GCW, Vienna, 20-22 November 2012

Some glacier-biased thoughts on

CryoNet

as proposed by the Global Cryoshpere Watch

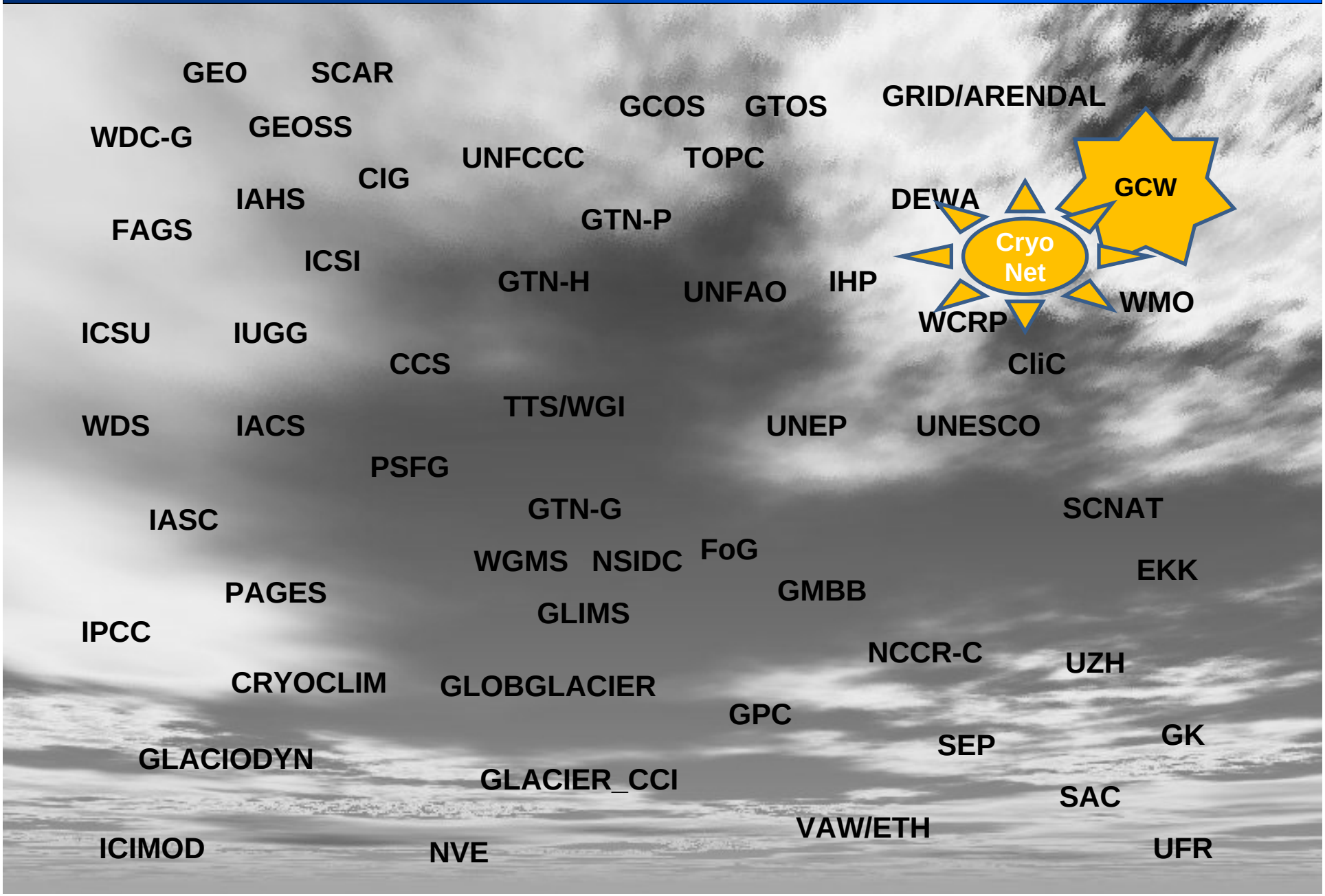
Michael Zemp

World Glacier Monitoring Service, Department of Geography,
University of Zurich, Switzerland

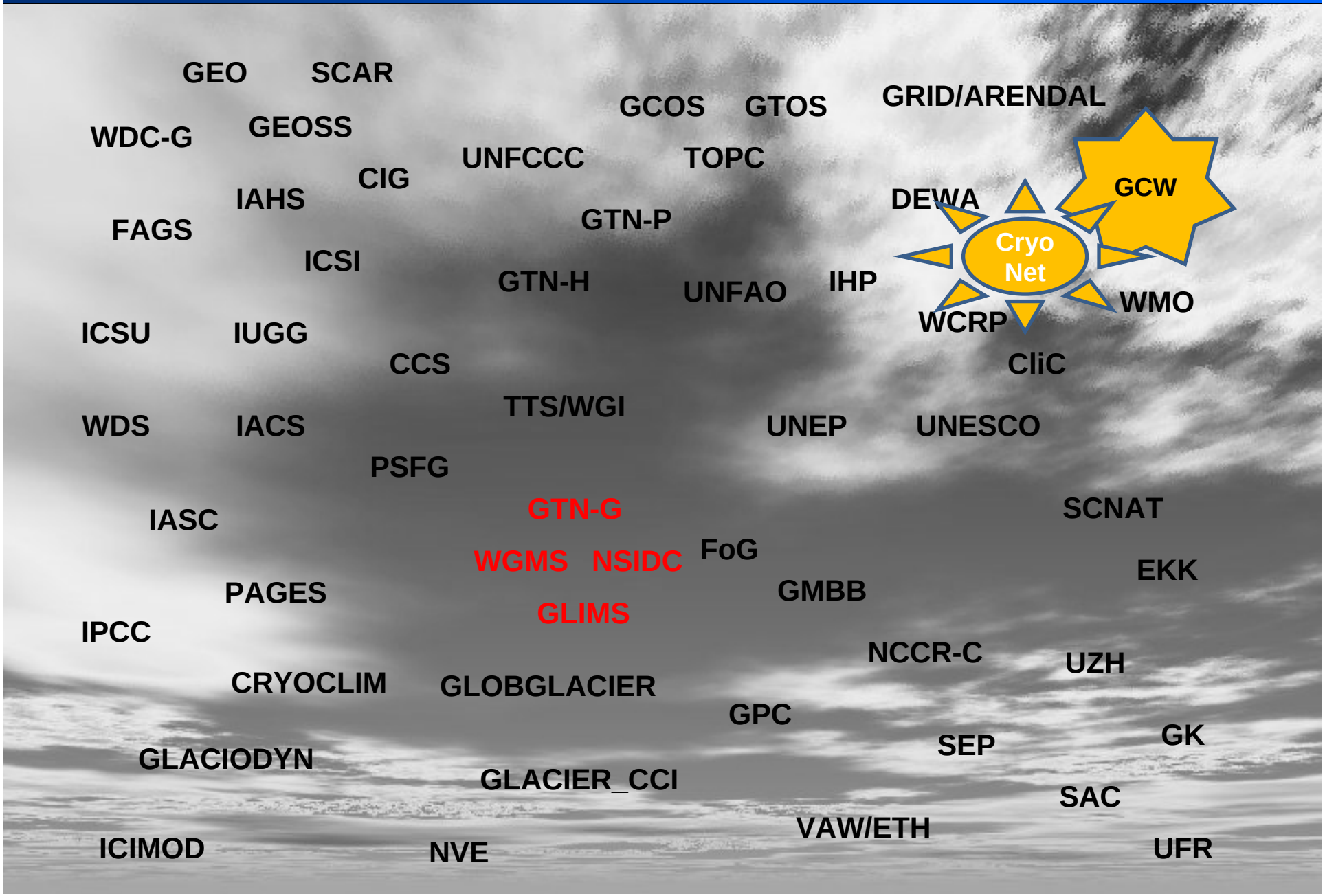
wgms World Glacier Monitoring Service

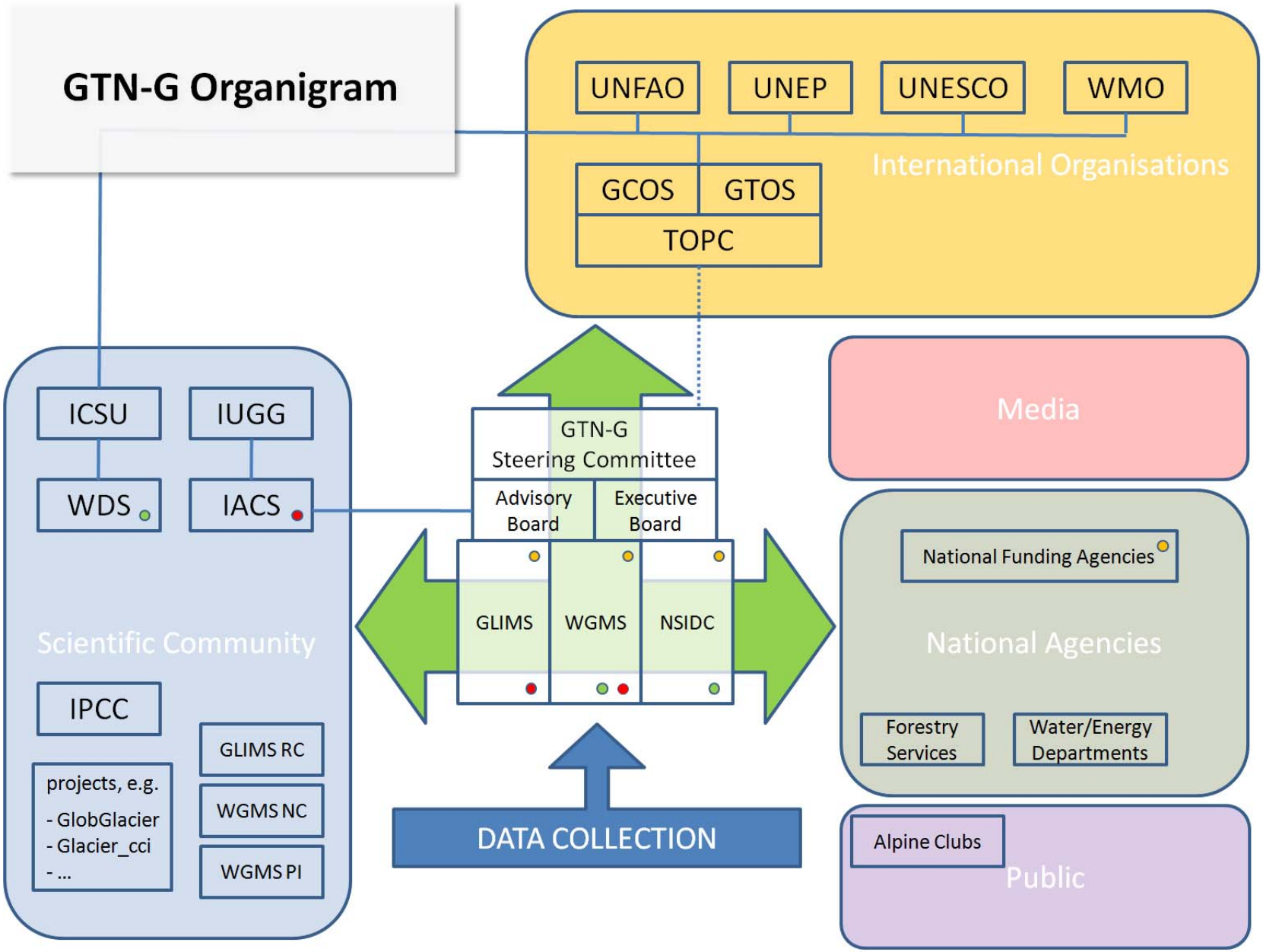
University of Zurich UZH

Once upon a time…



global terrestrial network of glaciers | thoughts on the proposed gcw-cryonet




GTN-G Organigram
UNFAO
UNEP
UNESCO
WMO
International Organisations
GCOS
GTOS
TOPC
ICSU
IUGG
WDS
IACS
Scientific Community
IPCC
projects, e.g.
- GlobGlacier
- Glacier_cci
- ...
GLIMS RC
WGMS NC
WGMS PI
GTN-G
Steering Committee
Advisory Board
Executive Board
GLIMS
WGMS
NSIDC
DATA COLLECTION
Media
National Funding Agencies
National Agencies
Forestry Services
Water/Energy Departments
Alpine Clubs
Public

Global Terrestrial Network for Glaciers (GTN-G)
Steering Committee

Advisory Board

Executive Board

Global Land Ice Measurements from Space

World Glacier Monitoring Service

US National Snow and Ice Data Center

available funding for operational work

WGMS staff

Dr. Michael Zemp
Director
email: michael.zemp@geo.uzh.ch
phone: +41 44 6355139

Prof. Dr. Martin Hoelzle
email: martin.hoelzle@unifr.ch
phone: +41 26 3009022

Dr. Isabelle Gärtner-Roer
email: isabelle.roer@geo.uzh.ch
phone: +41 44 6355139

Prof. Dr. Wilfried Haeberli
Immediate-Past Director
email: wilfried.haeberli@geo.uzh.ch
phone: +41 44 6355120

Dr. Samuel Nussbaumer
email: samuel.nussbaumer@geo.uzh.ch
phone: +41 44 6355262

GLIMS contacts

Prof. Dr. Andi Kääb
email: kaeaeb@geo.uio.no
phone: +47 228 55812

Dr. Jeffrey S. Kargel
email: jeffreyskargel@hotmail.com
phone: +1 520 780 7759

Dr. Frank Paul
email: frank.paul@geo.uzh.ch
phone: +41 44 6355175

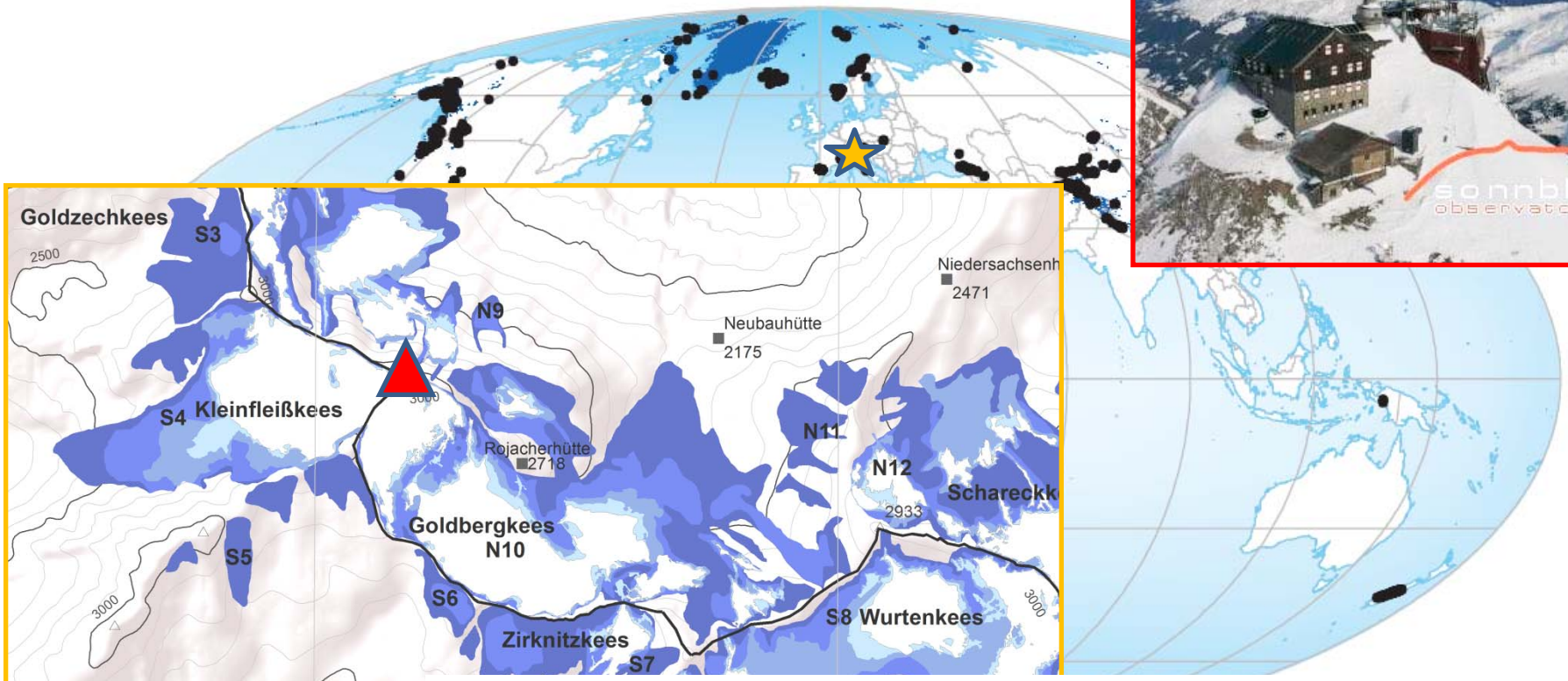
MSc Bruce H. Raup
email: braup@nsidc.org
phone: +1 303 492 8814

NSIDC contacts

Dr. Richard Armstrong
email: rlax@nsidc.org
phone: +1 303 492 1828

MSc Florence Fetterer
email: fetterer@nsidc.org
phone: +1 303 492 4421

A worldwide scientific collaboration network

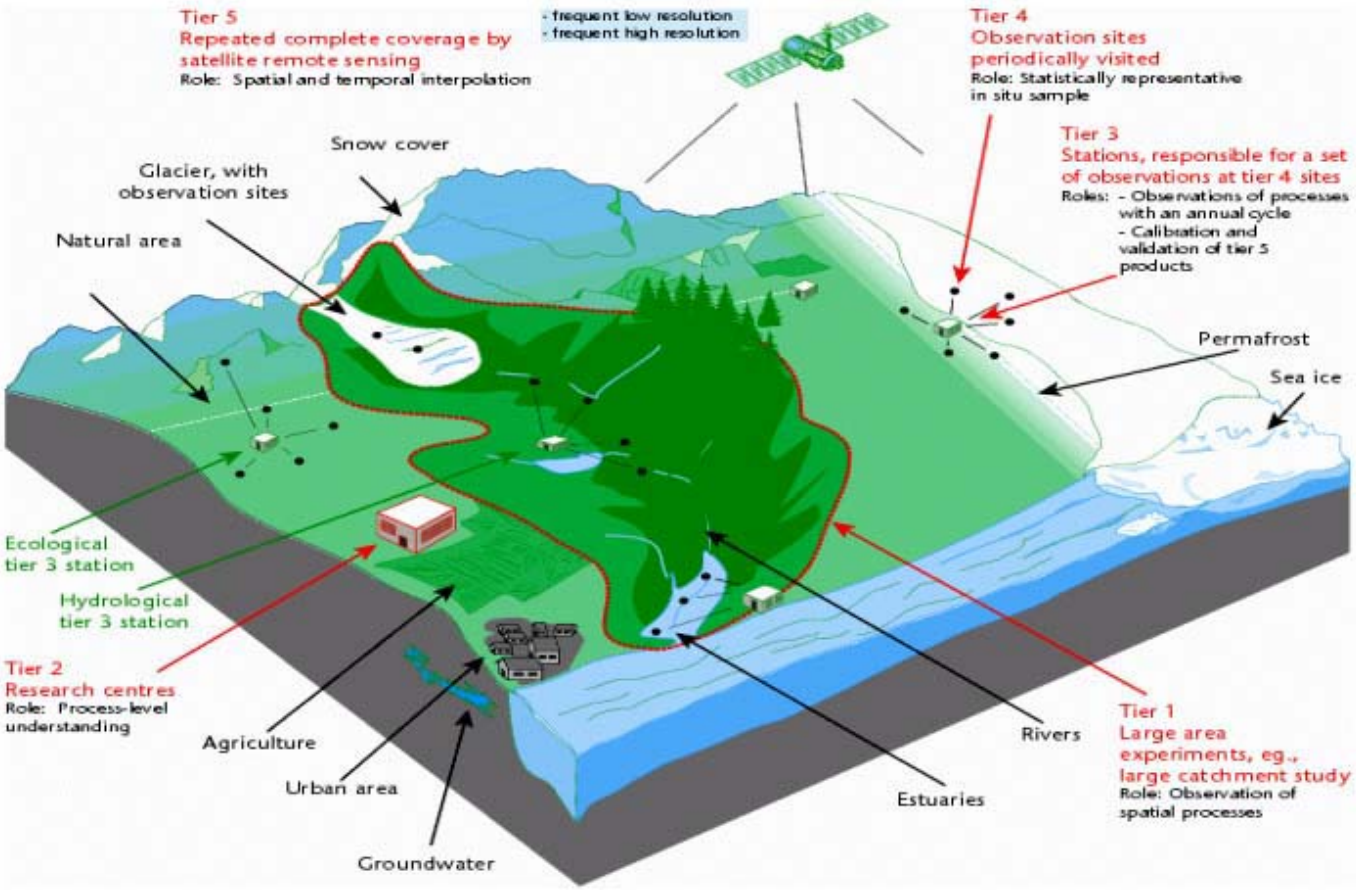


Goldbergkees
Kleinfleisskees
Pasterzenkees
Wurtenkees

Reinhard Böhm, Wolfgang Schöner, Bernhard Hynek
Zentralanstalt für Meteorologie und Geodynamik (ZAMG)
Hohe Warte 38
AUSTRIA – 1190 Wien
E-mail: reinhard.boehm@zamg.ac.at
wolfgang.schoener@zamg.ac.at
bernhard.hynek@zamg.ac.at

GCOS Tiered Monitoring System

A multi-level, integrative strategy combining: local process understanding with global coverage, in-situ measurements with remote sensing, and traditional observations with new technologies



Global Terrestrial Network for Glaciers: strategy

main goals of long-term observations:

- process understanding
- model validation
- change detection
- impact assessments

Haeberli et al. (2000)

change detection:

- rate of change
- acceleration trends
- pre-industrial variability
- change patterns

integrated / tiered observing strategy

Tier 1: multi-component obs. system across environmental gradients

Tier 2: process understanding and model calibration

=> extensive energy/mass balance, flow

Tier 3: regional indicators

=> mass change (index stakes, photogrammetry, LIDAR)

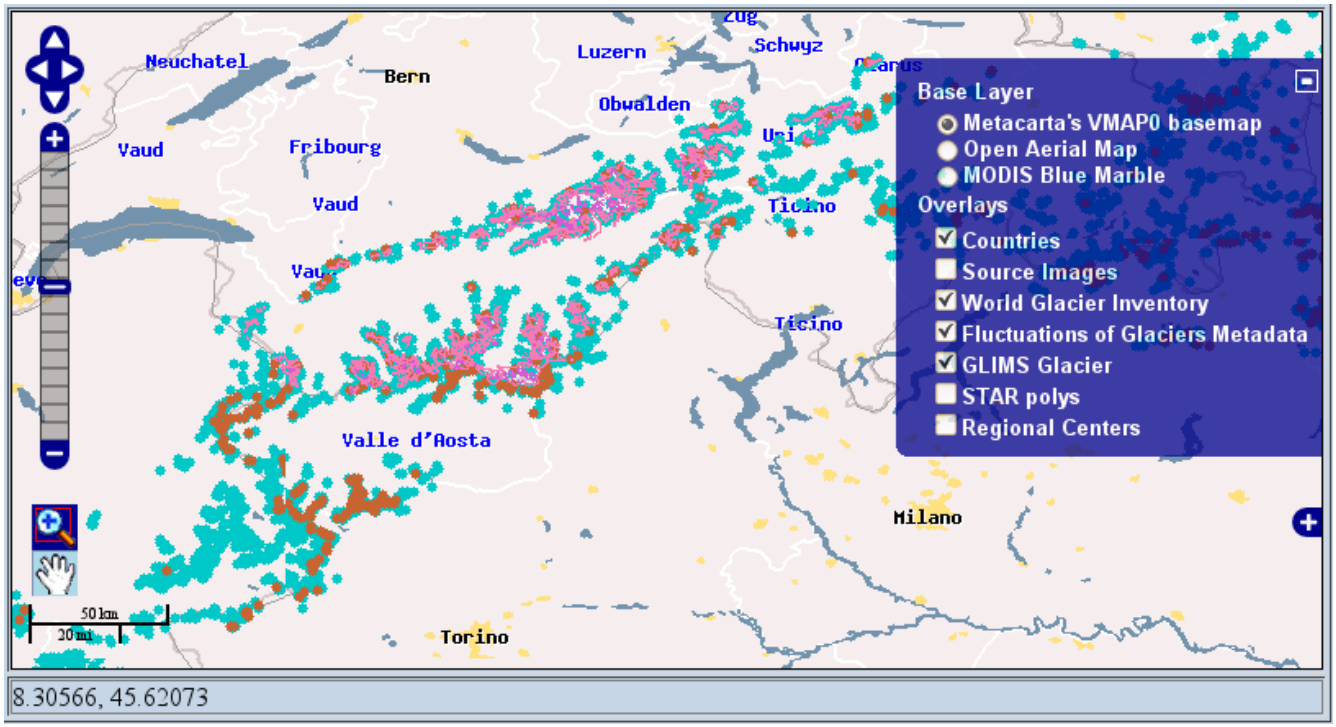
Tier 4: regional representativeness

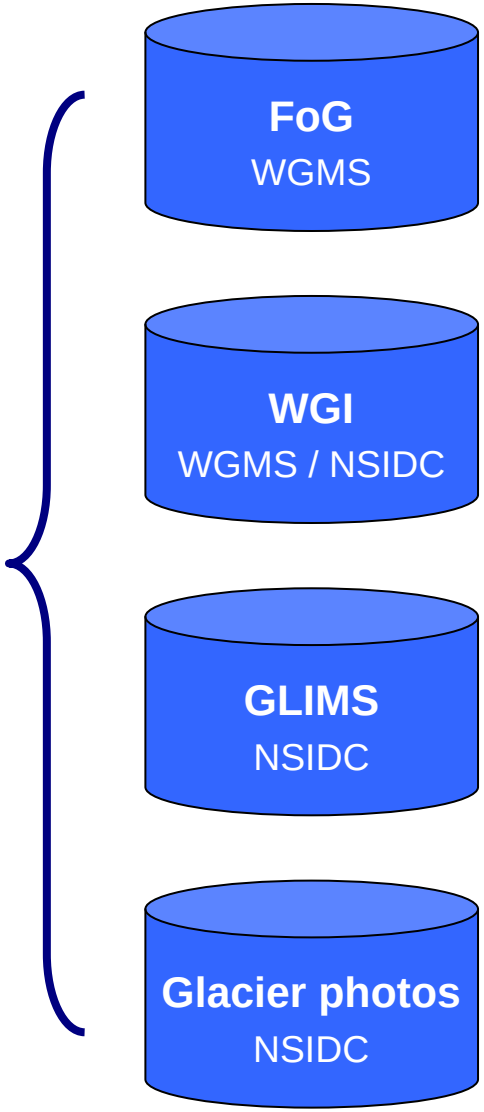
=> cumulative length change; DEM differencing

Tier 5: global coverage

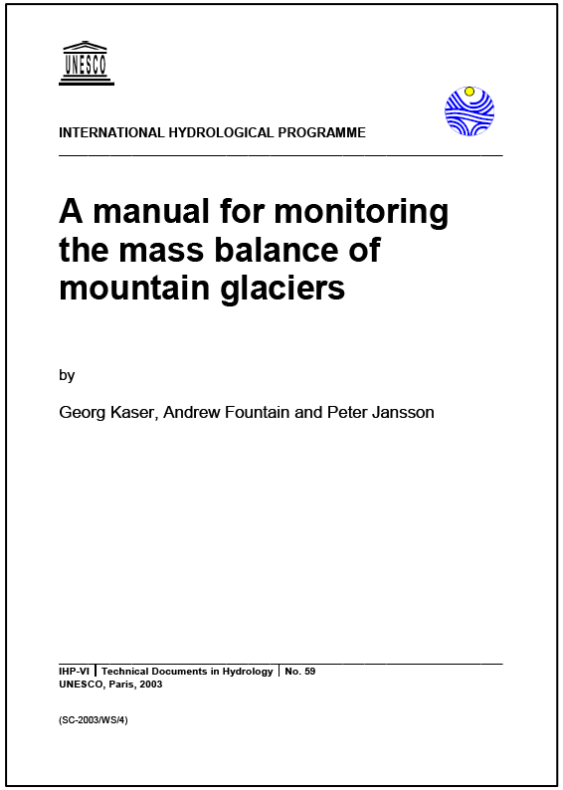
=> inventories (remote sensing/geoinformatics)

One-stop data-portal on www.gtn-g.org



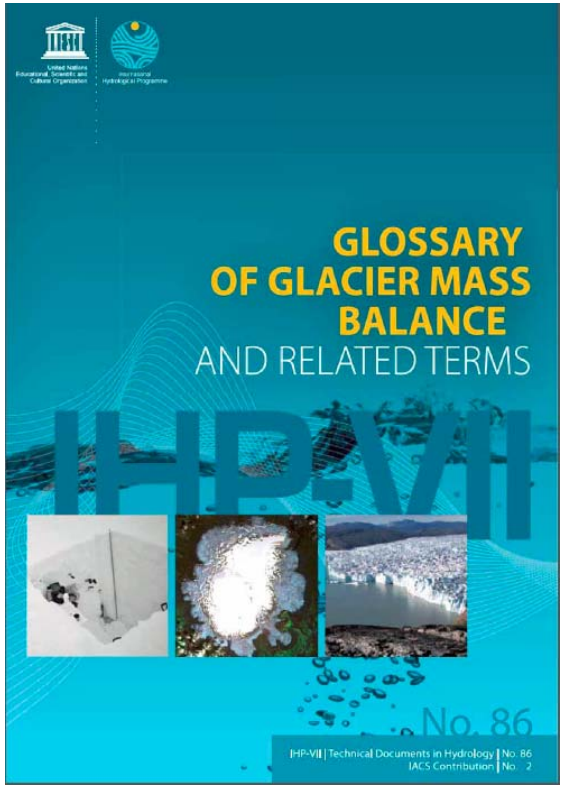


Terminology, guidelines and standards, assessment reports



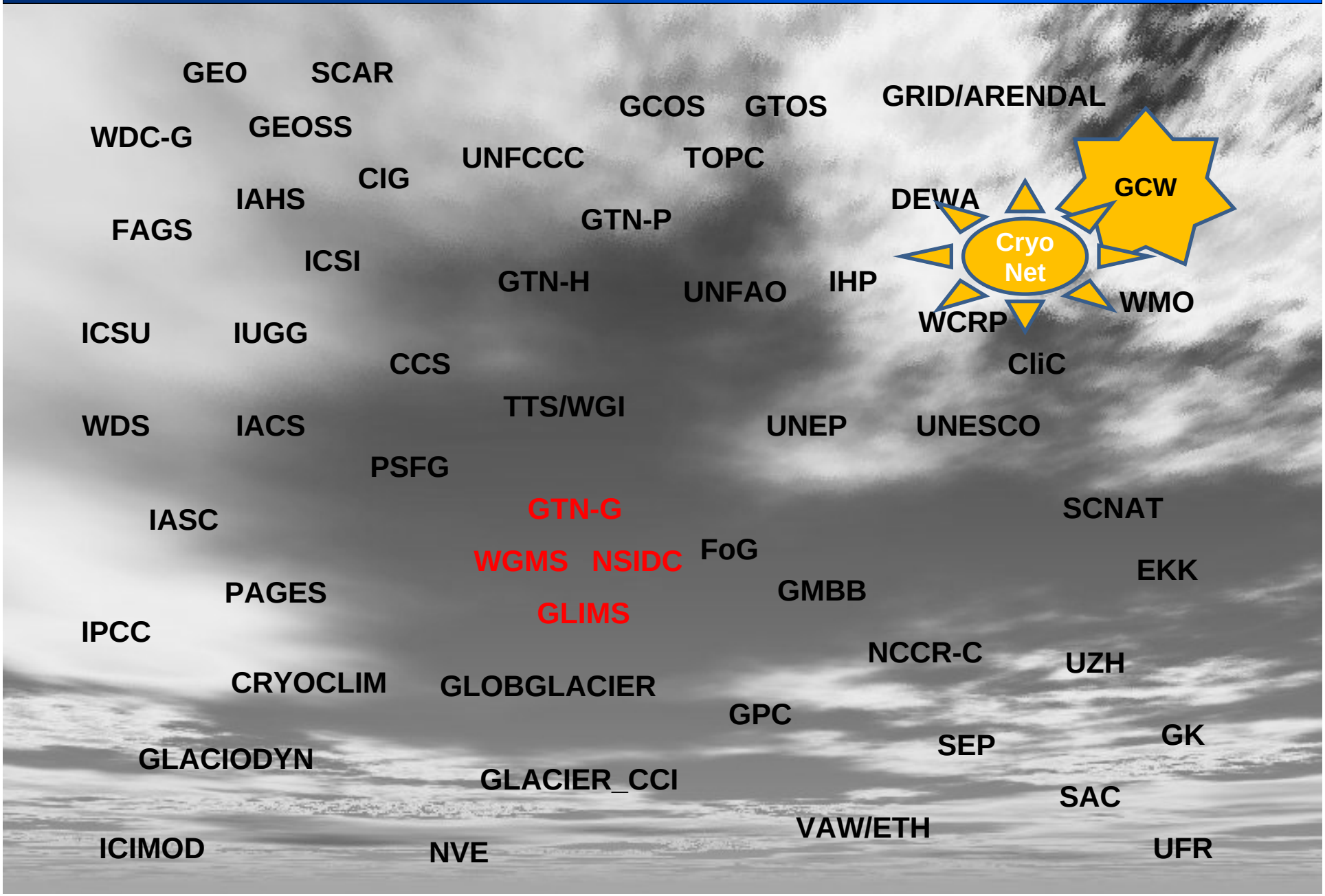
Kaser et al. (2003)

WGMS (2008)



Cogley et al. (2011)

Zemp et al. (in prep): **Review Article: Uncertainty and re-analysis of glacier mass balance observations.** The Cryosphere.


GEO
SCAR
GCOS
GTOS
GRID/ARENDAL
WDC-G
GEOSS
UNFCCC
TOPC
CIG
IAHS
DEWA
GCW
FAGS
GTN-P
Cryo Net
ICSI
GTN-H
UNFAO
IHP
WMO
WCRP
ICSU
IUGG
CCS
CliC
TTS/WGI
WDS
IACS
UNEP
UNESCO
PSFG
IASC
GTN-G
SCNAT
WGMS
NSIDC
FoG
EKK
PAGES
GMBB
GLIMS
IPCC
NCCR-C
UZH
CRYOCLIM
GLOBGLACIER
GPC
GK
SEP
GLACIODYN
GLACIER_CCI
SAC
VAW/ETH
ICIMOD
NVE
UFR

Global Atmosphere Watch

- WMO-led
- global network of meteo stations
- run by national meteo services
- with observations based on common WMO standards,
- stored at several world data centers,
- made available through joint web-interface run by MeteoSwiss.

versus

Global Cryosphere Watch

- ???-led
- global network of ???
- run by ???
- with observations based on common ??? standards,
- stored at ???,
- made available through a joint web-interface run by ???

GAW can build on a well-funded and operational network of national meteo-services while GCW will have to build mainly on data from the scientific community without funding for long-term monitoring.

As a consequence, GCW-CryoNet..

- **..must not build up structures that are redundant** to existing monitoring programmes in order to save limited resources.
- **..must be careful with using terminology** of existing monitoring programmes in order to avoid confusion (e.g., tiers, reference sites).
- **..must be well coordinated** with existing monitoring programmes and their operational bodies
- **..should size its goals according to available resources**.
- **..should come up with well-defined tasks/products** that supports both the data provider (i.e., institutions running the monitoring sites) and the data user (e.g., the scientific community).

Based on these basic consideration, I see the largest potential in..

- (a) the integration of existing observation programmes of individual cryospheric components.

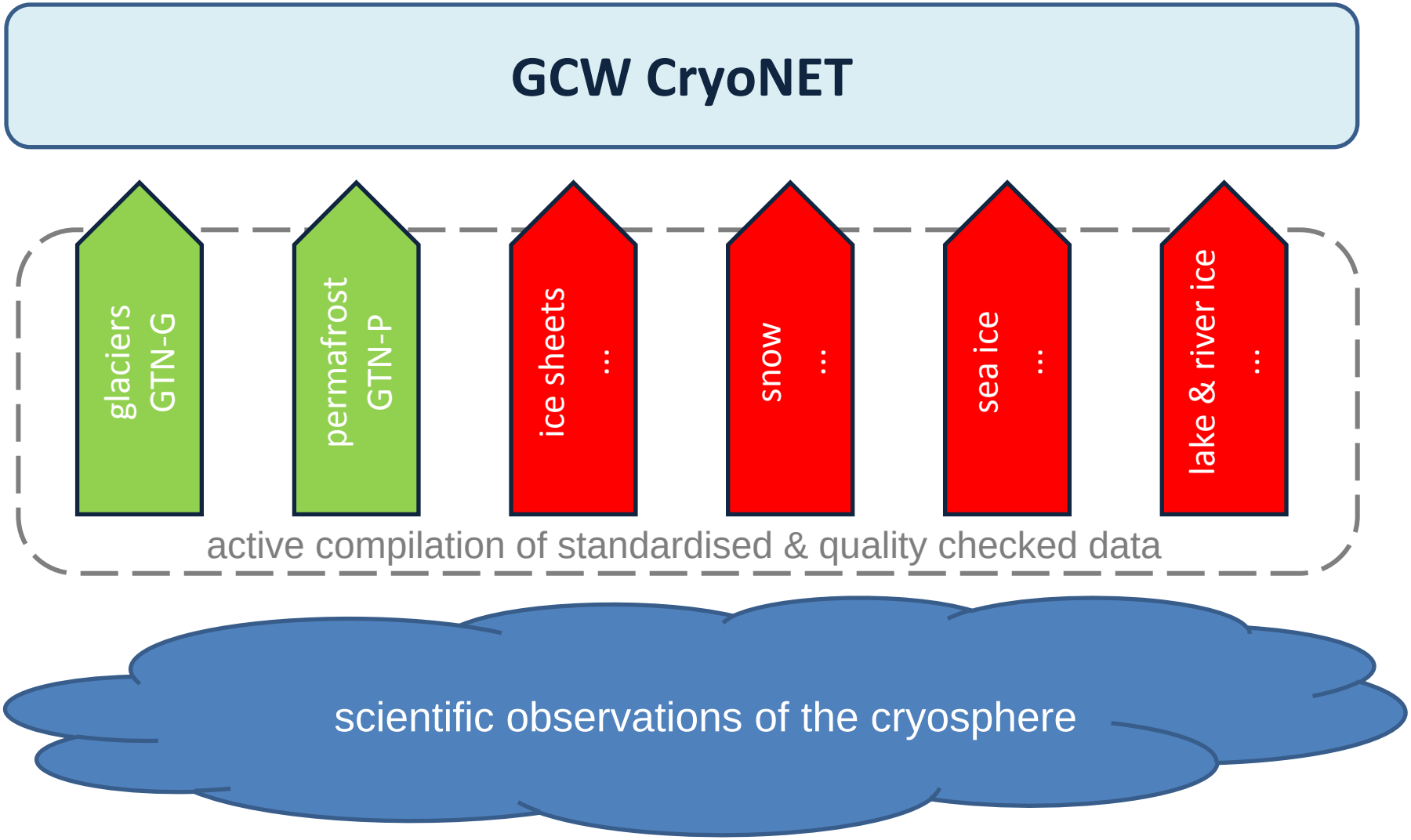
  or

- (b) fostering a network of high elevation automatic weather stations, including long-term cryospheric monitoring sites.

- (c) developing a label (e.g., reference/super site) for a network of existing monitoring sites (e.g., research stations) that are running long-term cryospheric observations. Such a label should only be assigned to monitoring sites that fulfill a well-defined set of criteria, e.g.:
  - monitoring of at least two cryospheric components
  - for more than 30 years
  - together with meteorological measurements
  - making these data freely available
  - …

- (d) increasing the visibility and funding of long-term monitoring sites

However, what to do about cryospheric data without responsible data center?!



Example of a potential supersite: Tarfala Research Station, Sweden

- Research station run by the University of Stockholm
- Open to scientist
- Long-term monitoring including
  - Climate data since 1965
  - Hydrological data since 1980
  - Glacier length and area changes since 19th century
  - Glacier mass balance since 1945/46
  - Permafrost data since 2000
  - Snow measurements since …
- All data freely available for scientific and educational purposes
- Repeatedly challenged by funding problems

Photo by M. Hambry, www.glaciers-online.net

More reference and supersites to be found from glaciers with long-term mass balance monitoring programmes

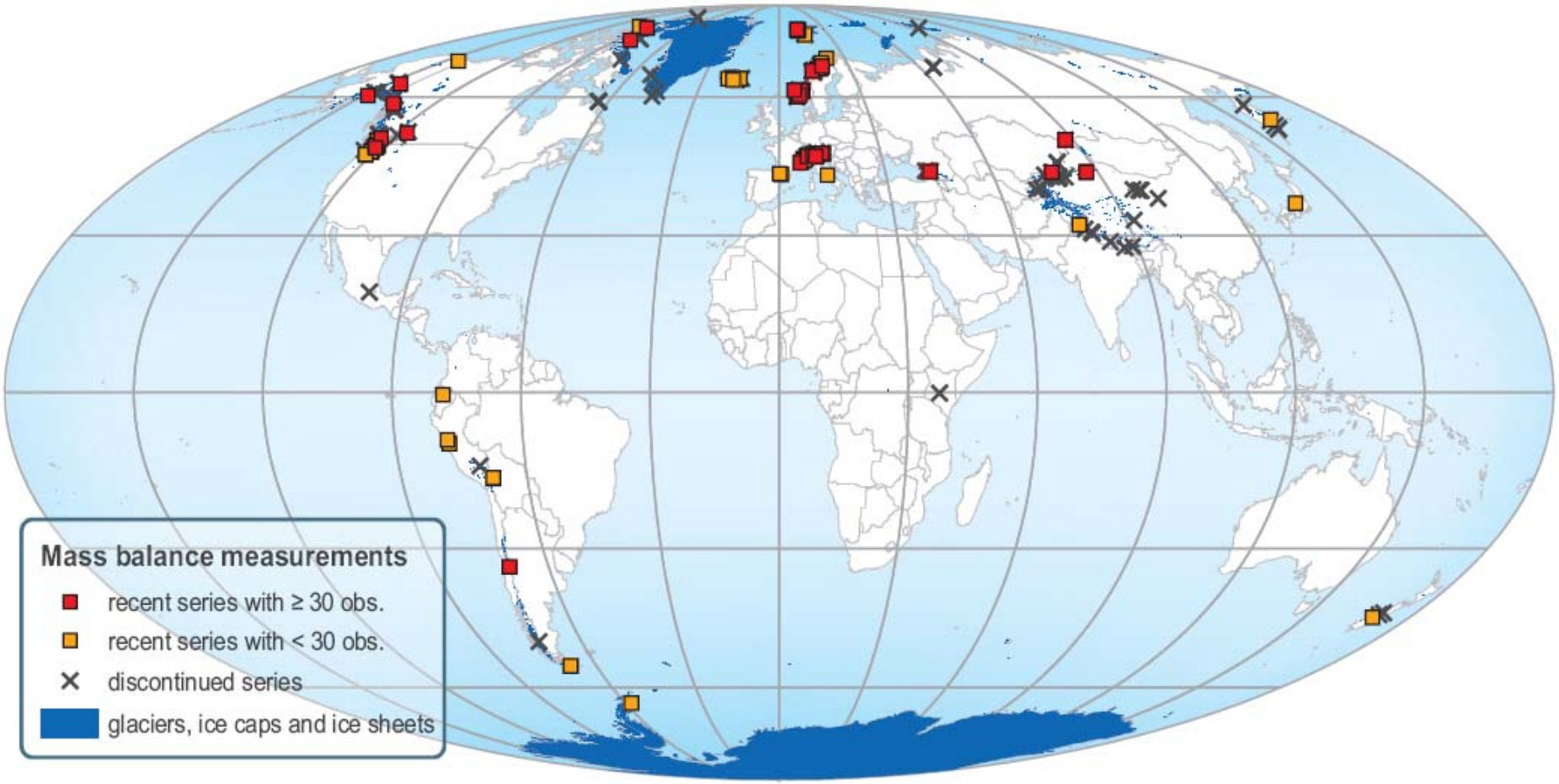


Fig. 4.7 Worldwide mass balance measurements

WGMS (2008)

...and they continued producing acronyms happily for ever.

I think it is now time for GCW to:

- Clearly position itself within existing international organizations dealing with the cryosphere
- Come up with specific tasks and products which
  - are well scaled in view of available resources,
  - complement existing tasks and products,
  - are of benefit for both data providers and users.

In other words:

Please add value (and not just another acronym) to the zoo of international organizations and focus on few but feasible tasks.