

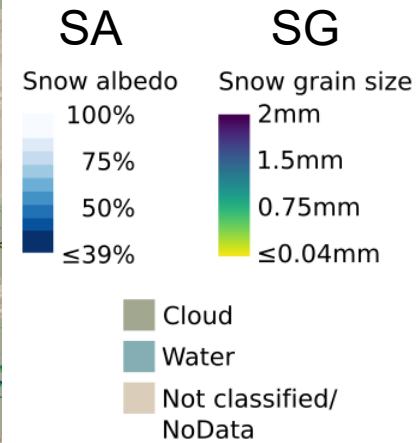
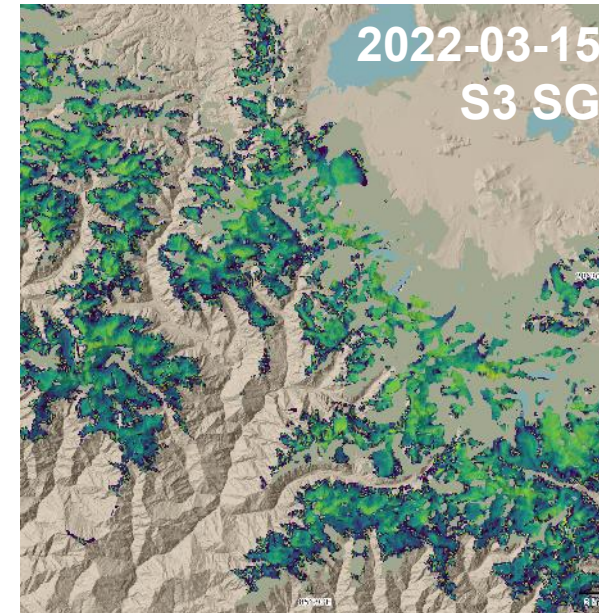
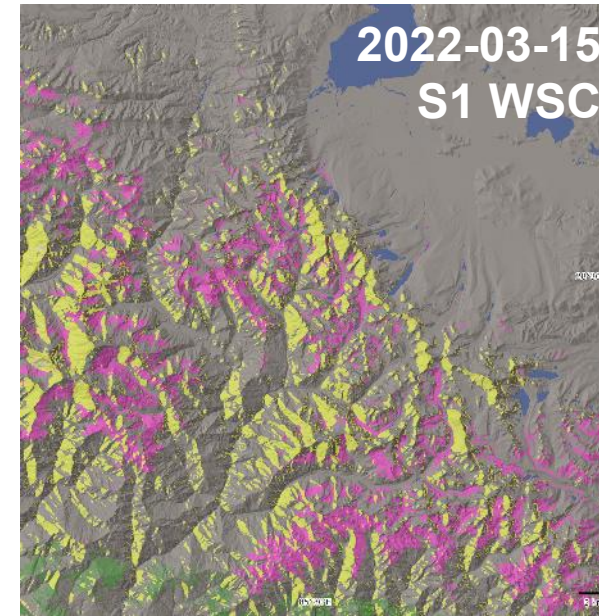
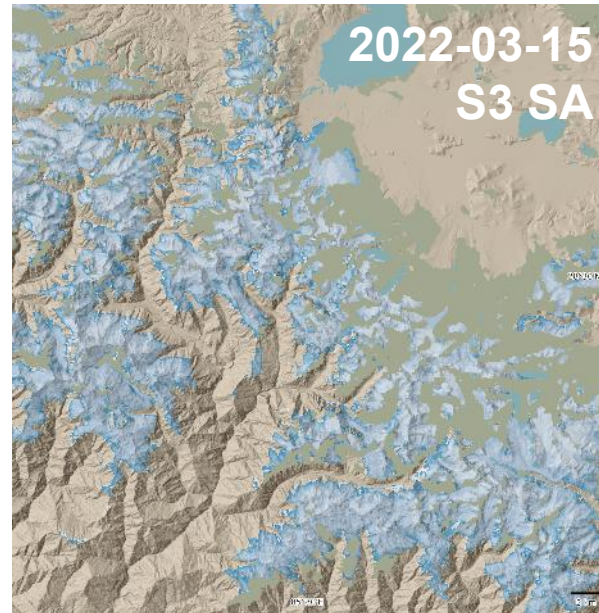
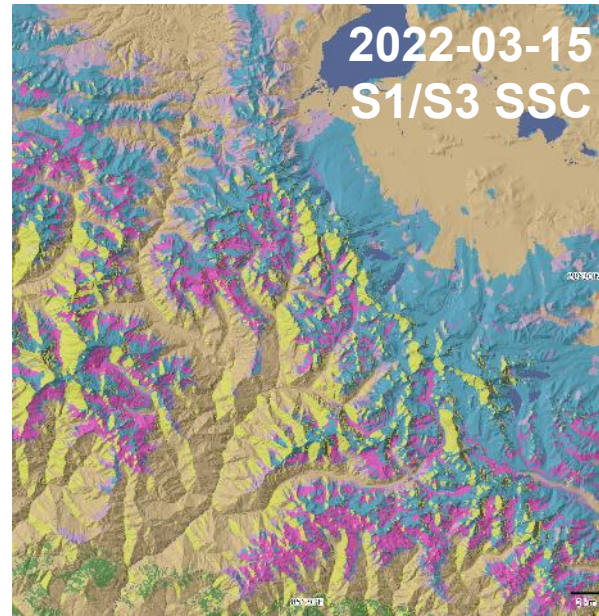
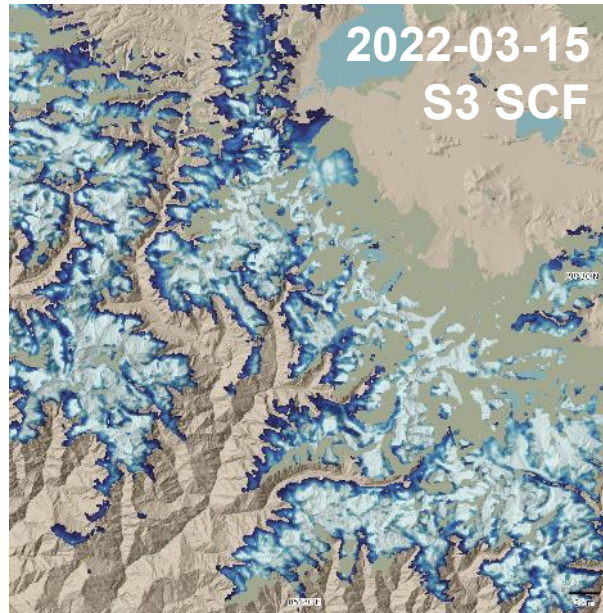
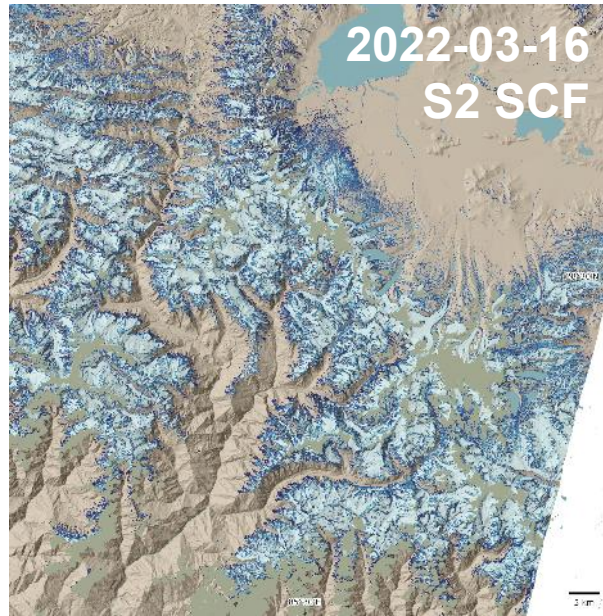
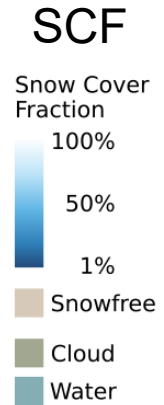
Extension of the AlpSnow products to INARCH sites

Gabriele Schwaizer, Nico Mölg,
Thomas Nagler, Maria Heinrich (ENVEO),
Carlo Marin, Mattia Callegari, Claudia Notarnicola (EURAC)
Fall INARCH Workshop

Generation of harmonised snow product portfolio for each INARCH region for the COPE period 2022 – 2024 from Sentinel-1 (S1), Sentinel-2 (S2) and Sentinel-3 (S3) satellite data:

- **Snow Cover Fraction (SCF):** 0.00200 deg × 0.00200 deg, daily (S3 SLSTR & OLCI)
- **Snow Albedo (SA):** 0.00200 deg × 0.00200 deg, daily (S3 OLCI)
- **Snow Grain size (SG):** 0.00200 deg × 0.00200 deg, daily (S3 OLCI)
- **Snow Cover Fraction (SCF):** 0.00020 deg × 0.00020 deg, 5 d repeat pass (S2 MSI)
- **Wet Snow Map (WSM):** 0.00100 deg × 0.00100 deg, 12 d repeat pass, 2 layers:
 - *Wet Snow Classification (WSC)* (S1 SAR)
 - *Snow State Classification (SSC)* (S1 WSC & S3 SCF combined)

Satellite snow product examples – Nepal, Langtang



- Prototype of harmonised snow product portfolio for the year 2022 generated for selected INARCH sites
- Product generation for all INARCH sites for the full COPE period (2022 – 2024) ongoing
- To get access to the prototype satellite snow products, please contact Gabriele Schwaizer / ENVEO: gabriele.schwaizer@enveo.at
- Final products will be provided via SpatioTemporal Asset Catalog (STAC)

Next steps and request for feedback



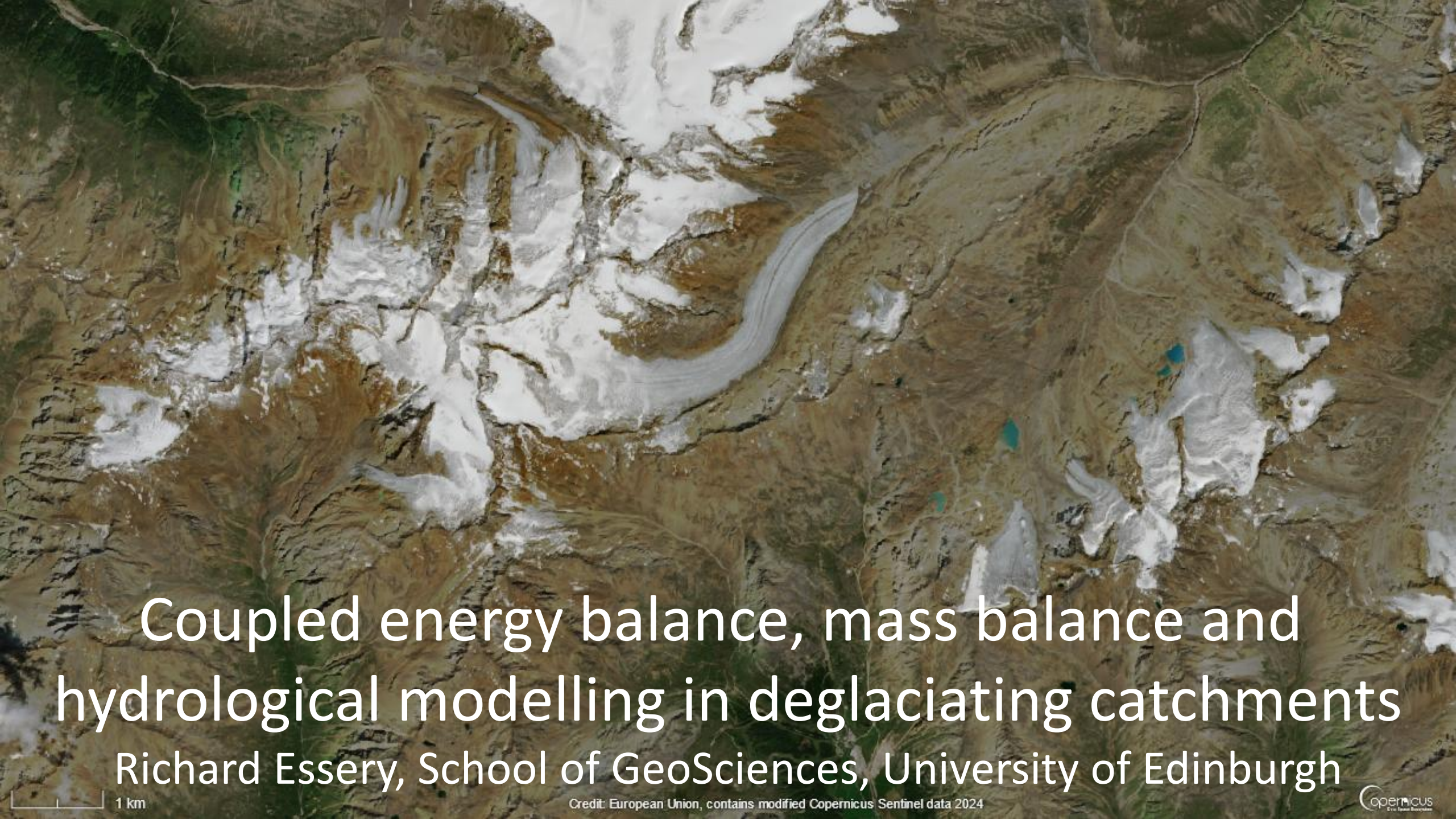
- Access to in-situ data from selected INARCH sites kindly requested (see email from Gabriele Schwaizer / ENVEO of 14.08.2026)
 - Available in-situ data from selected INARCH sites will be used as reference for quality assessment of satellite snow products
 - Please send any feedback on prototype satellite snow products to ENVEO
 - Report any identified gaps in satellite snow products to solve urgent scientific questions to ENVEO
- *Feedback on prototype products and quality assessment results will be considered for the generation of the final satellite snow product portfolio*



Contacts: [*gabriele.schwaizer@enveo.at*](mailto:gabriele.schwaizer@enveo.at)

[*thomas.nagler@enveo.at*](mailto:thomas.nagler@enveo.at)

[*https://alpsnow.enveo.at*](https://alpsnow.enveo.at)



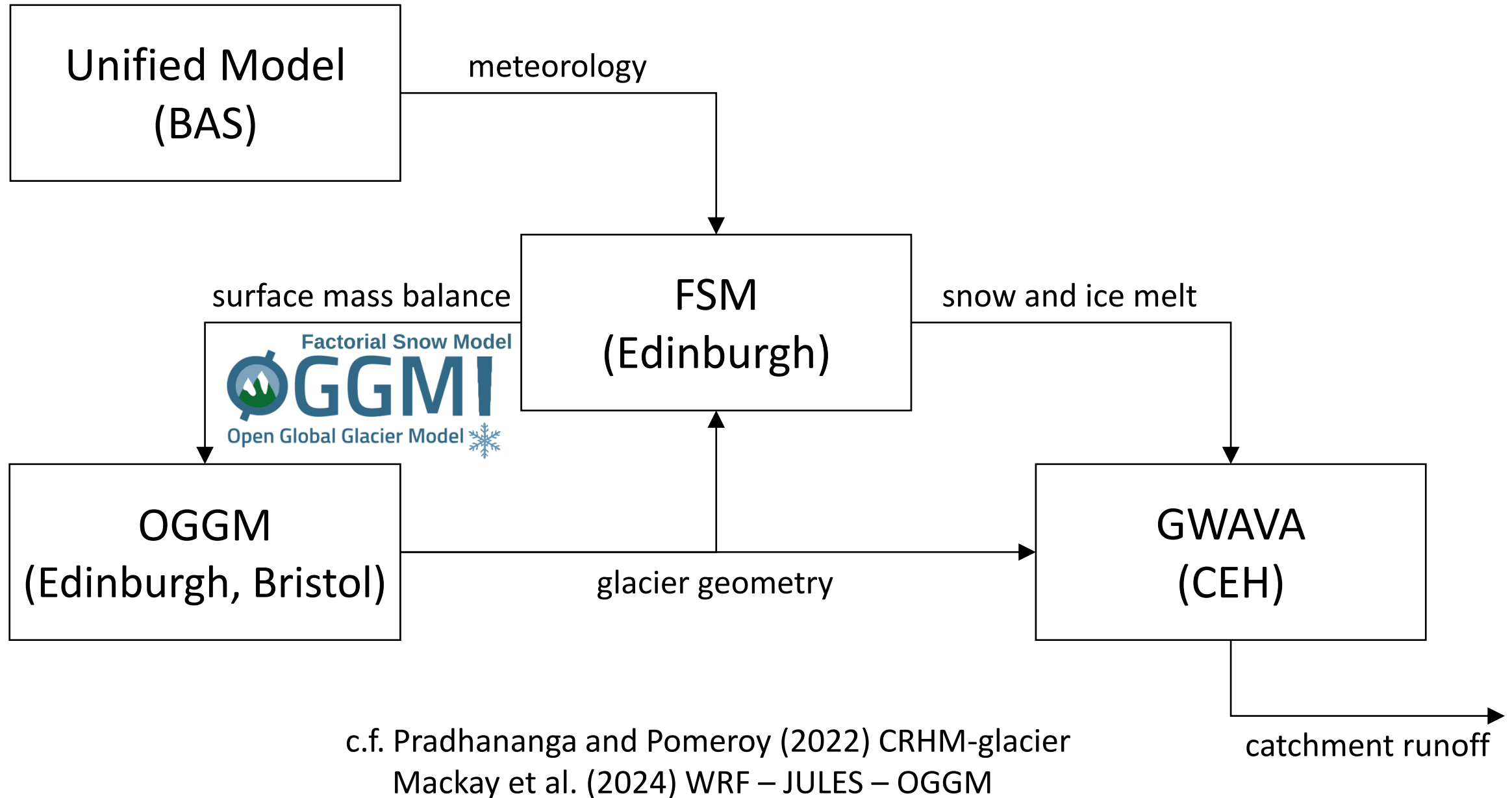
Coupled energy balance, mass balance and hydrological modelling in deglaciating catchments

Richard Essery, School of GeoSciences, University of Edinburgh

1 km

Credit: European Union, contains modified Copernicus Sentinel data 2024

NERC Highlight Topic Big Thaw modelling chain



Energy balance v. temperature-index models for glacier mass balance

$$\text{Temperature-index melt } M = \text{DDF} \times \min(T - T_0, 0)$$

- more common in glacier models (9 out of 11 in GlacierMIP2)
- more often run with monthly rather than daily inputs in glacier models

$$\text{Energy balance melt } M = [(1 - \alpha)SW + \varepsilon(LW - \sigma T_s^4) - G - H - L_s E] / L_f$$

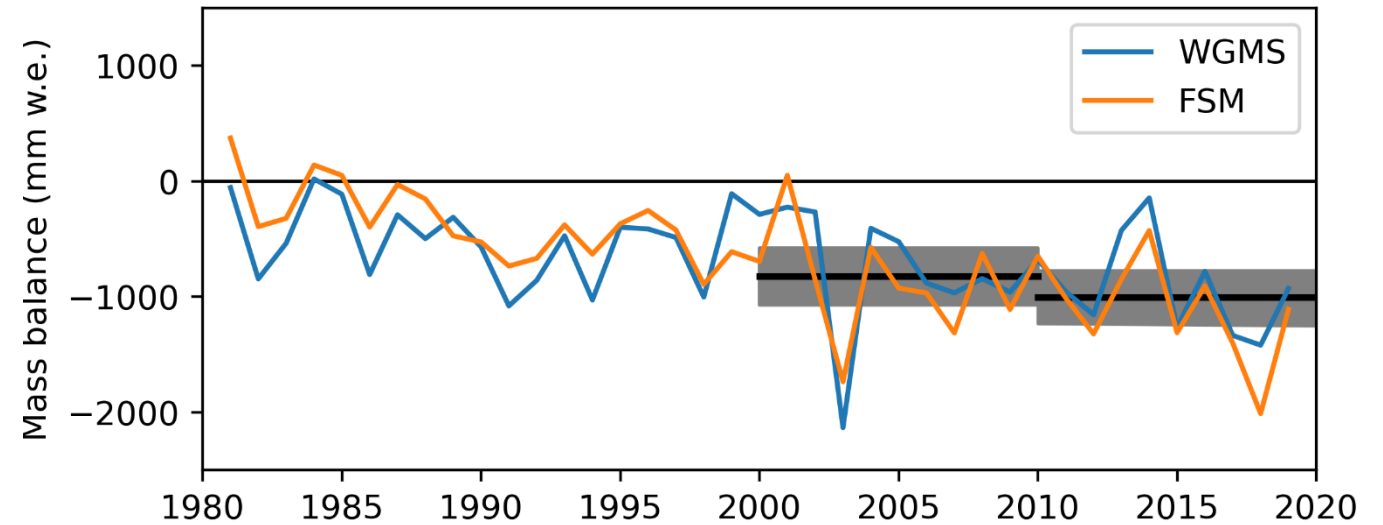
- required for surface boundary conditions in Earth System Models
- can distinguish between melt and sublimation
- more complex (1000 lines of Fortran c.f. 8 lines of Python)
- higher data requirements ($5000 \times$ input data volume) – but global reanalyses can provide
- more meteorological variables to downscale – but high resolution NWP is available for some regions
- more parameters to calibrate (16 c.f. 4) – but they are (more) physically meaningful and measurable
- longer run times ($\times 1000$) – but trivially parallelizable, and only ~ 0.25 s per glacier per year

Annual glacier mass balances: Rofental, Austria

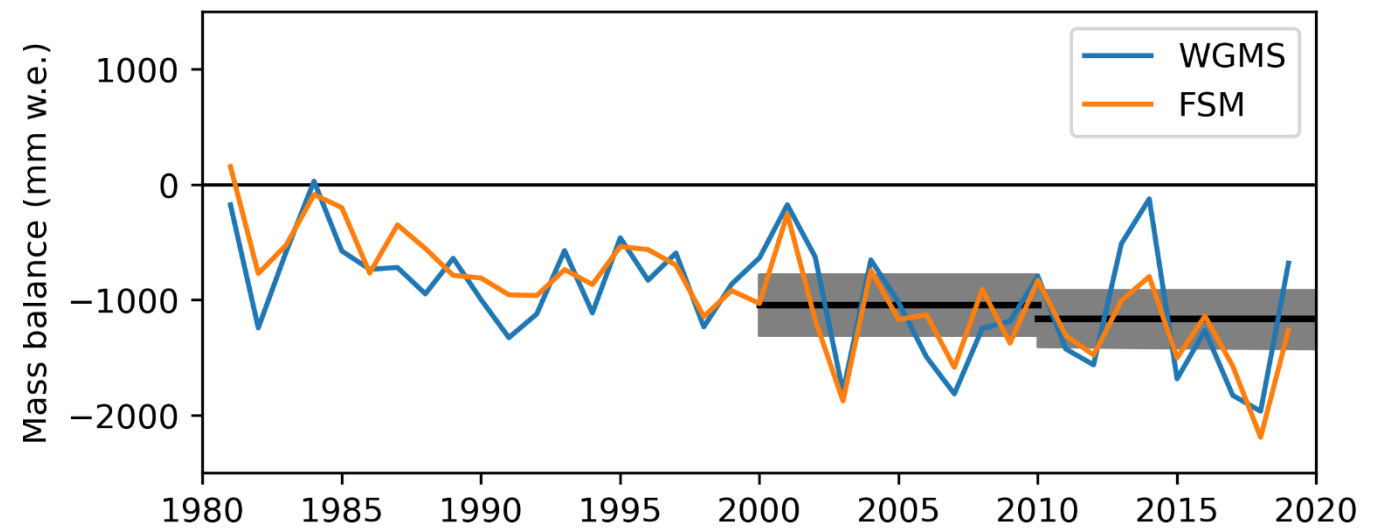


10 km

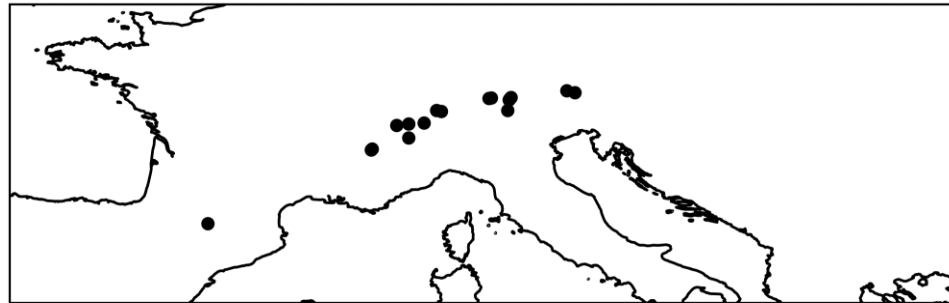
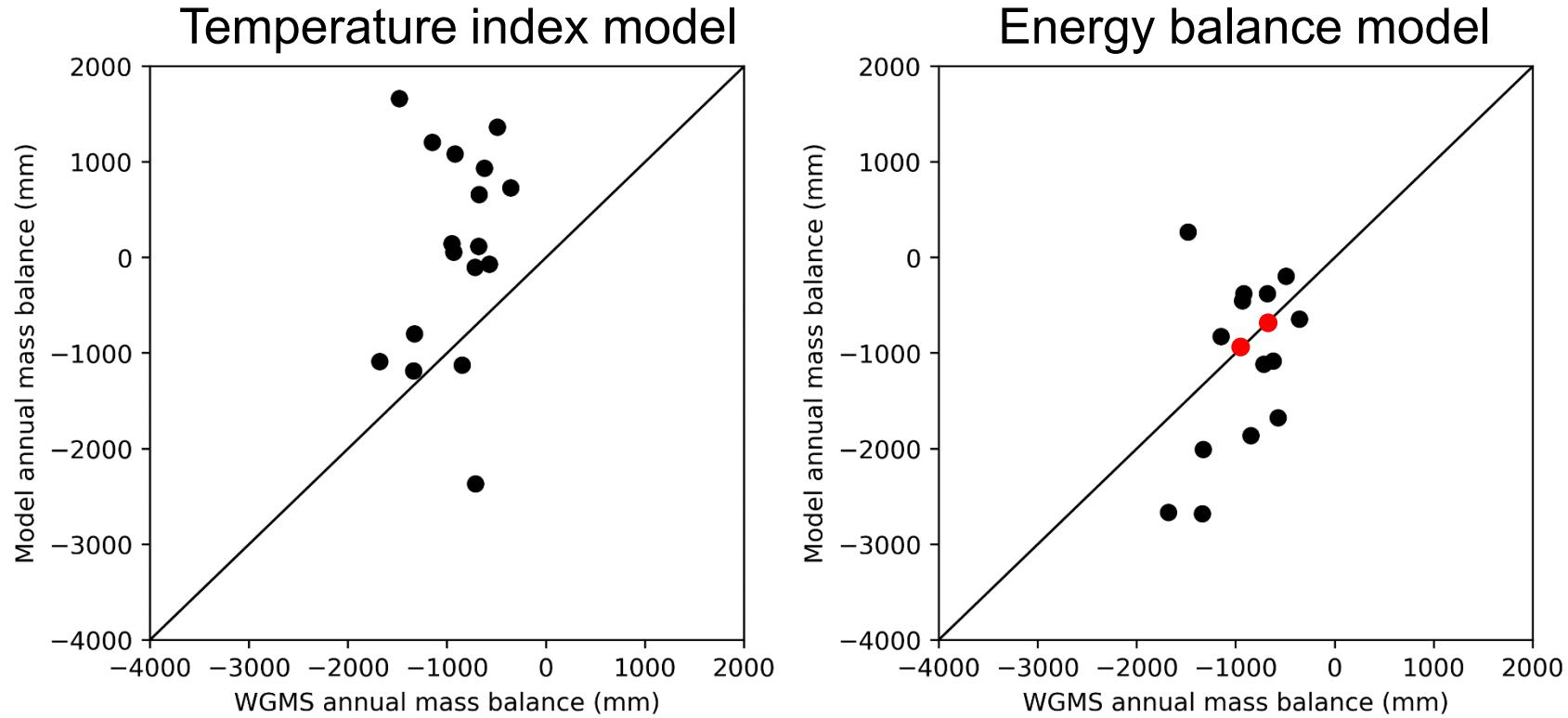
Vernagtferner



Hintereisferner



Uncalibrated mass balance models: WGMS reference glaciers

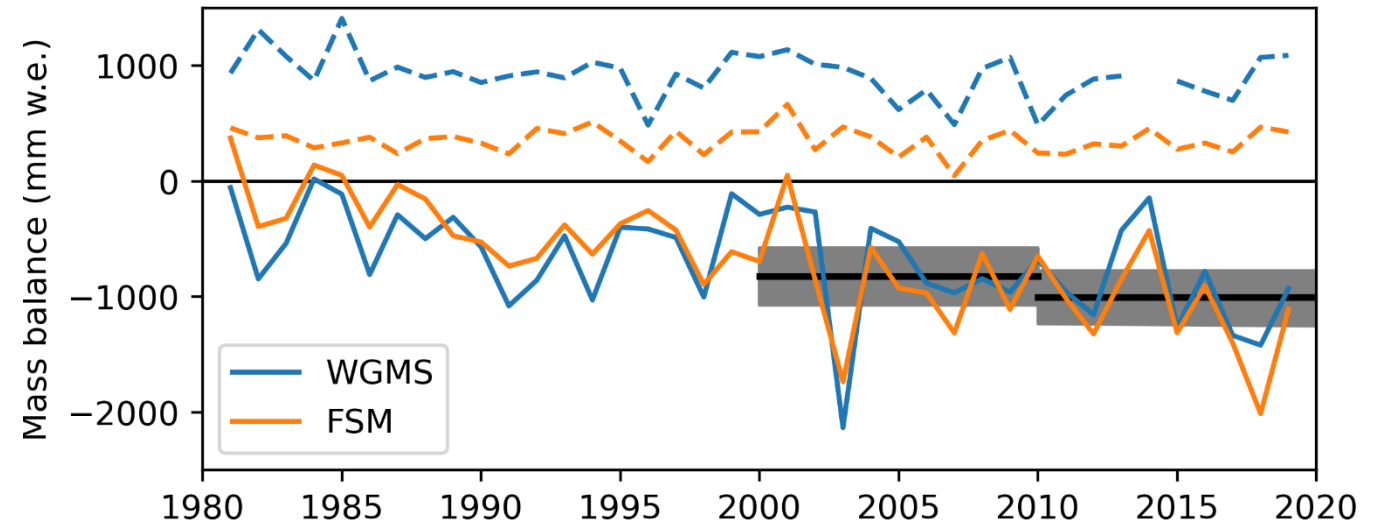


Annual and winter mass balances

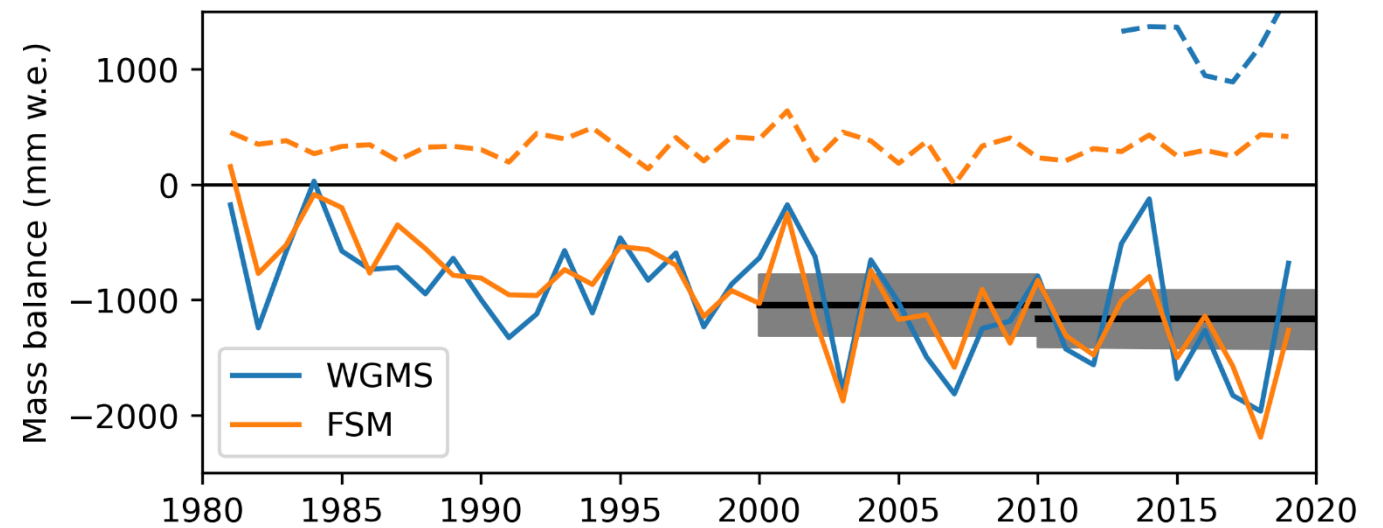


10 km

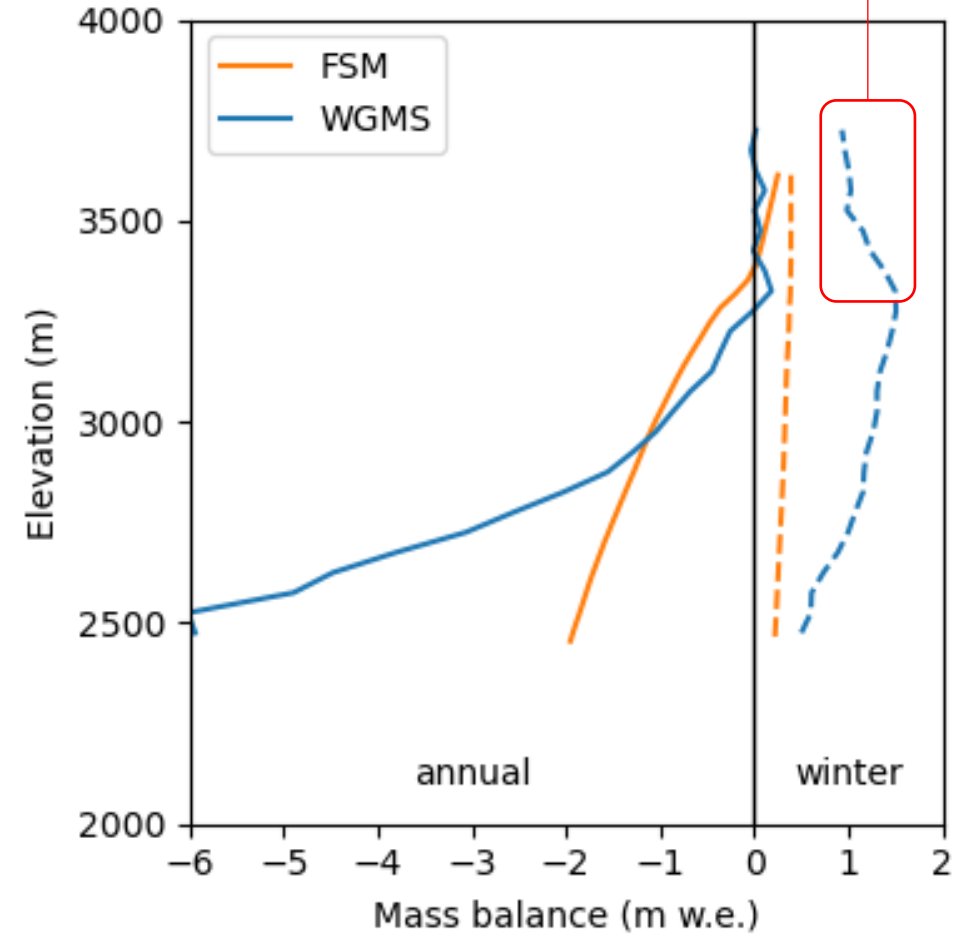
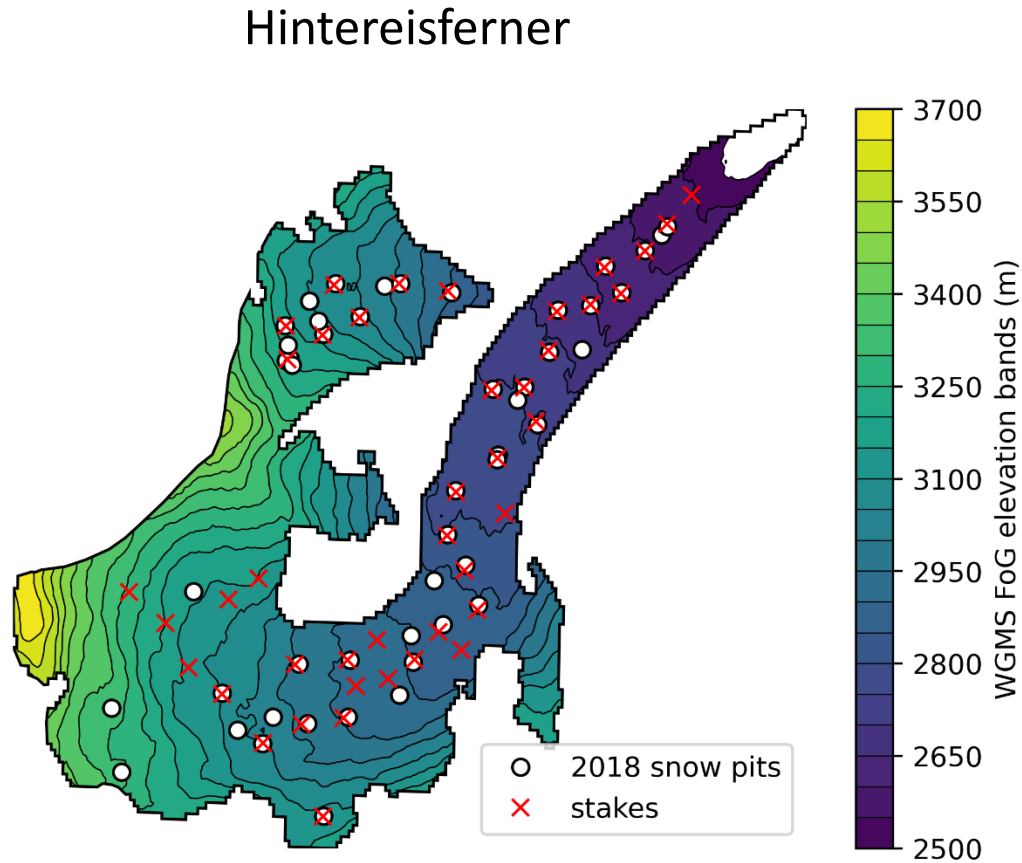
Vernagtferner



Hintereisferner



Measured and simulated mass balance profiles

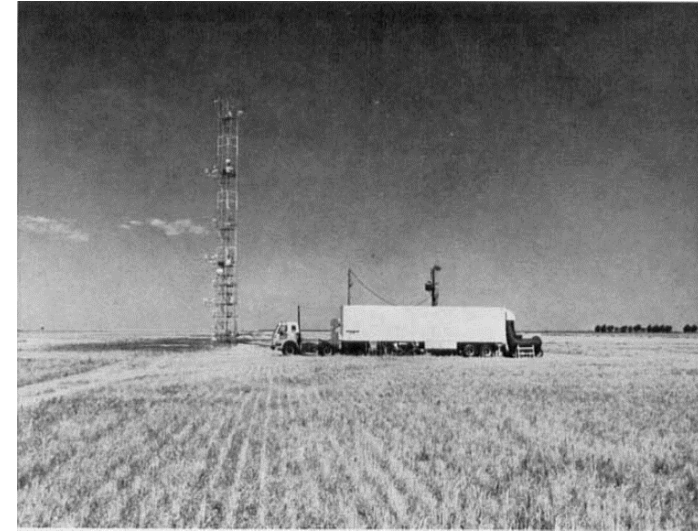


Classic surface layer field experiments: spot the difference

New South Wales: Dyer and Hicks (1970)



Kansas: Businger et al. (1971)



Netherlands: Beljaars and Holtslag (1991)



2nd Hintereisferner Experiment: Nicolson et al. (2025)



Scottish mountain hydrometeorology

