Geophysical Research Abstracts
Vol. 18, EGU2016-10891, 2016
EGU General Assembly 2016

Internationally coordinated glacier monitoring – a timeline since 1894

Samuel U. Nussbaumer (1), Richard Armstrong (3), Florence Fetterer (3), Isabelle Gärtner-Roer (1), Martin Hoelzle (2), Horst Machguth (1), Nico Mölg (1), Frank Paul (1,5), Bruce H. Raup (3,4), and Michael Zemp (1)

(1) World Glacier Monitoring Service (WGMS), University of Zurich, Zurich, Switzerland (samuel.nussbaumer@geo.uzh.ch), (2) World Glacier Monitoring Service (WGMS), University of Fribourg, Fribourg, Switzerland, (3) US National Snow and Ice Data Center (NSIDC), Boulder, USA, (4) Global Land Ice Measurements from Space (GLIMS) initiative, Boulder, USA, (5) Global Land Ice Measurements from Space (GLIMS) initiative, University of Zurich, Switzerland

Changes in glaciers and ice caps provide some of the clearest evidence of climate change, with impacts on sea-level variations, regional hydrological cycles, and natural hazard situations. Therefore, glaciers have been recognized as an Essential Climate Variable (ECV). Internationally coordinated collection and distribution of standardized information about the state and change of glaciers and ice caps was initiated in 1894 and is today organized within the Global Terrestrial Network for Glaciers (GTN-G). GTN-G ensures the continuous development and adaptation of the international strategies to the long-term needs of users in science and policy. A GTN-G Steering Committee coordinates, supports and advices the operational bodies responsible for the international glacier monitoring, which are the World Glacier Monitoring Service (WGMS), the US National Snow and Ice Data Center (NSIDC), and the Global Land Ice Measurements from Space (GLIMS) initiative.

In this presentation, we trace the development of the internationally coordinated glacier monitoring since its beginning in the 19^{th} century. Today, several online databases containing a wealth of diverse data types with different levels of detail and global coverage provide fast access to continuously updated information on glacier fluctuation and inventory data. All glacier datasets are made freely available through the respective operational bodies within GTN-G, and can be accessed through the GTN-G Global Glacier Browser (http://www.gtn-g.org/data_browser.html).

Glacier inventory data (e.g., digital outlines) are available for about 180,000 glaciers (GLIMS database, RGI – Randolph Glacier Inventory, WGI – World Glacier Inventory). Glacier front variations with about 45,000 entries since the 17^{th} century and about 6,200 glaciological and geodetic mass (volume) change observations dating back to the 19^{th} century are available in the Fluctuations of Glaciers (FoG) database. These datasets reveal clear evidence that glacier retreat and mass loss is a global phenomenon. Glaciological and geodetic observations show that the rates of the 21^{st}-century mass loss are unprecedented on a global scale, for the time period observed, and probably also for recorded history, as indicated in glacier reconstructions from written and illustrated documents. The databases are supplemented by specific index datasets (e.g., glacier thickness data) and a dataset containing information on special events including glacier surges, glacier lake outbursts, ice avalanches, eruptions of ice-clad volcanoes, etc. related to about 200 glaciers. A special database of glacier photographs (GPC – Glacier Photograph Collection) contains more than 15,000 pictures from around 500 glaciers, some of them dating back to the mid-19^{th} century.

Current efforts are to close remaining observational gaps regarding data both from in-situ measurements and remote sensing, to establish a well-distributed baseline for sound estimates of climate-related glacier changes and their impacts. Within the framework of dedicated capacity building and twinning activities, disrupted long-term mass balance programmes in Central Asia have recently been resumed, and the continuation of mass balance measurements in the Tropical Andes has been supported. New data also emerge from several research projects using NASA and ESA sensors and are actively integrated into the GTN-G databases. Key tasks for the future include the quantitative assessment of uncertainties of available measurements, and their representativeness for changes in the respective mountain ranges. For this, a well-considered integration of in-situ measurements, remotely sensed observations, and numerical modelling is required.