WGMS

National and global glacier monitoring efforts a comparative assessment

Boost in observations from remote-sensing data

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Glacier mass changes

Glaciological sample

~ 500 glaciers

~ 7,800 observations

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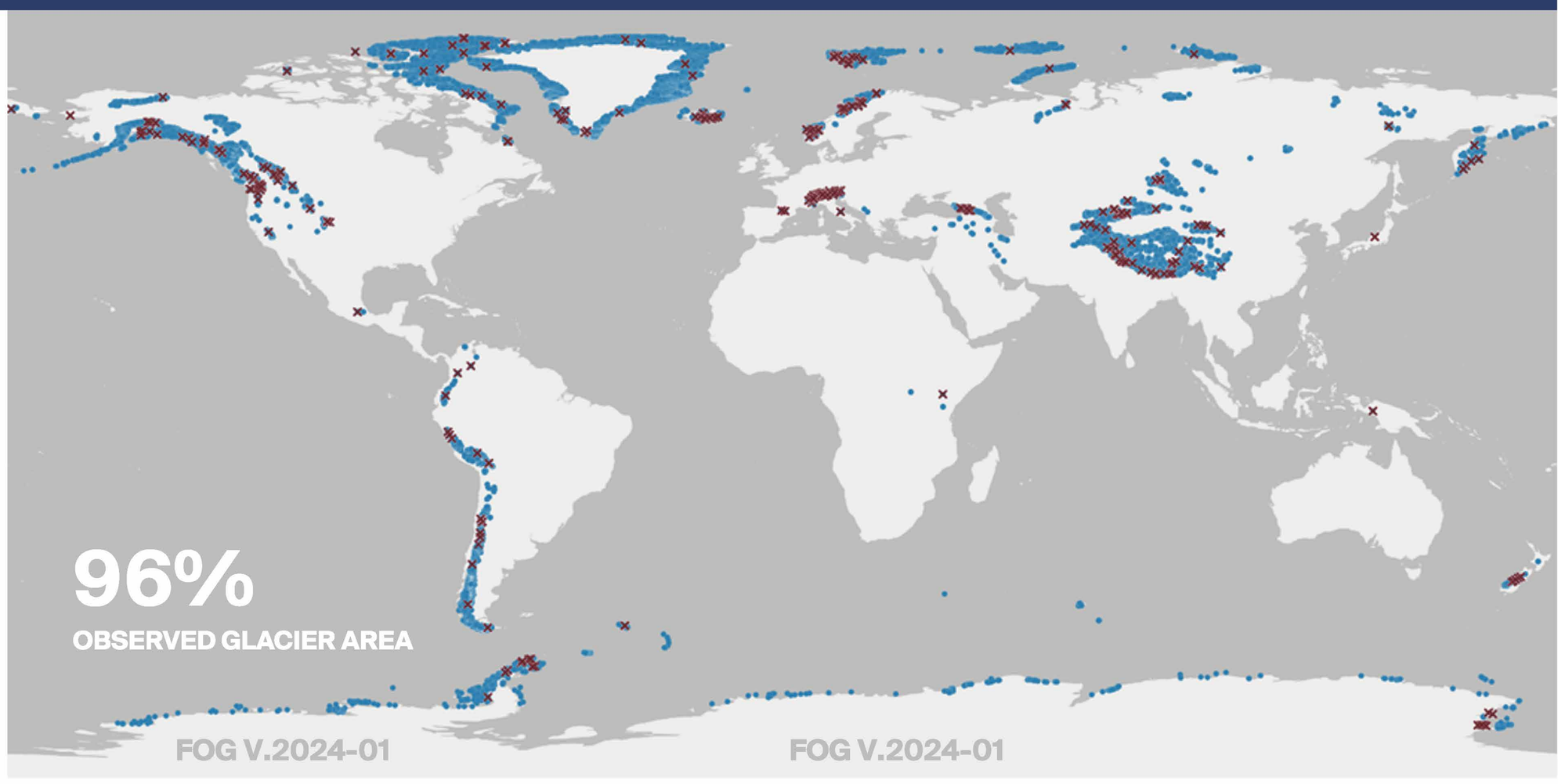
Glacier elevation changes

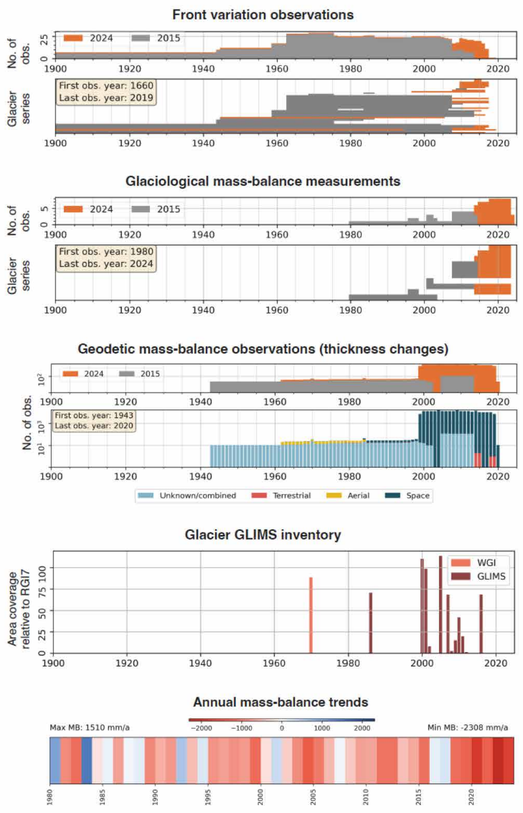
Geodetic sample

~ 210,000 glaciers

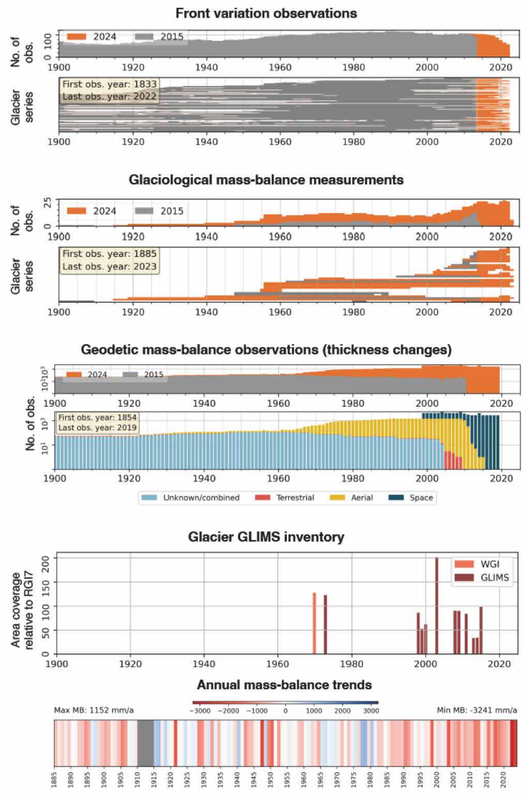
> 1 million observations



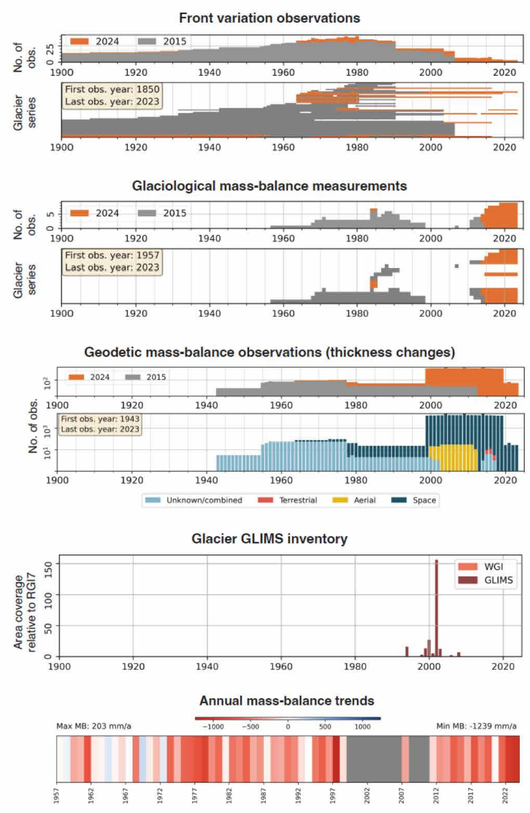
Glacier monitoring: Argentina



Glacier monitoring: Switzerland



Glacier monitoring: Kyrgyzstan



References

Dussaillant, I., R. Hugonnet, M. Huss, E. Berthier, J. Bannwart, F. Paul, and M. Zemp (2025): Annual mass changes for each glacier in the world from 1976 to 2023. Earth System Science Data, in press.

Gärtner-Roer, I., S. U. Nussbaumer, F. Hüsler, and M. Zemp (2019): Worldwide assessment of national glacier monitoring and future perspectives. Mountain Research and Development, 39(2), A1–A11.

Haeberli, W., J. Cihlar, and R. G. Barry (2000): Glacier monitoring within the Global Climate Observing System. Annals of Glaciology, 31, 241–246.

WGMS (2023): Global Glacier Change Bulletin No. 5 (2020–2021). M. Zemp, I. Gärtner-Roer, S. U. Nussbaumer, E. Z. Welty, I. Dussaillant, and J. Bannwart (Eds.), ISC(WDS)/IUGG(IACS)/UNEP/UNESCO/WMO, World Glacier Monitoring Service, Zurich, 134 pp.

Background

The World Glacier Monitoring Service (WGMS) and its global network of collaborators maintain a comprehensive programme of ongoing glacier change. The dataset serves as an increasingly important basis for fundamental glacier research and various applications at local, regional, and global scales. Knowledge of glacier distribution and quantification of glacier change is crucial for assessing the impact of glacier shrinkage on regional freshwater availability, local geohazards, tourism, sites of cultural significance, and global sea levels. Therefore, glacier monitoring is essential for the development of sustainable adaptation strategies in regions wherever glaciers (still) exist.

Approach

We assess the status of glacier monitoring in each country in 2025 and compare it to the 2015 baseline (Gärtner Roer et al. 2019). During this time, surface elevation changes derived from satellite data reached nearly global coverage. In addition, temporal but also spatial gaps could be filled by adding new glaciological in situ series thanks to data rescue efforts.

First results

Traditional glacier monitoring, based on in situ measurements, has grown over more than a century.

This historical background, with some very long series, but only of single glaciers, is today complemented and massively extended by the remote sensing approach. In addition, glacier modelling, which uses both sources as input, provides us with further insights and serves as a validation of these two sources.

Outlook

With the advent of new datasets, such as those derived from satellites, information on glaciers transcends national boundaries. However, limited funding often hampers the long term monitoring of glaciers, regardless of data source.

Examples of country factsheets

For each country, we describe the number of observed glaciers and total number of observations available in the WGMS Fluctuat ion s of Glaciers (FoG) database for the following observation types: front variation, glaciological surface mass balance, and geodetic surface elevation change. In addition, we review the availability of glacier outline inven tor ies and the annual mass balance trend (based on Dussaillant et al. 2025) in each country.

Switzerland.

2025 International Year of Glaciers' Preservation

Universität Zürich[UZH]

Country profiles

Link to selected country factsheets: