Number 6, August 2005

Ice and Climate News

The WCRP Climate and Cryosphere Newsletter

In this Issue:

"...glacier melt in the European Alps was extraordinary in 2003, and continues at a fast, and probably accelerated rate..."

Shrinking Glaciosphere: a View from the Glaciological Symposium

Maria D. Ananicheva (cest@online.ru), Institute of Geography, Moscow, Russia

This issue of Ice and Climate news presents, in short form, a selection of papers presented at the *Open All Russian XIII Glaciological Symposium*, held in St Petersburg, Russia, from 24 to 28 May 2004. Entitled "Shrinkage of the glaciosphere: facts and analysis", the symposium brought together about 150 glaciologists involved in a wide span of cryospheric research. Participants came from Russia and its Commonwealth of Independent States (CIS), other parts of Europe, the Americas, and Asia and gave 139 oral and poster presentations. Topics covered both theoretical and applied studies of the dynamics and regime of the "glaciosphere" in past-, present-, and the near-future conditions. The scientific programme included results from Antarctica, the Arctic, and all cold regions in between. Themes included snow cover, permafrost, hydrology and mountain glaciers, as well as hazards related to the global cryosphere.

The following articles include information on the CIS' cold regions, much of which has previously been difficult to access from outside countries. Also discussed are Arctic sea ice, the Kolka Glacier disaster, past climate from ice cores, and the unusual chemistry and biology associated with "cryconite holes" in Antarctica.

One of the main conclusions of the conference is that, against a background of a shrinking cryosphere, glaciological research has become both broader and more intensive. A renaissance of glaciological studies is observed in many CIS regions besides Moscow and St Petersburg. This positive tendency in geographical research provides hope that the situation in CIS science is improving. With this in mind, scientists are looking forward to opportunities for collaborative research contributing to meeting the WCRP Climate and Cryosphere project's goals.

****

Worldwide Glacier Mass Balance Measurements: trends and first results of an extraordinary year in Central Europe

Regula Frauenfelder (regula.frauenfelder@geo.unizh.ch), Michael Zemp (michael.zemp@geo.unizh.ch),
Wilfried Haeberli (haeberli@geo.unizh.ch) and Martin Hoelzle (hoelzle@geo.unizh.ch)
World Glacier Monitoring Service (WGMS), Zurich, Switzerland

Glacier signals from mountain areas are key elements of early detection strategies for dealing with possible human-induced climate change. The IPCC Third Assessment Report (2001) indeed defines mountain glaciers as one of the best natural indicators of atmospheric warming with the highest reliability ranking. Glacier mass balance is the direct undelayed signal, whereas changes in glacier length primarily constitute an indirect, delayed and filtered but also enhanced signal.

The World Glacier Monitoring Service (WGMS) has been responsible for collecting and publishing standardized data on glacier changes since 1986. Corresponding data bases and measurement networks form an essential part of the Global Terrestrial Network for Glaciers (GTN-G: operated by the WGMS) as a pilot project within the Global Climate Observing System (GCOS).

Worldwide mass balance measurements 1980-2001

A network of approximately 60 glacier mass balance observations provides information on presently observed rates of change in glacier mass, corresponding acceleration trends and regional distribution patterns. Continuous mass balance records for the period 1980-2001 are now available for 30 glaciers during the years 1980-2000 and for 29 glaciers in the year 2000/2001 (IAHS(ICSI)/UNEP/UNESCO/WMO, 2003). The mean of all glaciers included in this sample is strongly influenced by the large proportion of Alpine and Scandinavian glaciers. A mean value is, therefore, calculated using only one single value (in places averaged) for each of the nine mountain ranges concerned *(Figure 1)*. Mean mass balance during the period 1990-1999 amounts to -482 mm water equivalent (w.e.), three times higher than the corresponding value for the previous decade from 1980 to 1989 (-149 mm w.e.). The range of extremes observed at individual glaciers during one measurement year is roughly one order of magnitude higher than the mean value of the sample. On the other hand, the significance of the recorded signal increases with mass balance values cumulated over extended time periods.

The mean annual loss in ice thickness of mountain glaciers is close to half a meter per year, resulting in a total thickness reduction of about 7–8 m of ice since 1980 (cf. Figure 1, right). Mean (annual) specific net balance in nine mountain regions of the world (Cascades, Alaska, Andes, Svalbard, Scandinavia, Alps, Altai, Caucasus, Tien Shan) averaged roughly -0.3 m w.e. for the time period 1980 to 2001, with 20 negative and two positive balance years during these 22 years.

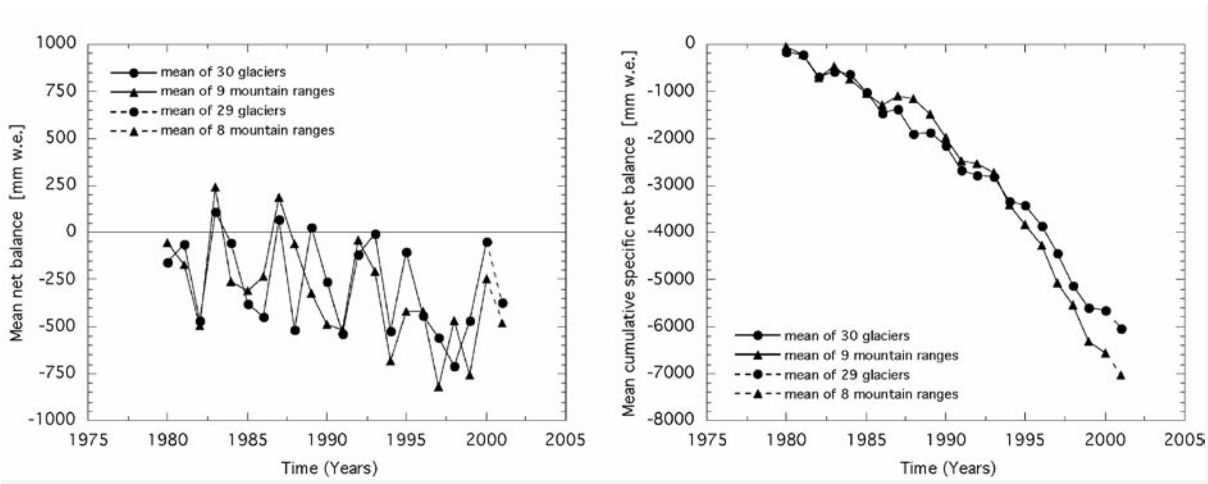

Figure 1. Evolution with time of the mass balance of 30 glaciers in nine mountain ranges worldwide (1980-2000), respectively for 29 glaciers in eight mountain ranges (2001); (left) mean specific net balance, (right) cumulative mean specific net balance (cf. IAHS(ICSI)/UNEP/UNESCO/WMO, 2003).

Extraordinary situation in Central Europe during 2003: a foreboding of things to come?

From June until mid-August 2003, a record-breaking heat wave, centered over France, Switzerland and Northern Italy, affected the European continent. In large areas, mean summer (JJA) temperatures exceeded the 1961-1990 mean by about 3ºC, corresponding to an excess of up to five standard deviations (Schär *et al.*, 2004).

The first rough estimates for 2003 indicate that the extremely warm and dry weather conditions during the summer caused an average loss of almost 3 m w.e. in glacier thickness in the European Alps. This is nearly twice as much as during 1998, the previous record year (1.6 m w.e.), and roughly five times more than the Alpine average loss of 0.6 m w.e. per year. Or an order of magnitude higher than the global mean annual net balance of -0.3 m w.e. recorded during the already exceptionally warm period 1980-2001 *(Figure 2)*. This implies that glacier melt continues at a considerable and most probably accelerating rate.

Estimated total glacier-volume loss in the Alps in 2003 corresponds to 5-10% of the remaining ice volume. Alpine glaciers had already lost more than 25% of their volume in the 25 years before 2003, and roughly two thirds of their original volume since 1850. Given such shrinking rates, less than 50% of the glacier volume still present in 1970/80 would remain in 2025 and only about 5-10% in 2100 (Haeberli *et al.,* 2002).

Schär *et al.,* (2004) simulated possible future European climate with a regional climate model in a scenario with increased atmospheric greenhouse gas concentrations. These simulations suggest that (under the given scenario assumptions) about every second summer could be as warm or even warmer (and dry or even dryer) than 2003 towards the end of the century (2071-2100).

The 2003 summer heat wave was a European event. However, this summer and its impact on glaciers may well serve as a case study for a possible future climate and should therefore gain worldwide interest.

Post scriptum 27.01.2005

Final values for all nine glaciers in the European Alps gave a mean specific net balance for 2002 and 2003 of -0.8 m w.e. and -2.5 m w.e., respectively. The value for 2003 is slightly smaller *(of Figure 2)* than the previously estimated value of nearly 3 m w.e. *(cf. Text*). However, this does not change the general conclusions that glacier melt in the European Alps was extraordinary in in 2003, and that the general decrease of global glacier mass continues at a fast, and probably accelerated rate.

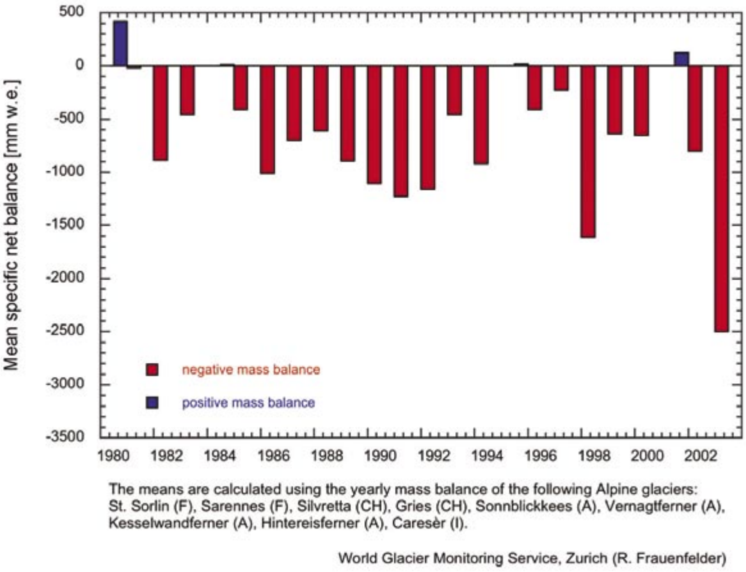

Figure 2. Mean specific net balance of nine glaciers in the European Alps for the period 1980-2003.

References

Haeberli, W., M. Maisch and F. Paul. 2002. Mountain glaciers in global climate-related observation networks. *World Meteorological Organization Bulletin* 51(1): 1-8.

IAHS(ICSI)/UNEP/UNESCO/WMO. 2003. Glacier mass balance bulletin no. 7. W. Haeberli, R. Frauenfelder, M. Hoelzle and M. Zemp (eds.), *World Glacier Monitoring Service, University of Zurich*: 87 pp.

IPCC, 2001. Climate Change. 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. *Cambridge Unversity Press,* Cambridge, UK: 881 pp.

Schär, C., P. L. Vidale, D. Lüthi, C. Frei, C. Häberli, M. Liniger and C. Appenzeller. 2004. The role of increasing temperature variability in European summer heat waves. *Nature,* Vol. 427: 332-336.

****

The *Ice and Climate* newsletter is published free of charge by the CliC International Project Office. Articles, letters, announcements and other contributions are welcomed.

The Project Office is supported by the Norwegian Polar Institute, the Norwegian Research Council, the UK Met Office, the Scientific Committee on Antarctic Research, and the World Climate Research Programme.

Director and editor:
Chad Dick (chad@npolar.no)

Layout, design and contact:
Tordis Villinger (tordis@npolar.no)

Address changes and requests to be added to or removed from the mailing list should be sent to:

CliC International Project Office
Norwegian Polar Institute
The Polar Environmental Centre
NO-9296 Tromsø, Norway
Tel: +47 77 75 01 50
Fax: +47 77 75 05 01
E-mail: clic@npolar.no

Past issues are available from:
//clic.npolar.no/newsletters/newsletters.php

CliC websites

http://clic.npolar.no (home)

http://cipo.npolar.no

http://acsys.npolar.no (inactive)

Printed by:
Lundblad Media AS
Tromsø, Norway

ISSN: 1502-7252

CliC / Cryosphere Meetings

5-9 September 2005: International Symposium on High-elevation Glaciers and Climate Records, Lanzhou, China. http://www.igsoc.org/symposia/2005/lanzhou/.

6-9 November 2005: CliC Scientific Steering Committee annual meeting. Danish Polar Center, Copenhagen, Denmark. Invitation only.

5-9 December 2005: American Geophysical Union (AGU) 2005 Fall Meeting Session C 12: “Sea Ice Feedbacks and Climate Change”, San Francisco, CA. Conveners: Peter Minnett (pminnett@rsmas.miami.edu) and Erica Key (ekey@rsmas.miami.edu)

5-9 December 2005: International Symposium on Sea Ice, Dunedin, New Zealand, International Glaciology Society (Int_Glaciol_Soc@compuserve.com)

5-7 July 2006: International Workshop on Antarctic Sea-Ice Thickness. Hobart, Tasmania, Australia (in conjunction with SCAR Open Science Conference). Contact: Steve Ackley, Clarkson University, NY (sackley@pol.net).

21-25 August 2006: Symposium on Cryospheric Indicators of Global Climate Change. International Glaciological Society, Cambridge, England http://www.igsoc.org/symposia/2006/cambridge/

Media Bits

- Mt. Cotopaxi in Ecuador supports the only glacier on the equator.
- The Kangerdlugssuaq Glacier southeast of Greenland is now moving towards the sea at the “astonishing” rate of more than 100 feet per day. (BBC News)
- More than half the sea rise was caused by a recent speedup in the melting of glaciers and ice sheets, especially in Greenland and Antarctica. (Seattle Times)
- If the glaciers continue to melt at such an alarming rate, power generation, irrigation and other allied benefits from rivers fed by glaciers will start diminishing. (Tribune - India)
- Scientists in India have warned that the ancient glacier that feeds the holy river Ganges is likely to melt down before the end of the century. (BBC News)

The CliC Principal Goal

To assess and quantify the impacts of climatic variability and change on components of the cryosphere and their consequences for the climate system, and to determine the stability of the global cryosphere.

In order to achieve this goal CliC has the supporting objectives to:

- Enhance the observation and monitoring of the cryosphere in support of process studies, model evaluation, and change detection.
- Improve understanding of the physical processes and feedbacks through which the cryosphere interacts within the climate system.
- Improve the representation of cryospheric processes in models to reduce uncertainties in simulations of climate and predictions of climate change.