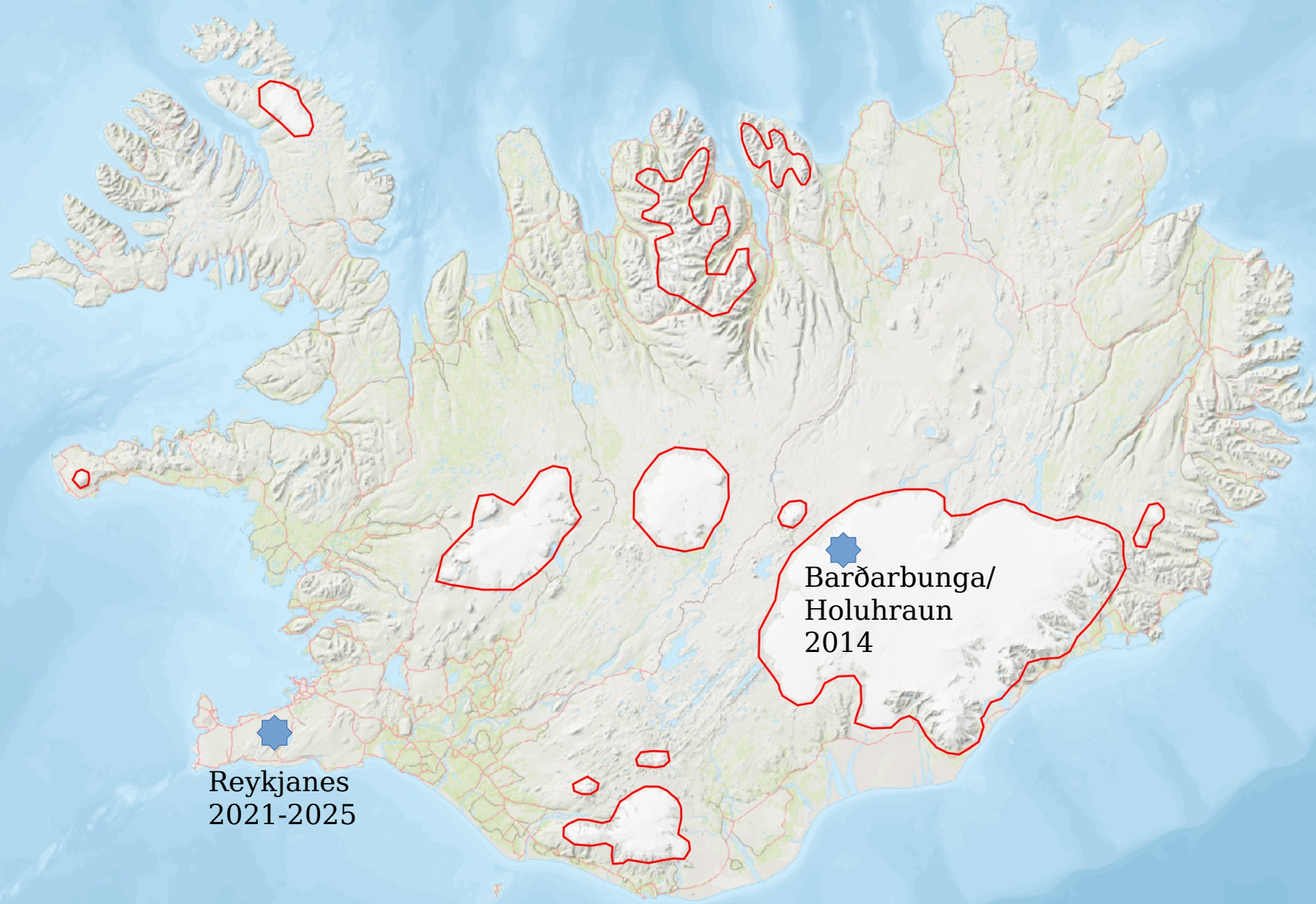
The crevasse mapping is based on variety of remote sensing data, satellite and aerial imagery of late summer and fall when the glaciers have least amount of snow cover. The glacier outlines of 2025 is used and nunataks are also shown. The data set is updated very other year approximately and the current version is from the year 2025.

Information about new crevasses can be forwarded to the following email: jokulsprungur@vedur.is. The crevasse maps are intended as guidelines for glacier travels, conditions can change fast, travel at own risk.

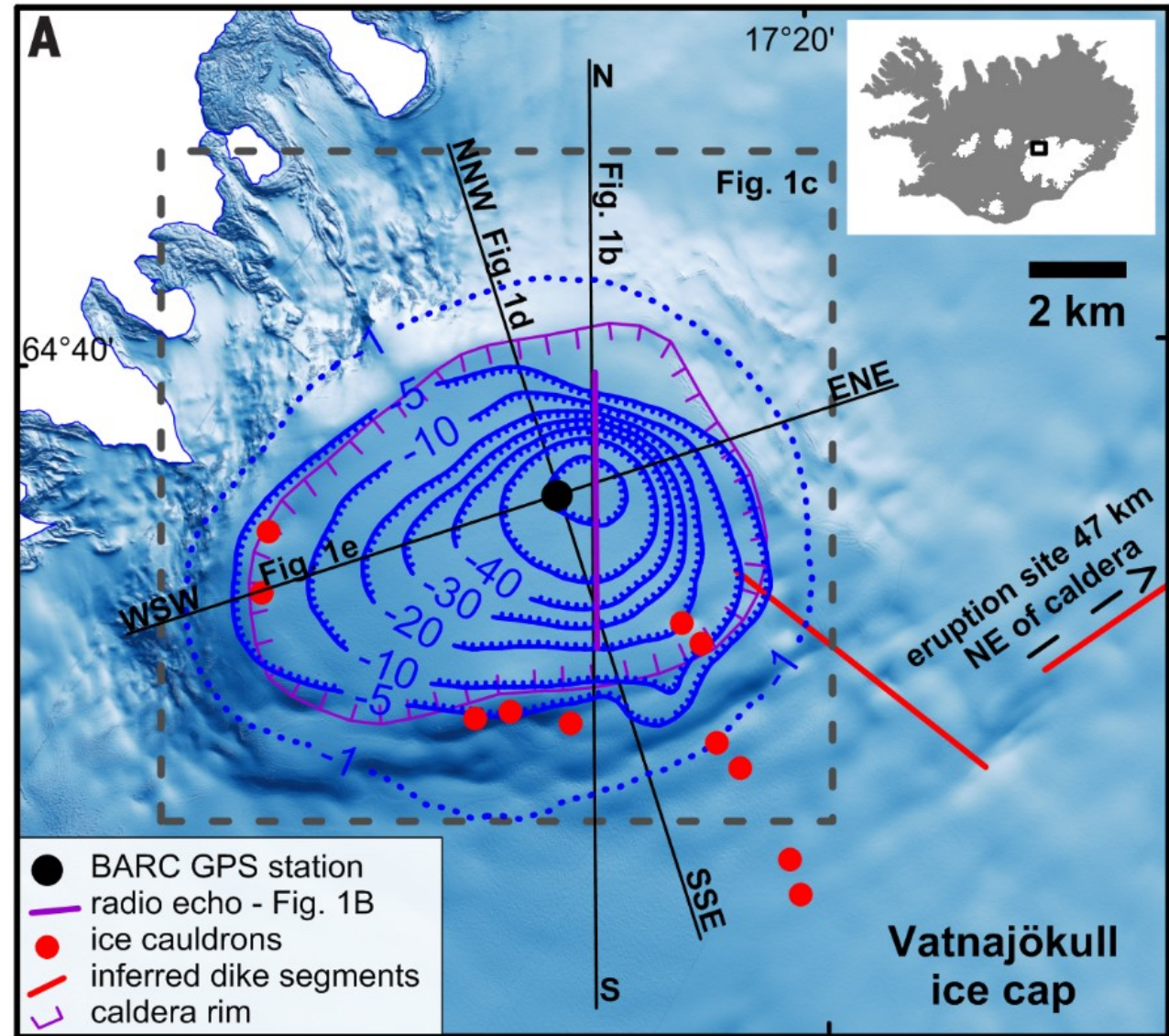
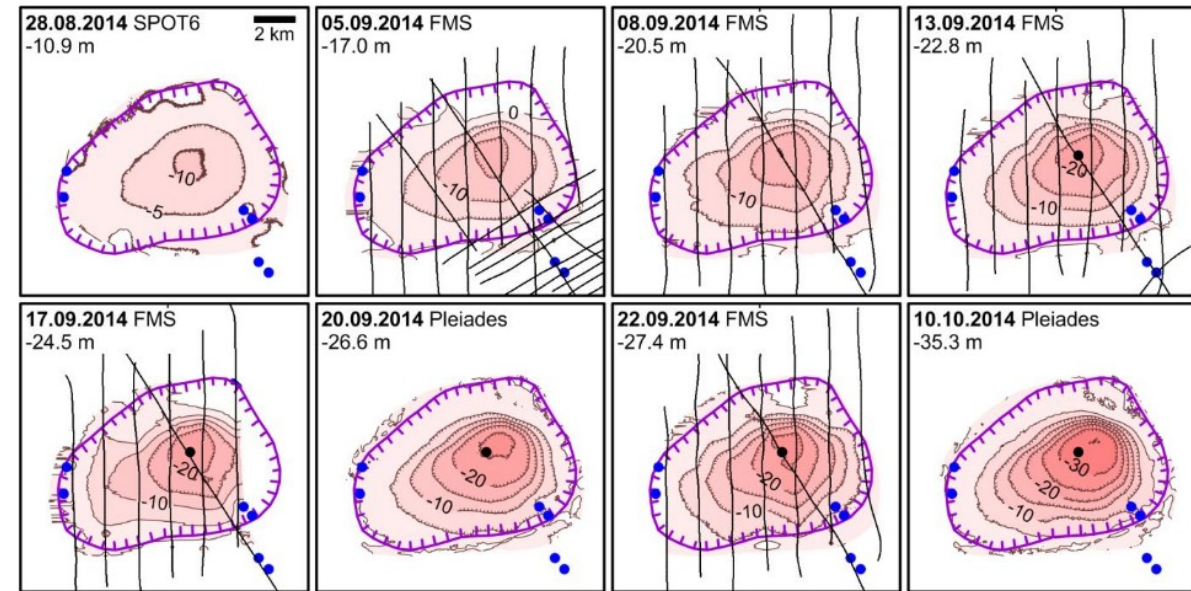
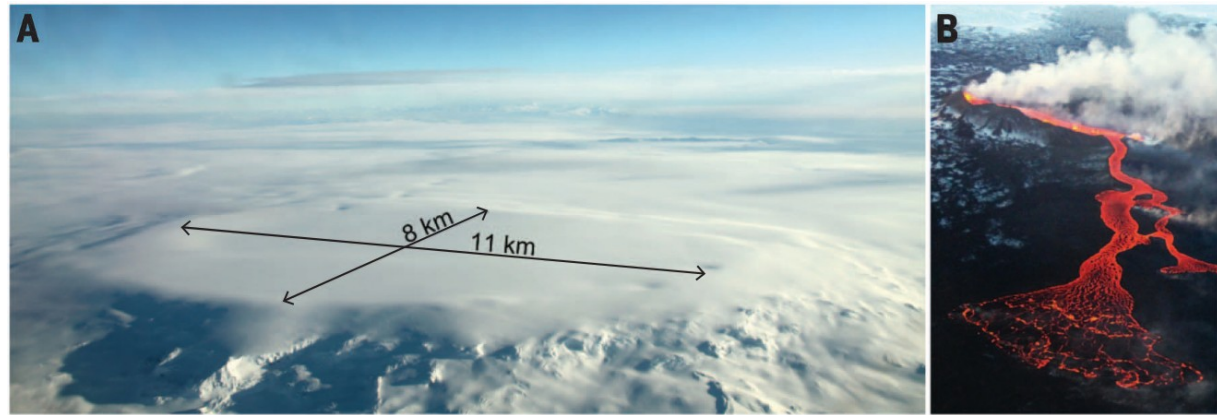


Hrafnhildur Hannesdóttir & Ragnar H. Þrastarson

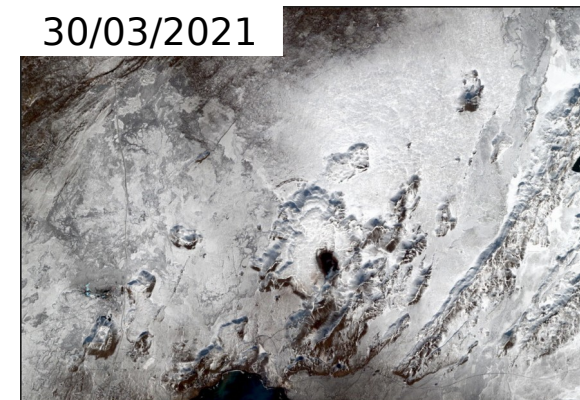
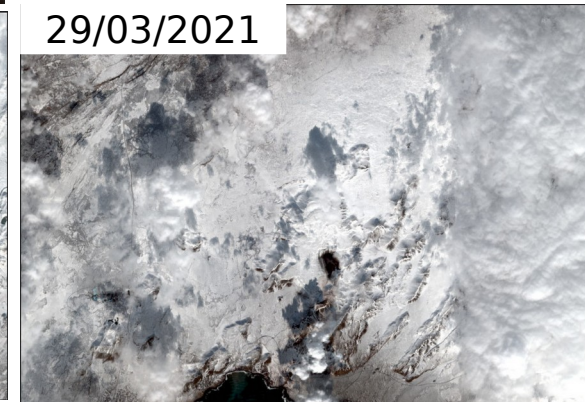
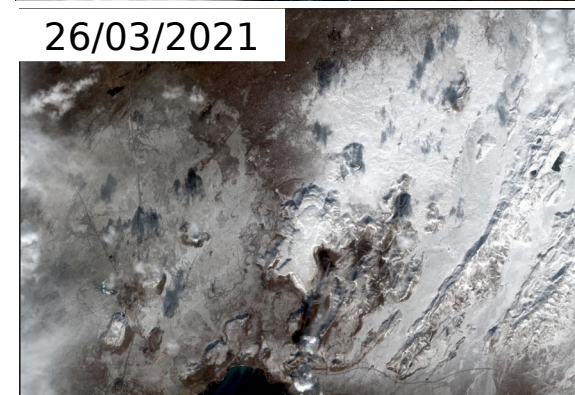
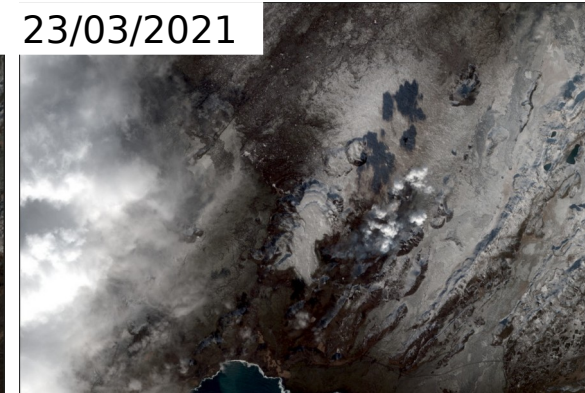
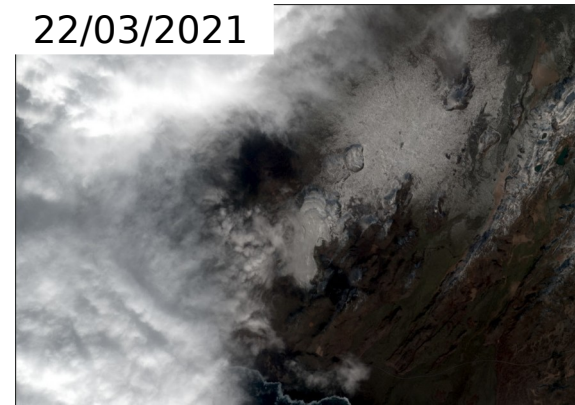
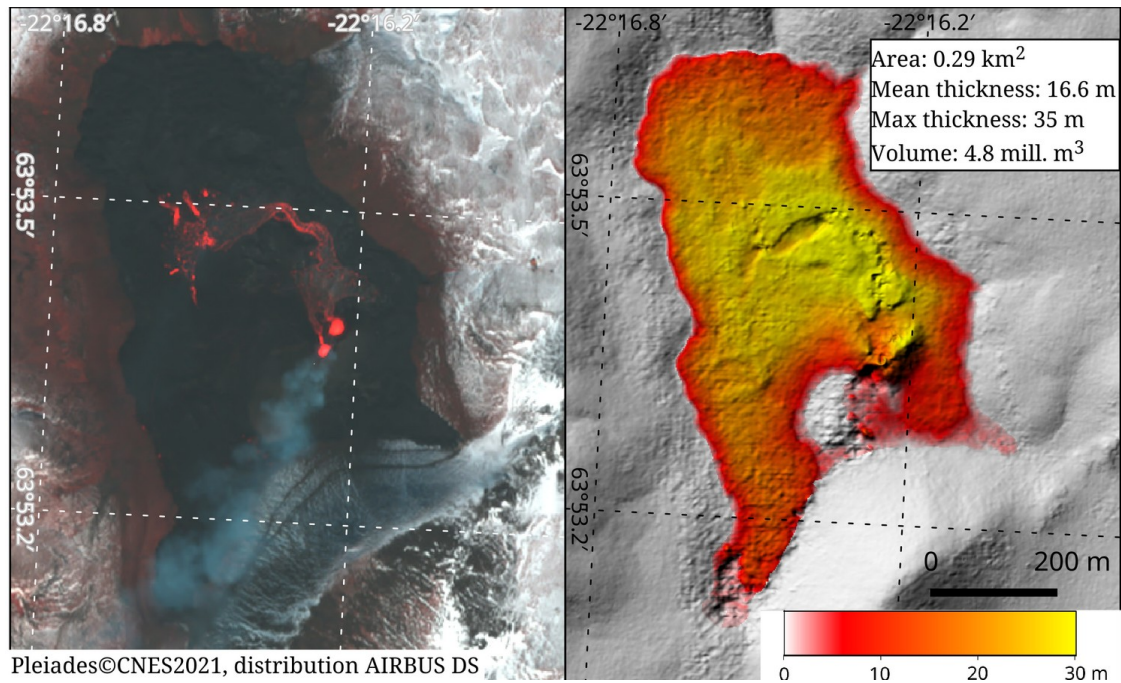
Volcanic eruptions measured by Pléiades



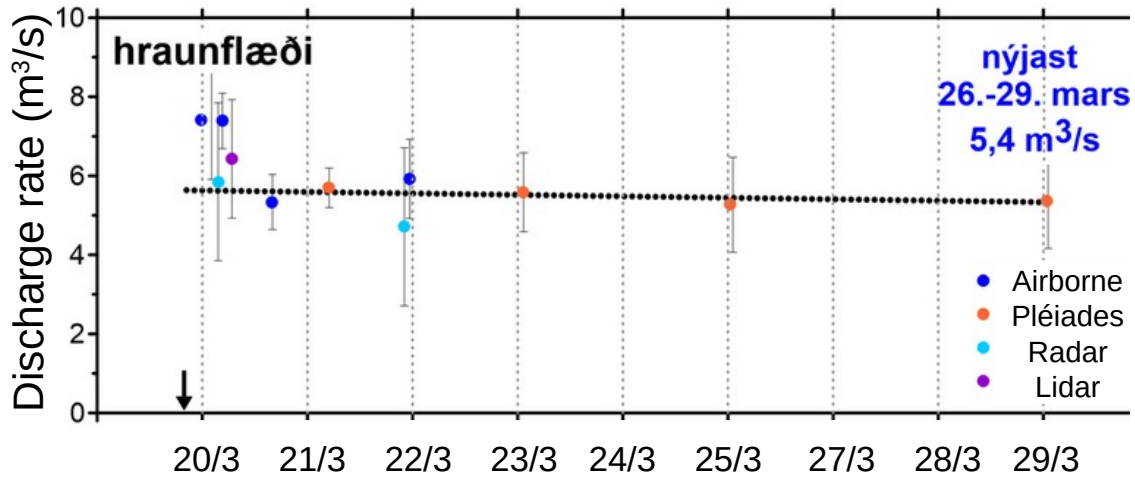
Volcano monitoring: 2014 Bárðarbunga/Holuhraun



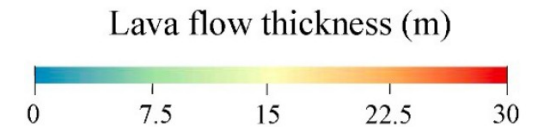
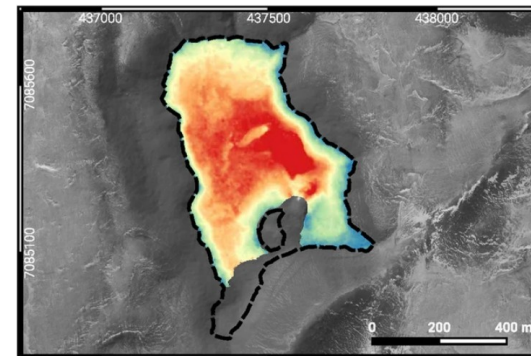
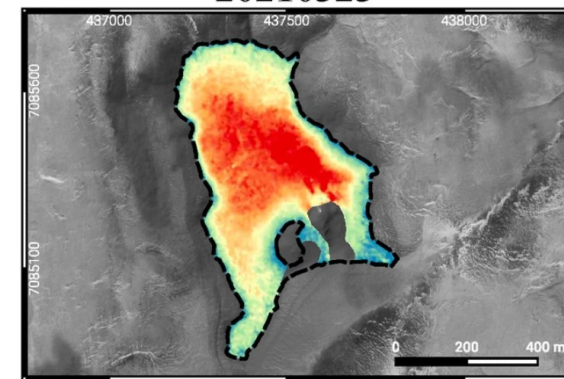
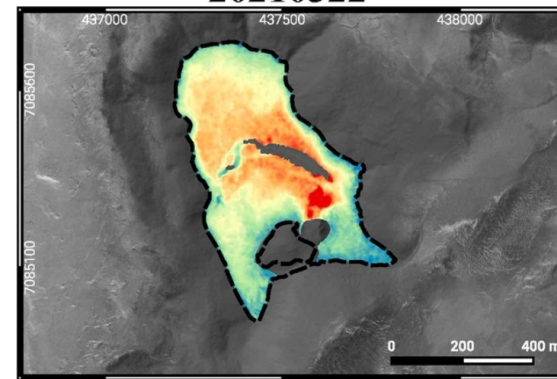
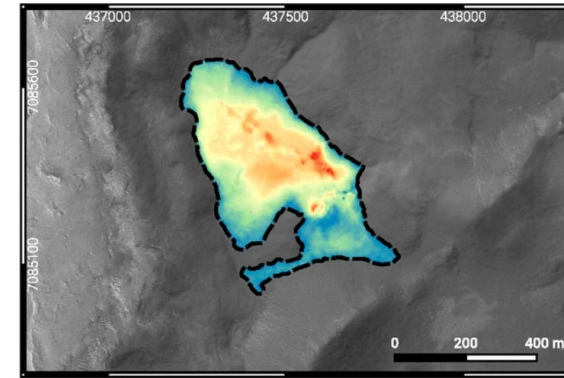
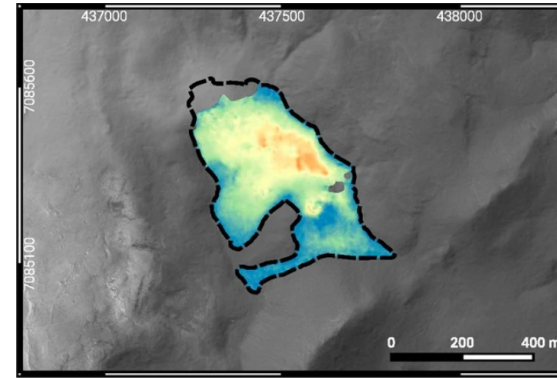
Volcano monitoring: 2021-2025 Reykjanes (CIEST2)



Volcano monitoring: 2021-2025 Reykjanes



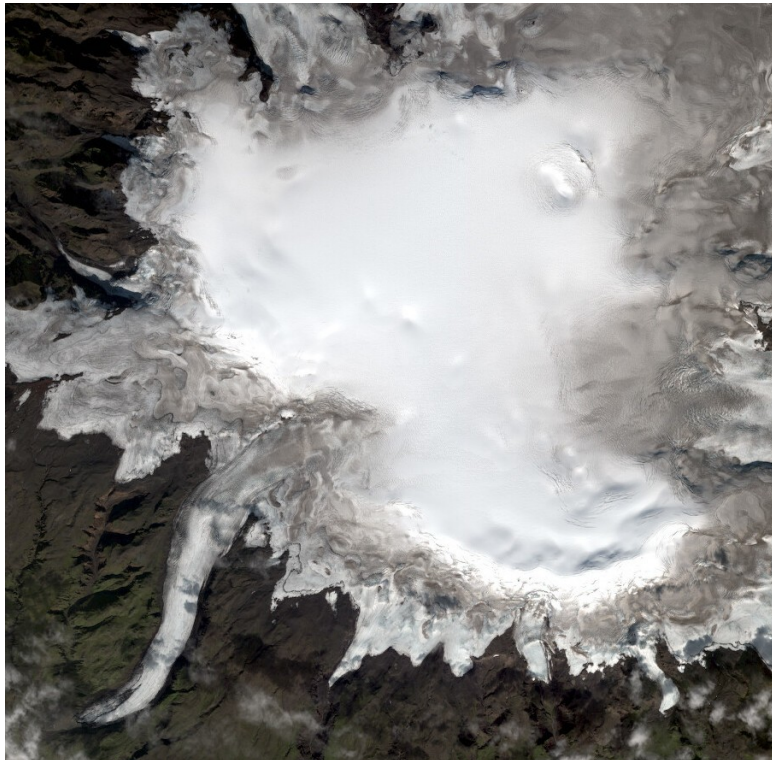
Gouhier et al., 2022, *Journal of Applied Volcanology*



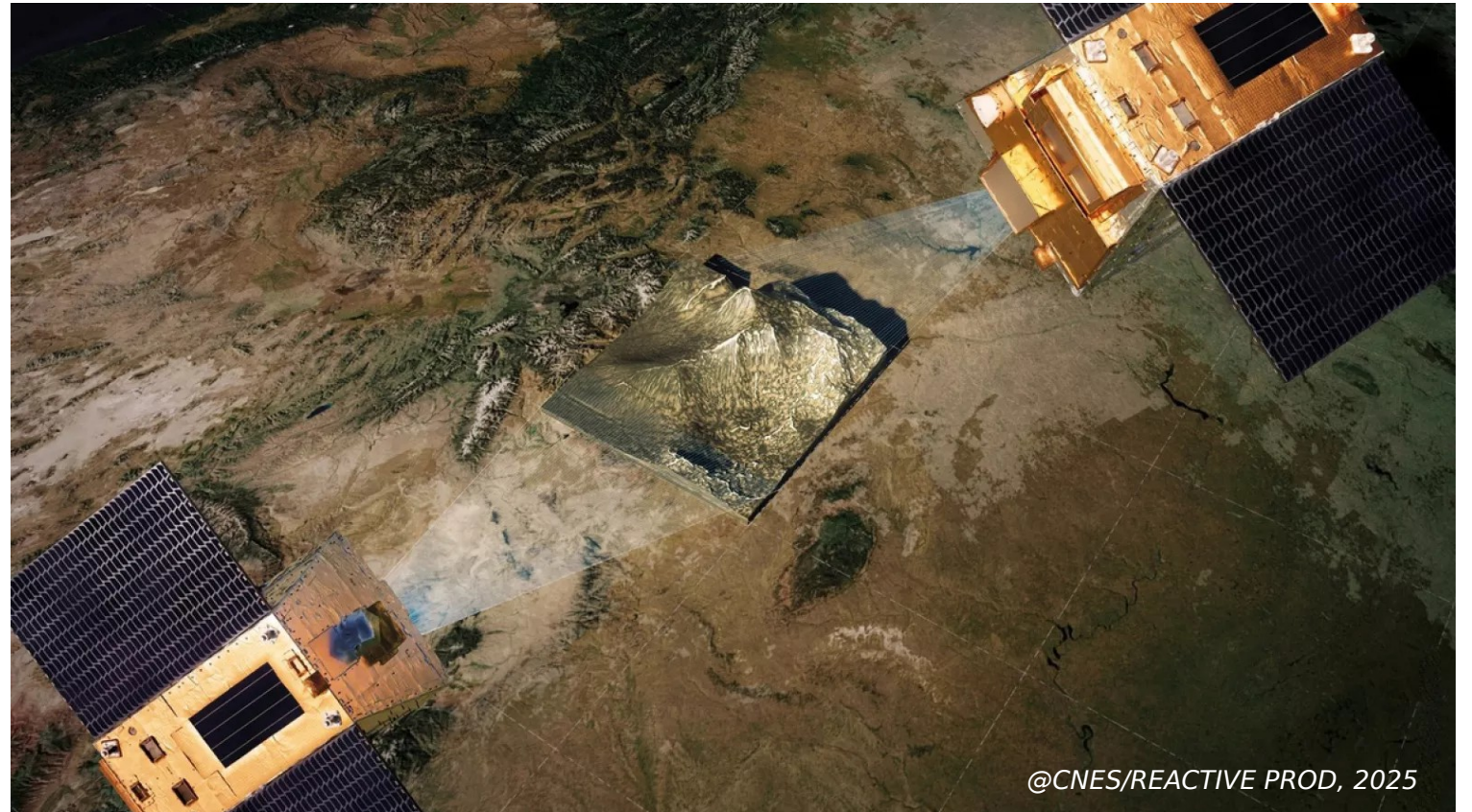
Perspectives

Pléiades will continue for ~2 more years before decommissioning. Archive from 2013 – present is going to be fully open.

CO3D successfully launched last year, and will continue many of the functions from Pléiades



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Thank you!