

## Minutes:

### Bureau Meeting of the IUGG Commission for the Cryospheric Sciences, UCCS Geneva (WMO) 30– 31 October, 2006

WMO Secretariat, 7bis, Avenue de la Paix, CP2300, Geneva 2, CH-1211,  
Switzerland, Meeting Room 6J

#### *Present Bureau Members*

Georg Kaser (President)  
Peter Jansson (Secretary)  
Jon Ove Hagen (Vice President)  
Konrad Steffen (Vice President)  
Julian Dowdeswell (Head of Division) (30 Oct. only)  
Charles Fierz (Head of Division)  
Manfred Lange (Head of Division)

#### *Invited Participants*

WGMS Director Wilfried Haeberli (30 Oct. only)  
WGMS Associate Michael Zemp  
IAHS President Arthur Askew  
IPA President Jerry Brown  
IAVCEI Michael Dungan (30 Oct. only)

#### *Bureau Members absent with regrets*

Kumiko Goto Azuma (Vice President)  
Gerry Jones (Past President)

#### *Invited participants absent with regrets*

ICSIH President John Pomeroy  
ICSIH Secretary Regine Hock  
Lawrence Mysack (IAPSO)  
Pierre Hubert (IAHS)  
Roland List (IAMAS)  
Andi Kaeaeb (GAPHAZ)  
Richard Essery (SNOWMIP 2)

## 1. Opening Remarks

The President *Georg Kaser* opened the meeting at 09.00 and welcomed the Bureau members and invited participants. The President, on behalf of the UCCS Bureau, expressed his deep gratitude to Vladimir Ryabinin, WMO and the WCRP for having the opportunity to visit the WMO and perform the Bureau meeting on their premises.

## 2. Welcoming Address: Ann Henderson-Sellers, Director of WCRP and Vladimir Ryabinin, Senior Scientific Officer of WCRP (WMO, WCRP, CliC, and IGOS-Cryosphere)

After a brief welcome from Ann Henderson-Sellers, the Senior Scientific Officer of the WCRP Vladimir Ryabinin welcomed the UCCS Bureau and

invited participants to the WMO and provided a most enlightening discourse of WMO/WCRP activities. Vladimir Ryabinin also invited the Bureau to a reception offered by WCRP for WMO, WCRP, CliC, IGOS-Cryosphere, and UCCS officers, held in the evening of October 30 at WMO.

### 3. Agenda additions/modifications

No additions. Modifications concerned pushing issues 13.4 (IAVCEI), 14 (WGMS) and 8 (Working Groups), in that order, to the top of the agenda since IAVCEI representative Michael Dungan, WGMS Director *Wilfried Haerberli*, and Head of Division *Julian Dowdeswell* were only able to attend the first day of the meeting.

### 4. Minutes of the Bureau Retreat Meeting, Karthaus 2006

#### 4.1. Corrections/modifications/additions

No corrections, modifications, or additions

#### 4.2. Acceptance

Vice President *Konrad Steffen* proposed to accept the minutes; Head of Division *Manfred Lange* seconded the proposition. Thanks were extended from the Bureau to the Secretary for the rapid processing of the minutes.

### 5. Activities following on the Karthaus Minutes of 2006

#### 5.1. Action items

All action items were completed.

#### 5.2. Other

No other business from the Karthaus Minutes

### 6. Reports from Officers (other issues than met in the items to follow)

#### 6.1. President's report

No specific report; discussions under different items in the agenda.

#### 6.2. Past President's report

The Past Presidents report was tabled (**APPENDIX A, Past President's Report (6.2)**). The Past President continues working with updates to the UCCS/IACS Statutes and By Laws. The IUGG has a deadline for sending out the document on February 28, 2007. This means that Bureau input to revise the document must be with the Past President by no later than 1 February, 2007.

The ICSI/UCCS/IACS history manuscript has been handed out to the bureau for revision. Bureau members are encouraged to provide input directly to the Past President.

The Past President chairs the so-called Nomination Committee for the coming Bureau. In view of the decision to be taken at Perugia, 2007, the Nomination Committee has the form of an *appointment committee*; however, this is an extraordinary circumstance.

#### 6.3. Vice Presidents' report

Vice President *Konrad Steffen* reported on the need to continue the established links to CliC. The Vice President can play a substantial role in this process in the future as well (see also 15.1.).

Vice president *Jon Ove Hagen* mentioned the WGMS evaluation discussed elsewhere in the minutes. He also briefly reported on the UCCS student awards presented during the IGS Cambridge Symposium in August 2006.

#### 6.4. *Secretary's report*

No specific report; discussions under different items in the agenda.

## 7. Finances

### 7.1. *Treasurer's report*

The Treasurer *Peter Jansson* tabled his report (**APPENDIX B, Treasurer's Report (7.1)**) and provided a short summary of the finances of the past year and what is left for the coming year. A short discussion followed on expected expenses leading up to the IUGG Perugia General Assembly in 2007. The discussion revealed that the current financial situation, given the addition of the 2007 allotment from the IUGG which yields a total of approx. USD 11000, will barely be enough to cover expected costs. This means it will be essential to try to establish more precise estimates on costs to obtain a better view of the finances leading up to the 2007 Assembly. Known costs include: costs for producing new logo (est. USD 1000), ad in EOS for promoting the UCCS led Perugia activities (est. USD 1000), costs for Perugia booth (est. USD 1000), costs for Perugia reception (est. USD 500), costs to send President Georg Kaser to the LOC/NOC meeting of the 2008 Montreal joint IAMAS/IAPSO/UCCS Assembly (est. USD 1600+500=2100), costs for bringing the Past President to the Perugia Assembly (est. USD 2200+1000+400), travel costs for Prof. Jacka (Chief editor Ann. Glaciol.) to Perugia Assembly (est. USD 2200+1000+400), mandatory translation of Statutes and By-Laws into French (est. USD 700). UCCS will receive funding from the head taxes taken out by some Associations at Perugia. There is, however, no possibility to estimate the size of this contribution in advance.

**ACTION ITEM 1 (7.1), Treasurer Peter Jansson:** To gather information to provide a detailed working for 2007.

### 7.2. *Acceptance*

Head of Division *Manfred Lange* proposed to accept the report; Vice President *Konrad Steffen* seconded the proposition.

## 8. Divisions

### 8.1. *Heads of Divisions' reports on Working Groups*

Head of Division *Julian Dowdeswell*:

- WG on Glacial sediments. The WG work progresses nicely. The WG is currently preparing for their Perugia workshop (**APPENDIX C, WG on Glacial sediments report (8.1)**)

- GAPHAZ. Work is progressing nicely and a summary of ongoing and

future activities was tabled. (**APPENDIX D, GAPHAZ report (8.1)**)  
 - Andean Glaciers. WG progresses nicely. The successful Workshop proceedings are now in press in the Global and Planetary Change.

Head of Division *Manfred Lange*:

- Sea Ice classification WG

Head of Division *Charles Fierz*:

The Head of division tabled a report of Division activities (**APPENDIX E, Division on Snow and Avalanches report (8.1)**)

- SnowMIP2. This activity has grown and are now included in many other programs. The group will most probably seek for extended terms. A report of activities was tabled (**APPENDIX F, SnowMIP2 report (8.1)**).

- Snow and Climate book. The book is now in its final stage with all material submitted for final editing.

- Snow classification. The work progresses nicely. The aim is to present proceedings from the activity in Perugia. A report of activities was tabled (**APPENDIX G, Snow classification report (8.1)**)

## 8.2. *Guidelines for future Working Groups and Workshops*

Head of Division *Charles Fierz* tabled a working document of ideas for guidelines for future WGs based on discussions with WG heads (**APPENDIX H, WG Guidelines (8.2)**). A discussion resulted in a few recommendations: that strict terms should be imposed with Assemblies constituting natural end points, that workgroups should result in published products (where applicable), that seed money for starting WGs should be provided, that the structure of WGs should aim to have broad international participation and open for new members. In addition there was agreement that it is necessary to also provide the option of Standing Groups. The purpose of such groups would be to provide a medium or long-term service to a well-defined scientific community. This may include the coordination of a scientific activity. E.g. WGMS Steering Committee, Cryospheric Classifications & Glossaries, Arctic Glaciology (Pontresina). I also noted: Chair or co-chair from bureau, review usually takes place every 4 to 6 years.

**ACTION ITEM 2 (8.2), Head of Divisions:** Rewrite proposed guidelines for Working Group and Standing Group guidelines and return to the President *Georg Kaser*

**ACTION ITEM 3 (8.2), Georg Kaser:** To report to Past President *Gerry Jones* on the concept of Standing Groups

## 8.3. *Proposals for new Working Groups and future Workshops*

A new WG on river ice can be established as a joint UCCS/ICSIH WG activity.

A proposal by *Cedomir Marangunic* for a WG on glacier management was discussed. The possibility of establishing this WG should be discussed with other persons with similar interests. The latter issue sparked a short discussion on legal matters. It was concluded that UCCS should avoid consulting-like activities because such activities are associated with legal

consequences. Associated with this are also any lists of experts that can be construed as guides for consulting. This is also to be avoided.

A workshop to follow up the WS on mass balance measurements and Modelling held in Tarfala, Sweden, 1998 has been proposed by Liss Andreassen, NVE, Norway. The workshop is planned for spring 2008. The bureau decided to support this workshop initiative. It was also suggested that WGMS should actively support the activity through its Associate *Michael Zemp*.

**ACTION ITEM 4 (8.3), Manfred Lange:** To contact ICSIH President *John Pomeroy* about joint WG on river ice.

**ACTION ITEM 5 (8.3), G. Kaser:** To contact Cedomir Marangunic and convey contact info to Andrea Fischer (Innsbruck) and Andreas Bauder (ETH Zürich for C. Marangunic to seek advice.

**ACTION ITEM 6 (8.3), Julian Dowdeswell:** To reply to Liss Andreassen on UCCS sponsorship of the proposed workshop on mass balance

**ACTION ITEM 7 (8.3), WGMS:** To contact Liss Andreassen to discuss possibilities for collaboration in organizing the workshop.

## 9. UCCS > IACS

### 9.1. Statutes updates

The statutes have been updated with greatly appreciated support and cooperation from the IUGG Secretary General *Jo Ann Joselyn*. The number and names of Divisions (now 5) can be changed up to the deadline for submitting the draft statutes to the IUGG Bureau, 15 February, 2007. Each Division should have a short abstract text describing its focus. This will be the job for new chairs. Past President has worked extensively to provide careful wording in the new Statutes. The Quorum statements have been changed. The statutes will not reflect the Bureaus wish to define workload among Bureau members. The IUGG wants single line for communication (Secretary). This means the Bureau will develop a memorandum outlining workload distribution and organize so that the Secretary can work as the line of communication with IUGG. This memorandum will be a document that can be revised by each new Bureau to fit new demands. Small changes on the statutes and by-laws as well as respective consistence checks with IUGG rules are ongoing.

**ACTION ITEM 8 (9.1), Future Division Heads:** provide short text on Division focus.

### 9.2. Translation of Statutes into French

The Past President *Gerry Jones* has investigated the possibility to translate the Statutes into French. He has an offer for approx. USD 700 for this work. The bureau decided to try to obtain further independent offers before deciding on this issue. The Bureau decided to give the President *Georg Kaser* the right to make a decision on this once offers are available.

**ACTION ITEM 9 (9.2), Charles Fierz:** Provide independent offer for translation of the Statutes.

9.3. *IACS Bureau – Nomination Committee*

The work of the Nomination Committee is progressing. The President *Georg Kaser* reported on the discussions which aim at getting an as wide a representation as possible from the different continents. Formal letters from prospective Bureau members accepting their positions are required once they receive the request to join.

9.4. *Promotion/information for IUGG Council Members*

This is work to be carried out by the President *Georg Kaser*, Secretary *Peter Jansson* and the IUGG Secretary General *Jo Ann Joselyn* during spring 2007. It is important to prepare the IUGG delegates so that all delegates are well informed by the issue.

9.5. *Network of National Representatives*

This work progresses.

9.6. *UCCS newsletter*

A newsletter should be sent out at the end of 2006. This should include Perugia information.

**ACTION ITEM 10 (9.6), Peter Jansson:** Send out reminder to get contents from Bureau members.

9.7. *Future Student Prizes*

Vice President *Jon Ove Hagen*, discussed the problems that arose when making decisions in Cambridge. The bureau decided that it would be difficult to provide the prize during multi-session meetings such as Perugia.

9.8. *History of the ICSI-UCCS-IACS transition*

See the past President's report (**APPENDIX A, Past President's Report (6.2)**). All need to contact the Past President on the history. Please note that the new history will be revealed at the Perugia Assembly and should not be distributed in advance.

**ACTION ITEM 11 (9.8), Bureau members:** Read and comment on ICSI/UCCS history to Gerry Jones.

9.9. *Logo*

The President *Georg Kaser* reported that work was progressing. The design bureau will provide logos for different purposes by the time of the Perugia Assembly.

9.10. *web site*

The Secretary reported on the web, which by the time of the meeting could be moved to the new hosting at CIRES under the URL [www.cryosphericosciences.org](http://www.cryosphericosciences.org). A new web should be designed to be unveiled in Perugia. This new web should include possibilities for WGs to change and display material as well as providing discussion forums, document sharing etc.

**ACTION ITEM 12 (9.10), Bureau members:** Provide ideas on functions and structure of the new web to Peter Jansson.

**ACTION ITEM 13 (9.10), Peter Jansson:** Investigate the possibility to implement technical solutions at the new hosting.

## 10. IUGG Assembly Perugia 2007

### 10.1. *State of the art*

Development is ongoing

### 10.2. *An updated Cryosphere Program*

An additional open Cryospheric session lead by Hilmar Gudmundsson has been suggested. Most IUGG Associations have supported this and IAHS agreed to host the session. The lack of inclusion of sea ice in the open session will be met by trying to approach IAPSO for an additional joint session to be run by IAPSO. WGMS will be present at the Assembly. If an information booth materializes, WGMS should be represented.

**ACTION ITEM 14 (10.2), Georg Kaser:** Contact WGMS if info booth idea becomes reality.

### 10.3. *Advertising Cryospheric Program*

An ad on UCCS session at Perugia should be organized for EOS. Vice President *Konrad Steffen* reported that an 8-day submission before deadline is necessary to get it into the paper. The ad should also be sent out through CRYOLIST and CLIMLIST. The text for the ad must be finished by mid-November. Conveners must be contacted to make sure information on ad is correct, e.g. on chosen proceeding journal.

**ACTION ITEM 15 (10.3), Georg Kaser, Peter Jansson, Konrad Steffen:** Ad for EOS, CRYO-/CLIMLIST finished by mid-Nov.

**ACTION ITEM 16 (10.3), Georg Kaser:** Write conveners on sessions.

### 10.4. *Financial support*

No large funds exist for providing travel support. UNESCO may be able to support travel for participants from developing countries to the Himalayan High Mountains session at Perugia. The different Associations should be contacted if questions on financing arise.

**ACTION ITEM 17 (10.4), Georg Kaser:** Contact UNESCO together with IAHS Secretary General Pierre Hubert on travel support possibilities.

### 10.5. *Bureau meeting(s) and Panel meeting(s) at Perugia*

The planning is ongoing. Preliminary planning indicates that the first Bureau meeting (i.e. the last meeting of the present UCCS Bureau) should take place on Sunday 8 July and the second (first meeting of the new Bureau) on Friday 13 July 2007. A Plenary meeting could take place on Thursday evening after the IUGG Council meeting that decides on the IACS proposal on July 11, and immediately before the celebration.

**ACTION ITEM 18 (10.5), Georg Kaser, Peter Jansson:** Find out when Plenary meeting should occur.

### 10.6. *UCCS-IACS reception*

The planning is ongoing. Thursday evening is the preliminary day for this event.

**ACTION ITEM 19 (10.6), Georg Kaser:** Make reservations for the reception and accommodation for Bureau members (7-14 Jul 2007).

#### 10.7. *Proceedings in Annals of Glaciology*

[Copy of IGS letter content from Georg Kaser]

**G.Kaser, 31.8.2006**

Dear conveners of IUGG Perugia Symposia,

As mentioned in my e-mail on 9.8.2006, the Executive Council of the International Glaciological Society (IGS) has convened in Cambridge on August 24. There, a **positive decision** has been made on offering UCCS the **Annals of Glaciology** for publishing the **proceedings of IUGG Perugia UCCS Symposia** under the following co-operative conditions:

1. The Perugia Annals shall become a benchmark document for both UCCS (to become an Association in Perugia) and IGS as for their future cooperation. I would like to remind you that UCCS is a body within the International Science Council, ICSU, and IGS is a private Society. Cooperation is thus thought to be synergistic rather than competitive.

2. Due to the UCCS's transitional position at the Perugia Assembly, the volume cannot be operated and paid via the Assembly registration. This has been explained in detail in my previous message.

3. Instead, the following financial plan has been decided:

3.1. **Page charges are compulsory for the full length of the paper.** Costs per page are being calculated by the IGS SG Magnús Már Magnússon in near future. They will be **clearly lower than the usual page charges** in the normal IGS Annals model. I will let you know as soon as numbers are available. Note that, if there is a real need, we can negotiate about payment exceptions and/or support such as in case of a good paper from a developing country scientist. Please inform me in such a case.

3.2. Each paper will be available for **free download** on the IGS web site as soon as it is accepted and until the entire volume is printed. After, it will be removed from the IGS web site and made available for purchase at the Ingenta web site.

3.3. Depending on the entire number of papers there will be 2 OR 3 **different volumes**. This makes the purchase of the printed volume cheaper.

3.4. In order to allow authors and other interested people that wish to purchase one or more volumes of the UCCS Perugia proceedings to put the respective payments to their travel budget, we **will provide invoices at Perugia**.

4. IGS is very close to catch up with a normal processing schedule for both the Journal of Glaciology and the Annals of Glaciology. This is the result of strong efforts carried out over the last years following a decision to modernize the processing. IGS is very confident that the **Perugia Annals** issue(s) will be available one year after the Assembly (**July 2008**). The precise date will depend on the last papers to become accepted. Each paper will be put to the IGS website as soon as it is accepted. **First papers** are expected to be due by the **end of 2007**.

5. In order to make the publication possible in July 2008, we need to keep the following **deadlines**: (i) the abstract submission deadline of IUGG has not to be changed: 31 January 2007; (ii) those that are interested in submitting a paper for the proceedings must do so 2 months prior to the Assembly: 7 May 2007; (iii) papers and respective reviews are then discussed among editors (also reviewers if they accept) and authors during the Assembly: 9 – 13 July 2007; (iv) the revised final papers must be submitted 1 ½ months after the Assembly: 31 August 2007.

6. **Jo Jacka**, the present Chief Editor of the Journal of Glaciology has agreed to be the Chief Editor of the Perugia proceedings. Jo has a great experience in editing big volumes of scientific papers and I cannot think of any better choice.

7. The **conveners** will act as **session editors** or may **appoint somebody** for this task. Please inform Jo Jacka and me about.

I would like to thank those that have replied to my previous e-mail and take this as an agreement to join the Annals proceedings.

**All those that have not been able to reply so far are kindly asked to give me their opinion and decision soon. I will then keep you updated on the next steps.**

The UCCS bureau members look very much forward to the joint Perugia proceedings to be published in the Annals of Glaciology and I would like to encourage all of you to join in.

With my best wishes,

Georg Kaser

President of the IUGG Commission

For the Cryospheric Sciences (UCCS)

## 11. IAMAS-IAPSO-UCCS Assembly 2009 Montreal

### 11.1. *State of the art*

Problems has arose from some possible misunderstanding regarding the necessity for the by UCCS appointed LOC representative Scott Munro to attend LOC/NOC Meetings for the Montreal 2008 joint IAMAS/IAPSO/UCCS Assembly. IAPSO Secretary General *Lawrence Misak* has pointed out the necessity for UCCS to be represented. It was decided that the President *Georg Kaser* would attend the next meeting and that UCCS will completely fund his travel. In the meantime UCCS will need to find a replacement for Scott Munro. The Bureau fully backs the President's actions in this high priority issue.

**ACTION ITEM 20 (11.1), Georg Kaser:** To call John Pomeroy, Scott Munro and LOC/NOC chair Michel Beland to sort out the UCCS LOC/NOC participation.

### 11.2. *Name of assembly: Water Links 2009, Global water links, H<sub>2</sub>O links, Water planet, Cold planet?*

The name for the 2008 joint Assembly was discussed. A few suggestions were mentioned but no consensus suggestions were found. "Dynamic Earth" and "Variability and change of ..." were ideas that appeared.

**ACTION ITEM 21 (11.2), Bureau members:** Brainstorm on possible names for Assembly.

## 12. Other IUGG matters

### 12.1. *UCCS Secretary's report to IUGG*

The UCCS secretary sent in a report to the IUGG (**APPENDIX I, Secretary's report to IUGG (12.1)**)

### 12.2. *ICSU Panel on Renewable Energies (ISPRES)*

Arni Snorrason has been asked and has accepted to be the IUGG representative in the ISPRES. He was proposed jointly by UCCS and ICSIH.

### 12.3. *Young Scientists Conference*

Two nominations for the YSC were tabled (**APPENDIX J (12.3), YSC nominations**). Both were supported and sent on to IUGG for consideration.

### 12.4. *2007 meetings support*

UCCS has applied for IUGG conference support for the ICSIH/UCCS workshop "glaciers in watershed and global hydrology" to be held in August 2007. \$1500 support has been approved. In addition, the President will approach UNESCO for financial support for the workshop

**ACTION ITEM 22 (12.4), G. Kaser:** to approach UNESCO IHP for financial support for the ICSIH/UCCS workshop

## 13. **Contact to IUGG Associations**

### 13.1. *IAHS*

The IAHS President *Arthur Askew* commented on the strong common history between the former ICSI and IAHS. He also pointed out the availability of the IAHS Press Publications for producing also special publications not part of existing IAHS series such as the *Red or Blue series*.

### 13.2. *IAMAS*

Little to report in addition to what was covered on the Montreal Assembly.

### 13.3. *IAPSO*

Little to report in addition to what was covered on both the Montreal and the Perugia Assembly.

### 13.4. *IAVCEI*

The IAVCEI representative Michael Dungan pointed out the numerous couplings between volcanic activity and sea level change as well as land based ice cover. In many cases the global climatological forcing affecting sea level yields local effects at individual volcanoes. For the joint symposium, Steve McNutt and the representative will meet and brainstorm for ideas on topics. A common work group on Cryosphere-volcano interactions is a possible future venue.

## 14. **WGMS**

### 14.1. *The Director's Report*

The WGMS Director *Wilfried Haeblerli* summarized the WGMS Self-evaluation (**APPENDIX K, WGMS Director's Report (14.1), APPENDIX L, Self Evaluation Report (14.1)**) and stressed that it was a good exercise that can and will be used for increasing visibility in the community. The increase in focus from glacier data collection to also comprise a remote sensing component is natural since monitoring techniques develop and the

service needs to keep up with such changes. Investigating possibilities to link to the GLIMS project may be a natural way to include such a component, WGMS already participates in GLIMS through activities of some of its Associates. The most serious challenge facing the WGMS is, however, definitely the funding situation, which, although slightly improved in the last years is still intolerable. The current situation involves the funding of the director through chair appointment within his department as well as soft money to support the associates in their work. A proposal has been submitted to the Swiss National Science Foundation for a three year funding that would allow ongoing activities as well as the restructuring of WGMS. A final decision is expected in March; however, a preliminary hearing is expected in January. The President *Georg Kaser* offered to participate in this hearing if so required. The director mentioned the need for an official link between WGMS and GLIMS in order to best contribute to the GTN-G. A memorandum of understanding would be a natural step to formalize such collaboration.

#### 14.2. *Evaluation*

The first draft of the evaluation report authored by Vice President *Jon Ove Hagen*, and evaluation committee members *Frank Rau* and *Wilfried Hagg* was tabled (**APPENDIX M, WGMS Evaluation Report (14.2)**). The President *Georg Kaser* expressed his regrets that this draft was not circulated before the Bureau meeting, especially to the WGMS. The vice President summarized the work presented in the report to the Bureau. The Director also reported on the positive and constructive discussions resulting from the Evaluation Committee visit to the WGMS.

Both the self-evaluation and the evaluation reports stress that WGMS should be run under the future IACS: The Evaluation committee report stresses that the goals of the WGMS need to be defined. The modelling component suggested by the WGMS was not seen as a potential future component in WGMS activities since this means that the WGMS mixes the data collection and organization with research. The Director pointed out that ensemble analysis of regional mass balances is a modelling effort but that the result is to be considered a monitoring product. According to the Director, WGMS could/should set standards, e.g. regarding what model simplifications can be used for 'monitoring' purposes. The Bureau concurred, but stressed that the research made by the WGMS Associates should be clearly removed from all association to the WGMS. The Bureau recognizes and encourages the right of the Associates to perform such research just as any other researcher's using WGMS data.

#### 14.3. *Next steps - perspectives*

The Bureau and WGMS director agreed that the Self-evaluation, the Evaluation Committee Report as well as a combined conclusive report should be presented.

**ACTION ITEM 23 (14.3), *Jon Ove Hagen*:** To finalize the Evaluation Committee report within the 4 weeks following the Geneva Bureau Meeting

In order to support the WGMS the Bureau and Service agreed that a Steering Committee should be formed, consisting of no more than c. 8 participants, not including the ex officio WGMS participation. The main

points when setting up the committee is to clearly define its aims, its governance, and its scope. It is important to realize that the steering Committee should work with the WGMS to develop the service on a consensus basis. The Bureau will, however, as is also currently the case, be ultimately responsible for any decisions taken by the Committee and the Service. The first step is to establish a clear set of well-defined tasks. A second step is to investigate the possibility to distribute the operational workload to more than one location, Oslo as well as Boulder was mentioned as possible locations. Data availability is another task to be discussed within a future Steering Committee. This will serve to better support financing efforts and to serve the scientific community.

**ACTION ITEM 24 (14.3), Jon Ove Hagen:** To set up Steering Committee To achieve the goals, the service should also convene workshops. Two main areas were defined. First there is a need to consolidate the national correspondents and workshop activity should focus on this goal. Second, workshops focussing on the dissemination of Service data should also be performed to discuss new techniques, decide on improved standards or other issues that concern the Service.

## 15. WMO

### 15.1. CliC

Strong connections exist between CliC and UCCS that should be reinforced and maintained. Vice President Konrad Steffen, who is heavily involved with CliC and will not stand for another term within the UCCS bureau, suggested that he could become a liaison officer to bridge between the UCCS and CliC. The bureau strongly supported the idea. It is necessary to find out how such a new task can be made official by the Statutes and By-laws. One suggestion to follow up was to put the liaison officer on a level in parallel with the WGMS.

Regarding the action that Vicky Lytle was to join proposal to COST-ESF. A letter of support was written but the project failed to gain funding.

The successful collaboration with CliC in Cambridge shows that the collaboration should continue. We should follow up on this with, say, two year interval CliC/IACS meetings with overlap in the future.

The Bureau expressed its gratitude towards the Vice President for paving the way with CliC.

### 15.2. WCRP

The connections to WCRP was strengthened by our visit to WCRP/WMO in Geneva and it was agreed that this coupling should be strengthened by locating further Bureau meetings at WMO.

## 16. UNESCO

The President has been in contact with András Szöllözy-Nagy at UNESCO. Szöllözy-Nagy has reported that Sigfried Demuth will be at UNESCO/IHP as Chief of the Section **on Hydrological Processes and Climate** as well as

Senior Programme Specialist (global changes and water resources, FRIEND, HELP). The Bureau stressed the importance of remaining in close contact with UNESCO and its water related activities.

**ACTION ITEM 25 (16), Georg Kaser:** To write letter to Szöllözy-Nagy to express the UCCS interest to maintain good relations with UNESCO

**ACTION ITEM 26 (16), Georg Kaser:** To go to UNESCO in spring to see Sharf and Demuth and develop the connections between UNESCO and the UCCS.

## 17. Others

### 17.1. IGS

The Cambridge conference was successful as reported in the Newsletter 2 (**APPENDIX N, UCCS Newsletter 2 (17.1)**). IGS will sponsor all sessions in Perugia and publish proceedings in Annals for conveners who so wish.

The issue for co-sponsoring the upcoming 2007 IGS symposium in Moscow should be discussed with the IGS

**ACTION ITEM 27 (17.1), Charles Fierz:** To contact IGS Secretary General Magnus Mar Magnusson and chief editors (Martin Schneebeli and Jerry Johnson) on co-sponsoring the Moscow symposium.

**ACTION ITEM 28 (17.1), Charles Fierz:** If first action successful, to ask Richard Essery, Sergey Sokratov or Martin Schneebeli to be UCCS representative in Moscow.

### 17.2. IPY – UCCS Proposal on Ice-Snow Classification and Glossary

Division Head *Charles Fierz* proposed a 2 year term for a WG on Ice-Snow classification and glossary. The Vienna EGU meeting will be the starting point for establishing a group to form the WG.

WGMS also seeks to become visible within the IPY frame work. WGMS will contact IPY to show what they can contribute in terms of data and data structures. The Bureau expressed its gratitude to the Service for taking on this activity.

### 17.3. IPA

The IPA President Jerry Brown reported on several issues. First the successful work of the joint WG GAPHAZ. The Permafrost conference in China was very successful with 250 participants. An abstract volume has been published and proceedings will be published in peer reviewed journals. The IPA President reported on the Permafrost Young Researchers Network (PYRN.org) activities, including their young researchers awards handed out during the Conference. PYRN has free membership and is run by the young researchers independently of IPA. Membership is required to qualify for awards

In the future IPA, will re-evaluate its WGs. New WGs may include subglacial permafrost. The IPA constitution has now been changed so that Association activities are run in cycles of 4 years instead of 5 as before. This makes synchronization with IUGG matters easier.

#### 17.4. SCAR

No action taken yet.

**ACTION ITEM 29 (17.4), Julian Dowdeswell:** To contact Julian Summerhays on SCAR

#### 17.5. *International Geological Congress/Geoscience World Congress 2008:* [www.33igc.org](http://www.33igc.org)

The Secretary *Peter Jansson* reported that contacts with the IGC council had been made and that a positive feed-back has been received. Although the deadline for proposing workshops (August 31) has been passed by quite a margin, additional activities can be added, although a quick response was requested. The Secretary has discussed the matter with Vice President *Jon Ove Hagen* and started to ask for potential conveners. At the time of the bureau meeting, no results from this search have emerged. Vice President *Julian Dowdeswell* suggested that Workgroup President Prof. *Michael J. Hambrey* could potentially organize a workshop within the frame work of IGC.

**ACTION ITEM 30 (17.5), Peter Jansson, Jon Ove Hagen, Bureau members:** Contact potential conveners and supply contact to the IGC

#### 18. Other business

A general call was made that the Bureau members should keep track of other upcoming meetings and inform the Bureau about these.

#### 19. Next Bureau meeting

The next Bureau will be the last meeting of the outgoing Bureau, as per the statutes, during the Perugia Assembly in July 2007. The exact date for this meeting will be organized in conjunction with other planning of activities during the second week of the Assembly. Because the incoming Bureau will also, by the statutes, need to hold their first bureau meeting during the Assembly, it is planned to organise the outgoing Bureau meeting on Sunday 8 July and the new Bureau meeting on Friday 13 July 2007, separated by the general IUGG Council meeting on Wednesday 11 July where the decision of the future faith of the UCCS will be determined.

#### 20. Closure

The President closed the meeting at 16.10, October 31, 2006.

## **SUMMARY OF APPENDICES**

***APPENDIX A, Past President's Report (6.2)***

***APPENDIX B, Treasurer's Report (7.1)***

***APPENDIX C, WG on Glacial Sediments report (8.1)***

***APPENDIX D, GAPHAZ report (8.1)***

***APPENDIX E, Divison on Snow and Avalanches report (8.1)***

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***APPENDIX G, Snow classification report (8.1)***

***APPENDIX H, WG Guidelines (8.2)***

***APPENDIX I, Secretary's report to IUGG (12.1)***

***APPENDIX J, YSC nominations (12.3)***

***APPENDIX K, WGMS Director's Report (14.1)***

***APPENDIX L, Self Evaluation Report (14.1)***

***APPENDIX M, WGMS Evaluation Report (14.2)***

***APPENDIX N, UCCS Newsletter 2 (17.1)***

## SUMMARY OF ACTION ITEMS

**ACTION ITEM 1 (7.1), Treasurer Peter Jansson:** To gather information to provide a detailed working for 2007.

**ACTION ITEM 2 (8.2), Head of Divisions:** Rewrite proposed guidelines for Working Group and Standing Group guidelines and return to the President *Georg Kaser*

**ACTION ITEM 3 (8.2), Georg Kaser:** To report to Past President *Gerry Jones* on the concept of Standing Groups

**ACTION ITEM 4 (8.3), Manfred Lange:** To contact ICSIH President *John Pomeroy* about joint WG on river ice.

**ACTION ITEM 5 (8.3), G. Kaser:** To contact Cedomir Marangunic and convey contact info to Andrea Fischer (Innsbruck) and Andreas Bauder (ETH Zürich for C. Marangunic to seek advice.

**ACTION ITEM 6 (8.3), Julian Dowdeswell:** To reply to Liss Andreassen on UCCS sponsorship of the proposed workshop on mass balance

**ACTION ITEM 7 (8.3), WGMS:** To contact Liss Andreassen to discuss possibilities for collaboration in organizing the workshop.

**ACTION ITEM 8 (9.1), Future Division Heads:** provide short text on Division focus.

**ACTION ITEM 9 (9.2), Charles Fierz:** Provide independent offer for translation of the Statutes.

**ACTION ITEM 10 (9.6), Peter Jansson:** Send out reminder to get contents from Bureau members.

**ACTION ITEM 11 (9.8), Bureau members:** Read and comment on ICSI/UCCS history to *Gerry Jones*.

**ACTION ITEM 12 (9.10), Bureau members:** Provide ideas on functions and structure of the new web to Peter Jansson.

**ACTION ITEM 13 (9.10), Peter Jansson:** Investigate the possibility to implement technical solutions at the new hosting.

**ACTION ITEM 14 (10.2), Georg Kaser:** Contact WGMS if info booth idea becomes reality.

**ACTION ITEM 15 (10.3), Georg Kaser, Peter Jansson, Konrad Steffen:** Ad for EOS, CRYO-/CLIMLIST finished by mid-Nov.

**ACTION ITEM 16 (10.3), Georg Kaser:** Write conveners on sessions.

**ACTION ITEM 17 (10.4), Georg Kaser:** Contact UNESCO together with IAHS Secretary General Pierre Hubert on travel support possibilities.

**ACTION ITEM 18 (10.5), Georg Kaser, Peter Jansson:** Find out when Plenary meeting should occur.

**ACTION ITEM 19 (10.6), Georg Kaser:** Make reservations for the reception and accommodation for Bureau members (7-14 Jul 2007).

**ACTION ITEM 20 (11.1), Georg Kaser:** To call John Pomeroy, Scott Munro and LOC/NOC chair Michel Beland to sort out the UCCS LOC/NOC participation.

**ACTION ITEM 21 (11.2), Bureau members:** Brainstorm on possible names for Assembly.

**ACTION ITEM 22 (12.4), G. Kaser:** to approach UNESCO IHP for financial support for the ICSIH/UCCS workshop

**ACTION ITEM 23 (14.3), Jon Ove Hagen:** To finalize the Evaluation Committee report within the 4 weeks following the Geneva Bureau Meeting

**ACTION ITEM 24 (14.3), Jon Ove Hagen:** To set up Steering Committee

**ACTION ITEM 25 (16), Georg Kaser:** To write letter to Szöllözy-Nagy to express the UCCS interest to maintain good relations with UNESCO

**ACTION ITEM 26 (16), Georg Kaser:** To go to UNESCO in spring to see Sharf and Demuth and develop the connections between UNESCO and the UCCS.

**ACTION ITEM 27 (17.1), Charles Fierz:** To contact IGS Secretary General Magnus Mar Magnusson and chief editors (Martin Schneebeli and Jerry Johnson) on co-sponsoring the Moscow symposium.

**ACTION ITEM 28 (17.1), Charles Fierz:** If first action successful, to ask Richard Essery, Sergey Sokratov or Martin Schneebeli to be UCCS representative in Moscow.

**ACTION ITEM 29 (17.4), Julian Dowdeswell:** To contact Julian Summerhays on SCAR

**ACTION ITEM 30 (17.5), Peter Jansson, Jon Ove Hagen, Bureau members:** Contact potential conveners and supply contact to the IGC

## **Appendix A, Past President's Report (6.2)**

### **IUGG-CCS Bureau Meeting, WMO, Geneva, October 2006**

#### **Report of the Past-President**

In the period since the last Bureau Meeting at Karthaus in June 2006 I have essentially been involved in three activities. These activities are: putting the final touches to the Statutes and By-laws for IACS, chairing the UCCS Nominating Committee for the nomination of candidates to serve on the IACS Bureau for the period 2007-2011, and writing the History of the transition of ICSI to UCCS to IACS.

#### ***The IACS Statutes and By-laws***

After the approval of the draft of the future IACS Statutes and Bye-laws by the IUGG Executive Committee in September 2005, I have been working with the IUGG Secretary General, JoAnn Joselyn, in modifying the text in order to clear up any ambiguities that may arise in interpretation. The modifications are minor (so far, Statutes 2.1 and 2.3, By-law 3.3.b.viii) but the texts are now much clearer. The Statutes are still being examined for inconsistencies such as the exact wording of terms and cross-references between certain Statutes and By-laws; thus some minor changes may again be necessary. The overall Statutes, however, can be considered as almost complete and satisfactory as far as JoAnn and myself are concerned. I am very grateful to JoAnn for the great job she did in drafting version 3 of the Statutes. I also thank Julian Dowdeswell, and Manfred Lange of the Bureau for their counsel and help in the preparation of the Statutes. A final version of the Statutes will be sent to the Bureau early in the New Year. After approval by the Bureau, the version will be sent to the IUGG Secretariat before the end of February 2007.

#### ***The UCCS Nominating Committee***

UCCS has formed a Nomination Committee with the mandate of selecting and nominating candidates to serve in the IACS Bureau for the period 2009-2011. The new Bureau Officers will commence their term of office at the Plenary Administrative Session of IACS in Perugia. The Committee consists of myself as Chair by virtue of my office of Past President, Georg as Secretary by virtue of his current position of President, and Liz Morris. IUGG has informed the Committee that there will be no election as such. Elections can only be held after changes to the Statutes and By-laws of IUGG that will have to be brought down by the creation of a new Association. IUGG have also indicated that the simplest procedure would be for the UCCS Bureau to become the IACS Bureau in 2007 as the ICSI Bureau became the UCCS Bureau in 2004. As of now, the Nomination Committee will propose a President-Elect, and candidates for those positions left vacant by Bureau Officers who wish to terminate their Bureau activities or move to another position within the Bureau.

## **Appendix A, Past President's Report (6.2)**

### *The History of the transition of ICSI to UCCS to IACS*

When the Bureau asked me to write the history of ICSI's transition to IACS, I accepted to do it thinking that it would be considered as - and proposed as - an addendum of about a thousand words or so to Radok's 1997 paper. However, the paper has turned out to be approximately the same length as that of Radok. I believe it can now stand alone and as a complementary paper to Radok's publication but focussed more particularly on the question of the events that lead up to the transition of ICSI to IACS. I have submitted the paper for approval by the Bureau and welcome any corrections and suggestions that may be made. I will say, however, that as a scientist I found it difficult to write particularly on the events that took place prior to the decision of the ICSI Bureau in 2000 to tackle the issue directly with IAHS and IUGG. In effect the whole issue of Association vs Commission prior to 1999 was one of negativism. A large divide separated the pro- and anti-Association protagonists for many years. In the paper I have tried to suppress the negative connotations of the anti-Association arguments and try to place them in a more positive light by referring to the context of the time at which the debates occurred. I also have tried to establish and then describe three periods associated with the overall debate i.e. the pre-war and post-war years from 1927 to 1994, the events prior to the decision to attempt the transition during 1994-2000, and the transition itself from 2000-2007.

H.G. Jones  
Past-President, UCCS, 2005-2007  
October 26 2006



# IUGG Commission for the Cryospheric Sciences

**Peter Jansson, Secretary/Treasurer**

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## Treasurer's report for 2006

The financial status for the UCCS is quite well. Financial support for 2006 was received from the IUGG. This is an annual allotment that the UCCS will receive also during 2007. The UCCS expenses for 2006 have cover travel support for individual officers requiring such support and who have taken part in what has been deemed vital arrangements. In general, our policy is to give USD300 for intra-continental travel and USD500 for inter-continental travel. Such support has thus been paid to the Division Head M. Lange Secretary P. Jansson, President G. Kaser and Past President G. Jones. Full support was given to Past President G. Jones for attending the meeting in Karthaus and the IAMS/IAPSO/UCCS NOC Meeting in Toronto. In addition, funding was used during the IGS/CLIC/UCCS symposium in Cambridge for printing the UCCS folder and for two student cash prizes of USD 100 each for best presentation and poster, respectively, at the meeting.

The UCCS finances are currently kept in Swedish bank account in Swedish kronor (SEK) as well as a cash depot in USD, the latter kept for cash reimbursements. The USD cash depot is not replenished but will be used until it is exhausted. The finances on Oct 28, 2006, thus were SEK 551988.94 and USD 1070 (or totally approximately equivalent to USD 8100 or EUR 6200). There is a negative change from last year but which is within a reasonable range for normal year to year variability, especially considering the extra costs of an additional bureau meeting and the cash prizes awarded during the Cambridge meeting. This can nevertheless be seen as a large surplus for an organization such as the UCCS but the Bureau sees the need for such a buffer for costs coming under 2007, mostly for supporting the IUGG Assembly in Perugia, 2007. There is also need to organize a new web site with a unique domain name as well as designing a new logo, which is handled by a professional design bureau during the coming year. In summary, the UCCS finances are in good health.

For account details see appendix.

Peter Jansson  
UCCS Secretary Treasurer

## APPENDIX C, WG on Glacial Sediments report (8.1)

# IUGG Commission for the Cryospheric Sciences Working Group on 'Glacial debris transport and deposition' Report for 2005-2006

### Activity

The main activity over the past year has been the acquisition of papers arising from the August 2005 conference in Aberystwyth and editing them. This meeting was co-sponsored by CCS. The full work was sent to the IAS Special publications editor in August 2006, and publication is expected in mid-2007. The volume comprises some 20 papers, covering the following themes:

- Glacier dynamics and sedimentation
- Modelling glaciers and ice sheets
- Quaternary glacial systems
- Pre-Quaternary glacial systems

As contents list is appended.

A Working Group website has been developed, thanks to the design skills of the new Work Group Secretary, Dr David Graham of Loughborough University, UK. Please see: <http://www.lboro.ac.uk/research/phys-geog/dtg/index.html>.

*M. J. Hambrey  
October 2006*

## APPENDIX C, WG on Glacial Sediments report (8.1)

Appendix: Conference Symposium volume

### Glacial Sedimentary Processes and Products

*Edited by*

**Michael J. Hambrey**

**Poul Christoffersen**

**Neil F. Glasser**

**Bryn Hubbard**

(Centre for Glaciology, University of Wales, Aberystwyth, U.K.)

**International Association of Sedimentologists**

**Special Publication No. \*\*\***

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#### **Preface**

D. J. Drewry: Brian Harland and the Neoproterozoic 'Snowball Earth' concept

#### **Introduction to papers**

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#### **Glacier dynamics and sedimentation**

Siegert, M. J., Le Brocq, A. and Payne, A.J.: Hydrological connections between Antarctic subglacial lakes, the flow of water beneath the East Antarctic Ice Sheet and implications for sedimentary processes

Midgley, N. G., Glasser, N. F. & Hambrey, M. J.: Sedimentology, structural characteristics and morphology of a Neoglacial high-Arctic moraine-mound complex: midre Lovénbreen, Svalbard

Rousselot, M., Fischer, U. and Pfister, M.: A new laboratory apparatus for investigating clast ploughing.

#### **Modelling glaciers and ice sheets**

Pollard, D. and DeConto, R.M.: A coupled ice-sheet/ice-shelf/sediment model applied to a marine margin flowline: forced and unforced variations

Siegert, M. J.: A brief review on modelling sediment erosion, transport and deposition by former large ice sheets.

#### **Quaternary glacial systems**

Willmott, V., Domack, E., Padman, L. and Canals, M.: Glaciomarine sediment drifts from Gerlache Strait, Antarctic Peninsula

Russell, H.A.J., Sharpe, D.R. and Bajc, A.F.: Sedimentary signatures of the Waterloo Moraine, Ontario, Canada

Delisle, G., Grassmann, S., Cramer, B., Messner, J. and Winsemann, J.: Estimating episodic permafrost development in northern Germany during the Pleistocene

## **APPENDIX C, WG on Glacial Sediments report (8.1)**

- Winsemann, J., Asprion, U. and Meyer, T.: Lake-level control on ice-margin subaqueous fans, glacial Lake Rinteln, Northwest Germany
- Delaney, C.: Seasonal controls on deposition of Late Devensian glaciolacustrine sediments, central Ireland
- Kullessa, B., Clarke, G., Hughes, D.A.B. & Barbour, S.L.: Anatomy and facies association of a drumlin in Co. Down, Northern Ireland, from seismic and electrical resistivity surveys.
- Bennett, M. R. , Huddart, D. and Thomas, G.S.P.: The Newbigging esker system, Lanarkshire, Southern Scotland : a model for composite tunnel, subaqueous fan and supraglacial esker sedimentation
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- Barrett, P.J.: Cenozoic climate and sea level history from glacial marine strata off the Victoria Land coast, Cape Roberts Project, Antarctica
- Fasano, F., Baroni, C., Talarico, F.M., Bettuzzi M., Pasini, A.: Glacial stress field orientation reconstructed through micromorphology and  $\mu$ X-Ray computed tomography of till
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- Kumpulainen, R.: The Ordovician glaciation in Eritrea and Ethiopia. NE Africa
- Etienne, J. L., Allen, P.A., Rieu, R. and Guerroué, E.: Neoproterozoic glaciated basins: a critical review of the “Snowball Earth” hypothesis by comparison with Phanerozoic glaciations

## **Appendix D, GAPHAZ report (8.1)**

### **Working Group:**

### **Glacier and Permafrost Hazards in Mountains**

#### **Report 2006**

The joint working group on glacier and permafrost hazards in mountains (GAPHAZ) by the Commission on Cryospheric Sciences of the International Union of Geodesy and Geophysics (UCCS) and by the International Permafrost Association (IPA) organized its third scientific session on glacier and permafrost hazards "Climate change impacts on glaciers, permafrost and related hazards" within the European Geosciences Union (EGU) General Assembly 2006 held in Vienna. The session was listed in the assembly sections on Cryospheric Sciences, Natural Hazards, and Climate. 12 talks and 24 posters were presented, about a third of which focused directly on glacier and permafrost hazards. Further information and the abstracts can be found at <http://www.copernicus.org> (go to EGU, assembly 2006, programme, cryospheric sciences, session CR12). A similar session has been proposed also for the EGU'07.

A special issue of "Global and Planetary Change" resulting from the EGU'05 session is in press. Under the title "Climate change impacts on mountain glaciers and permafrost" it contains 15 papers, of which about a third focusses directly on glacier and permafrost hazards. Further information will be available through <http://www.sciencedirect.com>.

One of the aims of the working group is to set up an internet-based data base of worldwide glacier and permafrost disasters in mountains. The related initial data collection has been completed by M. Flubacher (University of Zurich) in cooperation with the WGMS and will be available online very soon. It lists about 90 worldwide cases. Similarly, general recommendations regarding glacier and permafrost hazard assessments are in a second feedback round within working group members and will be published soon.

Following the change of the working group chair Andreas Käab from the University of Zurich to the University of Oslo will the GAPHAZ webpage be moved and renewed.

Andreas Käab ([kaeaeb@geo.unizh.ch](mailto:kaeaeb@geo.unizh.ch))

## **Appendix D, GAPHAZ report (8.1)**

### **Working Group:**

### **Glacier and Permafrost Hazards in Mountains**

#### **Future Plans**

During 2007 the IPA will conduct a general assessment and review of their current WGs. During this reflection process the WGs will have to

- list and comment on their initial objectives
- list future activities
- explain if and why a continuation is foreseen
- identify gaps in the WG topics
- list IPY activities

We will make the information collected also accessible to UCCS.

GAPHAZ will use this opportunity to reflect its current achievements and modify its future plans. Among other things it is my plan to discuss

- the composition of the board of chairs
- the list and revision of goals
- initiation of activities other than the ones conducted so far (meetings, scientific sessions, special issue, webpage, data base of disasters, recommendations)

#### **Comments on WGs in general**

- In general, I think, the most important support that UCCS can provide to its WGs is the platform UCCS itself. UCCS is very valuable in fulfilling this task.
- The actual success of a WG depends then to the largest part on the chairs and their initiative anyway.
- UCCS might want to promote and represent their WGs in a more compact way. (IPA does that more in my view). E.g.: coordinated session planning at conferences, information platform, active linking of WGs to international programs and initiatives, etc.

Andy Kääh

## APPENDIX E, Division of Snow and Avalanches report (8.1)



### IUGG Commission for the Cryospheric Sciences Division on Seasonal Snow Cover and Avalanches Bureau Meeting, 30-31 October 2006, Geneva

#### Head of division's report

Since my last report, activities developed satisfyingly in the three working groups of the division:

- By visiting SnowMIP2' web site and from listening to other sources, I can confirm that the WG is on track (see separate report). Adopted as activities of GLASS and CliC, actively present at various scientific meetings, the WG - and UCCS - are now known to a wide audience. Two from the large number of participants (30 institutions, over 40 models) already submitted results. I am looking forward to the first results that will result in a very interesting workshop at the IUGG General Assembly 2007 in Perugia. The chair envisages to ask for extending the term of this very active WG.
- Regarding the Snow and Climate book, Richard Armstrong tells me he now has final chapters from all authors and he and his wife are currently going through the final edits prior to sending the complete final draft to Cambridge. He hopes to send the complete draft to Cambridge by about mid-November. If CUP editors have any questions or comments, they have been instructed to communicate directly with the section leads, or the individual authors if necessary. My hope is we can announce the imminent coming out of the book in Perugia and end a twelve years old story!
- The Working Group on Snow Classification is on its way too (see separate report). I got quite positive feedback on the last technical committee meeting held in Telluride, CO, U.S.A. beginning of this month. I am fully aware much work remains to be done but I am still confident the WG will be able to present the revised classification in Perugia, even so some tasks such as publishing the classification will still lie ahead.

Additional activities relevant to UCCS:

- Manfred Lange, head of the division 'Sea, Lake and River Ice', and myself submitted successfully a proposal to IPY entitled "Ice and Snow Classification and Glossary" (# 346). At our 2006 Karthaus retreat, Manfred, Julian Dowdeswell, head of the division 'Glaciers and Ice Sheets', and myself discussed first ideas on how to proceed. As I could not provide my colleagues with a short summary of our discussion yet, not much was done with that respect since then. Nevertheless, I'll put a few ideas together on the next page.
- During a professional stay in Canada, I had the opportunity to meet John Pomeroy, President of ICSIH. While visiting one of his field sites in the Canadian Rockies, a short discussion let appear a willingness of strong collaboration between ICSIH and UCCS in the future. John welcomes warmly our participation - hopefully as association - to the joint IAMAS-IAPSO scientific assembly 2009 in Montreal.

Charles Fierz, head of the UCCS division Seasonal Snow Cover and Avalanches  
Davos, 26 October 2006

## APPENDIX E, Division of Snow and Avalanches report (8.1)



### IUGG Commission for the Cryospheric Sciences Division on Seasonal Snow Cover and Avalanches Bureau Meeting, 30-31 October 2006, Geneva

#### Head of division's report

“Ice and Snow Classification and Glossary”  
(IPY proposal/activity # 346)

Many glossaries relating to either specific topics of or to the cryosphere in general are now found on the web, e.g. the “Cryospheric Glossary” of the National Snow and Ice Data Center NSIDC (link available on UCCS' web site), the “Snow and Avalanche Glossary” of the European Avalanche Forecasting Services or even the “Glossary of Meteorology” of the American Meteorological Society. Going through these examples, you'll find that all of them could be improved and in particular ‘homogenised’ as to the definitions proposed. Regarding illustrations and multilingualism, much remains to be done too.

In our Karthaus discussion, Julian proposed, as a first step, to put up an illustrated, multilingual and web-based glossary starting from the printed “Illustrated Glossary of Snow and Ice” by T. Armstrong, B. Roberts and C. Swithinbank and published 1973 by the Scott Polar Research Institute SPRI. Julian also offered to ‘host’ the glossary on SPRI's web site. This would be a nice and visible UCCS/IACS product. In view of the already existing products, however, I am now asking myself whether we should rather offer to sponsor existing products, requiring them to meet a certain standard (illustration, multilingualism, clear indication of sources, acknowledging UCCS/IACS sponsorship) and by reviewing cryospheric related scientific terms. We would then provide links to those products on our web site. UCCS/IACS' would probably be even more visible that way.

While glossaries are very helpful, classification schemes and observational guidelines may be required to enhance communication among scientists and even a broader audience as well as to allow for standardised collection of data. This is the declared purpose of the 1990 “International classification for Seasonal Snow on the Ground” (no link available yet on our web site but may be found under ‘NSIDC Publications’ as CRREL report “Seasonal\_Snow.pdf”). Another example is the “Antarctic Sea Ice Observations” (T. Worby et al., 1999), which could be linked to a future classification and glossary platform on the UCCS/IACS web site. As for glossaries, ‘homogenisation’ would be required here too. As a snow scientist, I was surprised on how simply snow is treated in the latter guidelines, e.g..

How could this activity be implemented into UCCS/IACS? Last year I proposed to create a standing committee on classification. While reflecting on WG guidelines, I realised a standing committee would be too rigid. In future I think this activity could well be taken by the heads of division together with one vice-president as a kind of supervisor. The task would mainly consist in serving as contact persons and to look for adequate reviewing of both new proposals and changes to existing documents. For now, I would propose UCCS/IACS to set up a WG in Perugia with ending term in Montreal 2009. The WG could be advertised in mail-lists such as Cryolist to gather as many IPY activists as well as interested and knowledgeable people to a first (informal) meeting in Perugia. Of course, UCCS/IACS heads of division and the supervising vice-president should actively participate into the WG, but not necessarily as chair. I anticipate much of the work could be done ‘online’ such that a second closing meeting could be held in Montreal 2009, fitting somewhat the IPY timetable.

## APPENDIX E, Division of Snow and Avalanches report (8.1)



**IUGG Commission for the Cryospheric Sciences  
Division on Seasonal Snow Cover and Avalanches  
Bureau Meeting, 30-31 October 2006, Geneva  
Head of division's report**

Links:

Cryospheric Glossary: <http://nsidc.org/cgi-bin/words/glossary.pl>

Glossary of Meteorology: <http://amsglossary.allenpress.com/glossary>

Seasonal\_Snow.pdf:

[http://www.crrel.usace.army.mil/techpub/CRREL\\_Reports/reports/Seasonal\\_Snow.pdf](http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/Seasonal_Snow.pdf)

Antarctic Sea Ice Observations: <http://www.aspect.aq/docs/REPORT.pdf>

## **Appendix F, SnowMIP2 report (8.1)**

### **UCCS Working Group “Intercomparison of Forest Snow Process Models” (SnowMIP2)**

Report for UCCS Bureau Meeting,  
Geneva, 30 - 31 October 2006

Richard Essery (rie@aber.ac.uk) and Nick Rutter  
Institute of Geography and Earth Sciences  
University of Wales, Aberystwyth, UK

Following on from the Snow Model Intercomparison Project (SnowMIP) for simulations of snowcovers without exposed vegetation, SnowMIP2 was commissioned by ICSI as an intercomparison of models simulating snow processes in forested environments. Following its inception, SnowMIP2 was also adopted as an activity of the GEWEX Land Atmosphere System Study (GLASS) and the WCRP Climate and Cryosphere project (CliC). Extending the original plan for an intercomparison of simulations at three sites, driving and evaluation datasets have been obtained for five sites (in Switzerland, Canada, Japan, the USA and Finland), each with a pair of nearby coniferous forest and open plots.

SnowMIP2 is being coordinated from the University of Wales Aberystwyth, and a postdoctoral researcher (Nick Rutter) began work on the project there in August 2005, with funding from the UK Natural Environment Research Council. After preparation of the driving datasets, draft experiment instructions were sent to the data providers for review and an advertisement for modelling participants was issued in April 2006. The draft instructions were sent to respondents in May 2006 and revised following comments. The modelling phase of SnowMIP2 began in June 2006 with the release of finalized instructions and driving, initialization and calibration data. A remarkable response was received, with more than 30 centres in 12 countries registering to participate; the deadline for completion of simulations is December 2006, so it remains to be seen how many models will return results.

Plans for SnowMIP2 have been presented at IAMAS 2005, EGU 2006 and the Munich Alpine Snow Workshop. The UCCS symposium on “Interactions between snow, vegetation and the atmosphere” at IUGG 2007 in Perugia, Italy, will provide an opportunity for the first presentation of results, and a workshop meeting will be organized in association with the symposium for discussion of results and analysis plans. With a large data archive to be exploited and several publications planned, it is likely that an application to extend the term of the working group will be made to UCCS in 2007.

More information on SnowMIP2 can be obtained from the project website (<http://users.aber.ac.uk/rie/SnowMIP2.html>) or by request to SnowMIP2@aber.ac.uk.

## APPENDIX G, Snow classification report (8.1)



### IUGG Commission for the Cryospheric Sciences Division on Seasonal Snow Cover and Avalanches

#### Working Group on Snow Classification

#### Status Report 25 October 2006

From the discussions so far it turns out that there are a lot of proposed and required changes to the (shape) classification that could be simply addressed by a proper characterisation of a snow layer as a whole and not just through the grain types found in that layer. The revised classification will thus include guidelines on how to use other properties such as density, hardness, liquid water content etc. to characterise snow. This also shows that an international exchange format for snow pit data would be very valuable in future. The Canadian Avalanche Association is willing to share its expertise with a XML-based format that is very promising, but it was agreed to give this issue a lower priority to avoid jeopardise the final goal of the WG, namely a revised classification to be presented next year in Perugia.

Furthermore, the question whether we should use a purely morphological or a purely physically based grain shape classification arises again and again. In my view, we need both to be able to bridge the needs of both skier and scientist, as stated in the WG proposal.

Despite an initially slow pace since my last report, the working group made recently some decisive steps towards its final goal:

- First, a web-based forum was installed at the initiative of Ethan Greene. The password protected forum will greatly help to finalise the discussion about open points regarding the revision.
- Second, Pramod Satyawali and Sergey Sokratov initiated a discussion among snow micro-structure experts. The outcome should be a recommendation to the technical committee as to what should be included in the revised classification.
- Third, the chair wrote a first draft of the revision along the lines adopted at the EGU 2005 meetings (see 2005 report). The incomplete draft focused on changes to the grain shape classification and was circulated among the technical committee members shortly prior to the International Snow Science Workshop ISSW'06 taking place 1-6 October 2006 in Telluride, CO, U.S.A.. A short and productive technical committee meeting could be held during this workshop, even though the chair and most committee members could not personally attend and had to be represented by a knowledgeable colleague. Changes were discussed according to a priority list provided by the chair, approved or disapproved, often improved, such that a second draft can be worked out until the beginning of 2007.

In addition, feedback on the 1990 classification from Russian snow workers that will have to be addressed in the second draft was very recently provided by Sergey Sokratov. Sergey will also contact Chinese colleagues while he is visiting there. That way we will hopefully identify a Chinese contact person for the political committee.

1 of (2)



## APPENDIX G, Snow classification report (8.1)



**IUGG Commission for the Cryospheric Sciences  
Division on Seasonal Snow Cover and Avalanches**

**Working Group on  
Snow Classification**

**Status Report 25 October 2006**

The next steps are:

- Contact UNESCO / IHP as a promising sponsor for dissemination. Others?
- Finalise the discussion on state-of-the-art in snow microstructure research
- Finalise the political committee (Members from South America, China, New Zealand, ...) and organise review by this body.
- Prepare second draft of revision (due beginning of 2007):
  - addressing concerns ISSW06, Russia, others
  - implementing guidelines for codification
  - implementing new photographic material
  - implementing micro-structure
  - implementing links to other areas
  - review glossary
- Prepare for IUGG General Assembly, 2-13 July 2007 in Perugia (including presentation of revised classification and workshop on “Natural Ice Microstructure”)

Charles Fierz, chair of the UCCS Working Group on Snow Classification

2 of (2)



## Appendix H, WG Guidelines (8.2)



**IUGG Commission for the Cryospheric Sciences**  
**Division on Seasonal Snow Cover and Avalanches**  
**Bureau Meeting, 30-31 October 2006, Geneva**  
**Past, present and future WG activities**

### Personal Experience

So far I participated myself into two WG (Snow and Climate, SnowMIP) and I am chair of one (Snow Classification).

The multi authored book 'Snow and Climate' was proposed at the 1995 IUGG General Assembly in Boulder, if I am correct. It therefore accompanies me almost since I started to work in the field and is now hopefully very near to completion. In that case the success does not rest on the chairs dedication, availability and initiative only (see below) as work and input are required from all co-authors, who must first be identified. Discussions about the books content after the first drafts were written seemed also counterproductive to me. Finally, discussion with a potential publisher may have been done at an earlier stage. I felt sometimes frustrated by the seemingly slow pace, but I have to admit I could often not put as much time into it as I would have liked to. In spite of this, I am convinced the book will be very valuable to our community and, because it should be a kind of 'basic principle' book, not outdated as some may fear.

SnowMIP started officially in November 1999 and ended mid 2004. A scientific committee supervised the WG progress and a dedicated team at the Centre d'Etude de la Neige CEN in Grenoble managed the intercomparison project. The WG presented results at various workshops and scientific conferences but only too few publications could be submitted, mainly due to a lack of available time by the most involved WG members. Nevertheless, this working group was very rewarding and the interest in SnowMIP2 shows such projects are needed and provide good visibility for UCCS/IACS. Furthermore, they allow to establish good contacts to other international research programmes.

The WG on Snow Classification started November 2003 and should end next year with the birth of IACS. Based on the initiative of a few individuals, the WG was welcomed by a large community of snow scientists and snow workers. The feedback following calls to submit changes, comments and improvements to the 1990 classification was quite successful. The revision is still at the stage of a preliminary draft, even so important changes have been recently accepted by the technical committee. As chair I realise how much depends on my initiative and, once again, on the time I can dedicate to this work. Furthermore, WG members should gather at least once each year to take decisions. Unfortunately, this is rarely possible, as evidenced by the recent meeting in Telluride (most attendees were 'knowledgeable' representatives). For such projects, the support (web site, contacts, etc.) and supervision from UCCS/IACS is of foremost importance to make them successful in due time.

### External Input

To get a more objective view on WG, I asked past and present WG chairmen about their experience and recommendations. The answers of John Pomeroy and Eric Martin (two past chairmen) are included at the end of this document. I also had quick looks at the web site of both the International Permafrost Association IPA and the International Association of Meteorology and Atmospheric Sciences IAMAS to get a feeling of the way these associations present their Working Parties and Commissions.

### WG Success

I agree with Andy Kääh that the success of a WG primarily rests on the chair and its initiatives. Nevertheless, the Association can be very helpful by providing adequate support ( web site, contact lists, seed money etc.) Furthermore, in those cases where a WG require a heavy work load from the

## Appendix H, WG Guidelines (8.2)

chair, the responsibility of the association's officers will also be engaged to bring the project successfully and in due time to an end.

### Guidelines in short

Below I compiled John's, Eric's and my own ideas about how to run future WG. I am strongly in favour of this very flexible, slim and uncomplicated structure, especially if WG are short term activities. However, it requires a few clearly stated guidelines to be met by the WG to allow a better supervision by the Bureau. In turn, WG may expect active sponsoring from UCCS/IACS as well as infrastructure support such as

- contact lists
- 'seed money', e.g. for pre-WG meetings (set-up), publishing costs etc.
- website. As suggested by Eric, a minimum content on the official UCCS/IACS website should be required (compact presentation?). The WG web site should allow for a private part and a member forum (more effective for discussions than e-mail). This may require a versatile system allowing not only the webmaster to post items on the UCCS/IACS site. Alternatively, expertise in putting up such a site should be provided (contact lists).

UCCS/IACS guidelines should include:

- Topic
    - should be an important issue, preferably not (too) much covered elsewhere.
    - service to community (assessments, recommendations, classifications etc.)
  - Proposal
    - preliminary analysis of the state-of-the-art
    - clear objectives
    - measurable progress milestones (including reports to responsible head of division and to Bureau)
    - links with other projects must be stated
  - Structure
    - broad international participation with a clear repartition of tasks among members. However, after its initiation, the WG has to be open to new members willing to actively contribute.
    - are committees required (technical, scientific, steering, political)? Who are the committee members? New committee members joining at a later stage should be announced to the Bureau.
    - contact person to Bureau designed (usually one of the heads of division)
  - Time frame
    - should not exceed 4 years, subject to a prolongation of at most 2 years. Ideally, WG should end at a General Assembly (visibility).
  - Deliverables
    - special issues of journals (Assembly workshops)
    - IACS Publications (with or without external sponsoring)
    - organisation of dedicated Workshops (outside IACS Assemblies)
    - assessments and recommendations
    - preliminary work for books (definition of content, identification of authors, contact with publishers)
- [I agree with John that books should not be the purpose of a WG per se!]

Charles Fierz, head of the UCCS division Seasonal Snow Cover and Avalanches

## Appendix H, WG Guidelines (8.2)

Davos, 26 October 2006

A WG need to be informed that they must demonstrate that they have

- i) an important issue,
- ii) clear objectives,
- iii) measurable progress milestones,
- iv) broad international participation,
- v) a point/date of completion.

It must be clear how members of a working group participate in the same.

What the WG need from IACS is the support of the Association for symposia and workshops at IUGG and IACS meetings, support from the Secretariat with communication lists and websites and possibly small amounts of 'seed money' to help them gain financial support for meetings, books, etc.

And after two books with decadal production schedules we should really consider whether big multi authored books are an advisable approach. Such books follow well after the WG is completed. This is good for posterity but not for WG operations. The special issues of journals that I used for Snow-Vegetation Interactions WG were successful and very quick - they raised the profile of the subject and provoked more intensive study which was the main objective. I think that snowmip2 has similar plans for special issues.

9 October 2006

Professor John Pomeroy

Canada Research Chair in Water Resources and Climate Change

Saskatoon, Saskatchewan, Canada

[Pomeroy@usask.ca](mailto:Pomeroy@usask.ca)

A WG is interesting if the topic is good (usually it is the case), and if this topic is not covered (or insufficiently covered) by other scientific associations. A preliminary analysis of the "scientific landscape" should be included in the document submitted to the Bureau. Links with other projects must also be stated at this stage.

Other important questions are :

- i) Objectives : should be reasonable and well defined (report, book, proposing conferences, workshops, ...)
- ii) participants (who, what kind of work)
- iii) management (is a committee needed?)
- iv) communication: a website is useful (a minimum content can be suggested in the guidelines, I participate now in a COST action, <http://cost731.bafg.de/> , this could be an example) the web site can also have a private part.

The support from the UCCS/IACS needed is usually a scientific support (tell the scientific community that the topic of the WG is important) in all the meetings, supports for organizing of workshop within conferences. Close connections between one person of the Bureau and the WG should be useful. The WG should also pass regularly material for that.

12 October 2006

Dr Eric Martin

Météo-France CNRM/GMME/MC2

Toulouse, FRANCE

[Eric.Martin@meteo.fr](mailto:Eric.Martin@meteo.fr)



# IUGG Commission for the Cryospheric Sciences

**Peter Jansson, Secretary/Treasurer**

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Stockholm University, SE-106 91 Stockholm, Sweden

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## UCCS activities in 2005

### 1. Statutes and by-laws for the International Association of Cryospheric Sciences

In 2005, major efforts were on the formulation of the statutes and by-laws for IACS. They were then accepted by the IUGG Executive Committee at its meeting in Perugia in September 2005. The IUGG EC has also decided and agreed to recommend to the IUGG Council to vote for IACS at its assembly in Perugia 2007.

### 2. IAHS General Assembly in Foz do Iguazu, Brasil

In Foz do Iguazu in April 2005, ICSI sessions were held for the last time at an IAHS Assembly:

**S 5:** *Contribution from Glaciers and Snow Cover to Runoff from Mountains in Different Climates* (convenor: Regine Hock), 28 oral presentations, 15 posters, and a vivid discussion. Selected papers are to be published in "Hydrological Processes" (R. Hock guest editor).

**WS 4:** *Andean Glaciology* (convenor: Jefferson Simoes), 11 oral presentations, 8 posters, Proceedings to be published in a „IAHS Red Book“ (P. Ginot and J.E. Sicart editors).

The **3rd Workshop on Andean Glacier Mass Balance Network** (A-GMN) was held. The ICSI initiated WG on Andean Glaciology has now officially become the UNESCO-IHP Andean Glaciology Group. A **Glacier Mass Balance Training Course** was coordinated and later successfully held on Zongo Glacier and in La Paz in Bolivia. The course was initiated and sponsored by ICSI/UCCS, led by Bernard Francou and Edson Ramírez, and financially supported by UNESCO and IRD.

The UCCS President attended the two IAHS Bureau Meetings and supported, among others, the formation of an **IAHS International Commission on Snow and Ice Hydrology**, ICSIH. It was agreed that ICSIH will cooperate closely with UCCS.

### 3. IAMAS General Assembly in Beijing, China, August 2005.

At the IAMAS 2005 Assembly, UCCS/ICSI participated with a Symposium on *Snow and ice covers feedback to interactions with forest, atmosphere and environment* (convenors Richard Essery, Charles Fierz, Peter Jansson and Manfred Stahli). The Symposium attracted about 25 persons for the entire day.

#### **4. International Conference on Glacial Sedimentary Processes and Products, Aberystwyth, August 2005**

UCCS has co-sponsored the International Conference on Glacial Sedimentary Processes and Products, held in Aberystwyth, UK, in August 2005.

For further information see: <http://www.aber.ac.uk/aberonline/uwa12405.shtml>

#### **5. UCCS flyer**

UCCS has prepared a flyer in order to inform about and to promote the new Union Commission for the Cryospheric Sciences on its way toward a full IUGG Association. The folder can be downloaded from [http://www.glaciology.su.se/ICSI/docs/general/IUGG\\_CCS\\_Folder.pdf](http://www.glaciology.su.se/ICSI/docs/general/IUGG_CCS_Folder.pdf).

#### **6. Scientific Program at the IUGG Scientific Assembly Perugia 2007.**

At the Scientific Program meeting held in Perugia in September 2005, UCCS has proposed its contribution to the 2007 IUGG Assembly. With one exception, all proposed sessions have been approved by the SPC and several associations have openly accepted to host the UCCS sessions: IAHS: 4, IAMAS: 5, IAPSO: 2, IAG: 1, IAVCEI: 1. The UCCS proposed lecturer for a Union Lecture, Robert Corell, has been accepted. UCCS has agreed to co-sponsor several Joint Association Symposia and has named respective co-convenors.

#### **7. UCCS Bureau Meeting in Paris, November 2005**

On November 3 and 4, 2005, the UCCS Bureau has held its second Bureau Meeting at UNESCO-IHP in Paris. Not only the shift from a Commission toward an Association but a long list of activities had filled a long agenda and two days of intensive work. It was agreed that special issues concerning the new and changing role of the body demands for a retreat meeting to be held separately from bureau meetings in June 2006. The minutes of the Paris Bureau Meeting are available at <http://www.glaciology.su.se/ICSI/docs/documents.html>.

#### **8. UCCS retreat meeting in Karthaus, Italy, 21–25 Jun. 2006**

The UCCS bureau met in Karthaus, northern Italy, for a retreat meeting primarily to have informal discussion about the UCCS, possible future IACS, and the role of the organization within the Cryospheric Sciences. This meeting did not fill the requirements for an ordinary bureau meeting and was only to allow discussion on a wide array of subjects of importance to the UCCS. The minutes from the meeting are not yet available but will appear on the UCCS web site.

#### **9. IGS/ClIC/UCCS symposium, Cambridge 21–25 Aug. 2006**

In August 2006, UCCS co-sponsors the *International Symposium on Cryospheric Indicators of Global Climate Change* together with the International Glaciological Society, IGS, and WCRP Climate and Cryosphere, ClIC. Apart from the scientific and organisational contribution, UCCS plans to award best students' presentations.

Further information at <http://www.igsoc.org/symposia/2006/cambridge/>

## **10. Proposal submission to IPY**

UCCS has submitted a proposal to contribute to IPY with an *Ice and Snow Classification and Glossary*

## **11. IAMAS/IAPSO/UCCS General Assembly in Montreal, 2009**

UCCS is preparing to participate in organizing a joint IAMAS/IAPSO/UCCS Assembly to be held in Montreal in 2009.

## **12. IUGG General Assembly Perugia, 2007**

Preparations are under way for organizing publications for UCCS sponsored workshops in Perugia as well as general organizational efforts for the meeting.

Peter Jansson, Aug 12, 2006



# IUGG Commission for the Cryospheric Sciences

**Peter Jansson, Secretary/Treasurer**

Department of Physical Geography and Quaternary Geology  
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e-mail: [peter.jansson@natgeo.su.se](mailto:peter.jansson@natgeo.su.se)

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## **Treasurers report for 2005/2006 (up to 30 June, 2006)**

The financial status for the UCCS is quite well. Financial support for 2005 was received from both the IUGG and from IAMAS, the latter in support for UCCS participation and activities at the IAMAS General Assembly in Beijing. The support from IUGG is an annual allotment that the UCCS will receive also during 2006 and 2007. The UCCS expenses for 2005 have been limited to provide travel support for individual officers requiring such support and who have taken part in what has been deemed vital arrangements. In general, our policy is to give USD300 for intra-continental travel and USD500 for inter-continental travel. Such support has thus been paid to the Past-president G. Jones for arrangements for the Quebec Bureau Meeting in 2004 as well as travel support for the Division Head M. Lange to attend the meeting. The Secretary/Treasurer P. Jansson attended both the IAMAS General Assembly and the Paris Bureau Meeting in Nov 2005 for which travel reimbursements were required. Full support was given for the important IAMAS Assembly. Further reimbursements for attending the Paris Bureau Meeting were given to the President G. Kaser and Division Head M. Lange. For the Karthaus retreat meeting full travel reimbursements were given to Immediate-past President Gerry Jones. Standard travel reimbursements were given to M. Lange and P. Jansson. Immediate-past President G. Jones was also given financing for attending the joint IAMAS/IAPSO/UCCS Assembly National Organizing Committee Meeting in Toronto. President G. Kaser was given travel support for attending the IAHS bureau meeting in 2006.

The UCCS finances are currently kept in Swedish bank account in Swedish kronor (SEK) as well as a cash depot in USD, the latter kept for cash reimbursements. The finances at the end of the first half of 2006 thus were SEK23358.44 and USD 1070. This can be seen as a large surplus for an organization such as the UCCS but the Bureau sees the need for such a buffer for costs coming under both 2006 and 2007, mostly for supporting the joint UCCS/IGS/CliC meeting in Cambridge, August 2006 and the IUGG Assembly in Perugia, 2007. The need to organize a new web site with a unique domain as well as information material requires additional funding during the coming year. In summary, the UCCS finances are in good health but will also need to be stretched to meet the needs of the budding organization.

For account details see appendix.

Peter Jansson  
UCCS Secretary Treasurer

## IUGG-CCS budget Nov. 1, 2005

SEK:		SEK		USD			
	Date	Descr.	item	balance	item	balance	
2004	2004-09-22	Deposit USD 1000 cash	7 222.50	7 222.50			
	2004-09-22	22241708324 Payment to G. Jones for IUGG Boulder 1	-3 918.40	3 304.10			
	2004-10-07	Deposit USD 1000 cash	7 210.00	10 514.10			
	2004-10-07	22241819287 Payment to G. Jones for IUGG Boulder 2	-3 756.86	6 757.24			
	2004-10-07	0140540 Psyment from IAHS	21 915.00	28 672.24			
	2004-12-08	Payment for meeting room at La Chateau Frontenac/Quebec 500 CAD	2 998.00	<b>25 674.24</b>			
2005	2005-03-12	BMQuebec Expenses at Quebec conf. Centre	-3 816.00	21 858.24			
	2005-06-14	Contribution from IUGG for 2005	37 534.50	59 392.74			
	2005-08-17	Travelreimbursement for Quebec USD500 to M. Lange	-4 137.55	55 255.19			
	2005-10-19	Travel and participation costs IAMAS GA 2005, Beijing for P Jansson	-19 000.00	36 255.19			
	2005-11-01	Contribution from IAMAS for 2005	21 816.72	58 071.91			
	2005-11-01	Travel reimbursement for Paris USD300 to P. Jansson	-2 350.00	<b>55 721.91</b>			
USD:							
2004		Balance from 19 June 2004				5 041.10	
		Banking fees			51.10	4 990.00	
		Travel reimbursement M. Lange (Cambridge bureeau meeting) Aug 2004			300.00	4 690.00	
		Deposit to swedish account			1 000.00	3 690.00	
		Deposit to swedish account			1 000.00	<b>2 690.00</b>	
2005		Travel reimbursement M. Lange (Paris bureeau meeting) Nov 2005			300.00	2 390.00	
		Travel reimbursement G. Kaser (Paris bureeau meeting) Nov 2005			300.00	<b>2 090.00</b>	
<b>Total balance for IUGG-CCS at Nov. 1, 2005</b>			<b>SEK:</b>	<b>55 721.91</b>	<b>USD:</b>	<b>2 090.00</b>	
<b>Net change 2004 -&gt;2005</b>				<b>30 047.67</b>		<b>-600.00</b>	
			approx USD equiv of SEK account:		<b>6 906.00</b>		
			approx total USD		<b>8 996.00</b>		

**Global Scientific Challenges: Perspectives from Young Scientists**

4-6 April 2007  
Lindau, Germany

**Participant Nomination**

Please complete this form and send it by e-mail to: [maureen@icsu.org](mailto:maureen@icsu.org)  
or by fax to +33 1 42 88 94 31

**DETAILS OF CANDIDATE NOMINATED**

Title: **Dr.** First Name: **Thomas** Last Name: **Mölg**

Year of birth: **1977**

Gender: F  M

Address: **Dept. Earth & Atmospheric Sciences, Univ. Innsbruck, Innrain 52, A-6020 Innsbruck**

Country: **AUSTRIA**

Nationality: **Austrian**

Languages: **German (native), English, French**

Email Address: **thomas.moelg@uibk.ac.at**

Phone: **+435125075418**

Fax: **+435125072895**

**Submitted by :**

Title: **Prof. Dr.** First Name: **Georg** Last Name: **Kaser**

Organization: **IUGG Commission for the Cryospheric Sciences**

If this young scientist is invited, will you be willing to sponsor him/her? Yes  No

## PROFILE OF NOMINEE

Name of Nominee: **Thomas Mölg**

### Academic Background: (10 lines maximum)

1996-2001: diploma studies geography (1<sup>st</sup> subject) and meteorology and geophysics (2<sup>nd</sup> subject) at the Univ. of Innsbruck (UIBK), MS thesis on the energy budget's role for glacier retreat on Rwenzori (East Africa), diploma 'summa cum laude'. - - 2001-2003: doctoral studies of natural sciences at UIBK, dissertation on revealing the climate signal from glacier recession on Kilimanjaro (East Africa), advisor: Georg Kaser, doctorate 'summa cum laude' - - since 2004: PostDoc scientist at UIBK, working in an international climate research project with universities Massachusetts (USA), Otago (NZL) and Berne (CH). - - For his work Thomas has so far been awarded five prizes (last one in 2005: Outstanding Reviewer Award from the American Geophysical Union)

### Current Position(s)

PostDoc at the University of Innsbruck

<http://www.uibk.ac.at/geographie/forschung/klima-eis/tropic/>

### Scientific Expertise and Interests: (10 lines maximum)

His main expertise is the response of glaciers to climate change, including micrometeorological processes over glaciers, energy and mass balance modeling (incl. solar radiation modeling), large-scale dynamics of tropical climate, numerical atmospheric modeling, and analysis of general circulation climate model (GCM) output. - - He is one of few young scientists in the Cryospheric Sciences who has - in addition to the physical processes at the glacier-atmosphere interface - a good knowledge of large-scale climate modes and their evolution over time scales from decades to centuries. This skill makes him an exceptionally complete scientist in the young climate research community.

### Why should your nominee attend this conference? (5 lines maximum)

Besides the scientific expertises outlined above (incl. many attendences on international conferences and and reviewing for established journals), Thomas has shown the ability to work in an independent manner as well as in teams, the will to communicate the science to the public by press appearences (e.g., London Times), and to be open for new approaches in his research. - all valuable preconditions for Global Scientific Challenges.



**Global Scientific Challenges: Perspectives from Young Scientists**  
4-6 April 2007  
Lindau, Germany

**Participant Nomination**

Please complete this form and send it by e-mail to: [maureen@icsu.org](mailto:maureen@icsu.org)  
or by fax to +33 1 42 88 94 31

**DETAILS OF CANDIDATE NOMINATED**

Title: Mr. First Name: Armin Last Name: Rist

Year of birth: 1974

Gender: F  M

Address: Arelenstrasse 1, 7265 Davos Wolfgang

Country: Switzerland

Nationality: German

Languages: German, English

Email Address: rist@slf.ch

Phone: +41 81 417 02 76

Fax: +41 81 417 01 10

**Submitted by :**

Title: Dr. First Name: Marcia Last Name: Phillips

Organization: Swiss Federal Institute for Snow and Avalanche Research

If this young scientist is invited, will you be willing to sponsor him/her? Yes  No

## PROFILE OF NOMINEE

Name of Nominee:

**Armin RIST**

### **Academic Background: (10 lines maximum)**

**Armin Rist studied Environmental Sciences at the Technical University of Munich (Germany). During his studies he worked as a practical trainee for an NGO in Nepal, mapping landslides in the Himalayas and in an ecological awareness programme. He completed his Masters thesis on Swiss low-altitude permafrost sites characterized by undercooled scree slopes with stunted trees in 2002 at the Swiss Federal Institute for Snow and Avalanche Research (SLF). Since 2003 Armin Rist has been investigating the hydrothermal regime and stability of the active layer in alpine permafrost. His PhD thesis, which will be presented in Spring 2007, combines field and laboratory investigations, delivering unique results on the interactions between water and heat balance in steep frozen scree slopes and their influence on slope stability.**

### **Current Position(s)**

**PhD student at the Swiss Federal Institute for Snow and Avalanche Research, Davos.**

### **Scientific Expertise and Interests: (10 lines maximum)**

**Armin Rist's main interests are landscape ecology and geobotany in mountain areas with a special focus on cryological issues. His investigations of the processes in the active layer of alpine permafrost are highly relevant in the current context of climate change. His knowledge of the triggering processes of mass movements in permafrost terrain has attained a very high level in the course of his investigations, which included extensive field and laboratory measurements as well as the analysis of complex data.**

### **Why should your nominee attend this conference? (5 lines maximum)**

**Mr. Rist should attend the conference because he has an interdisciplinary background and is fascinated by the complex interactions of natural and sociological phenomena. His communication skills and interest for the work of others make him an ideal participant for a conference of young scientists from different backgrounds.**

Prof. Dr. W. Haeberli, Director  
Department of Geography, University of Zurich-Irchel,  
Winterthurerstrasse 190, CH-8057 Zurich  
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**REPORT TO THE COMMISSION ON CRYOSPHERIC SCIENCES (CCS/IUGG)  
ON ACTIVITIES IN THE YEAR 2006 OF THE  
WORLD GLACIER MONITORING SERVICE (WGMS)**

**General**

The five main tasks of the service as defined in 1986 by a corresponding expert/steering meeting have been unchanged and are still to

- (1) collect and publish standardized data on glacier fluctuations at 5-yearly intervals;
- (2) manage and upgrade the existing inventory of glaciers and ice caps;
- (3) prepare a bulletin reporting mass balance results of selected reference glaciers and ice caps at 2-yearly intervals;
- (4) stimulate satellite observations of remote glaciers and ice caps in order to reach global coverage; and
- (5) periodically assess ongoing changes.

A short description of the service and links to related glaciological sites are given on the WGMS homepage

<http://www.geo.unizh.ch/wgms>

The page also provides a list of relevant publications prepared within the framework of the activities of the service as well as information on the monitoring strategy. Mass balance results are reported one year after the measurement year. Data are available from the WGMS databank (World Glacier Inventory data and Glacier Fluctuation data) as well as from the mirror site at the World Data Centre in Boulder, Colorado (World Glacier Inventory data).

**Fluctuations of Glaciers**

Volume VIII, the FLUCTUATIONS OF GLACIERS 1995-2000, was printed and distributed: <http://www.geo.unizh.ch/wgms/fog/fog8.pdf>. To produce a printed version is still considered to be an important option for a number of reasons (safety, accessibility in all parts of the world, enclosed maps, accompanying texts and bibliographies, etc.) and was therefore done for this last volume of the 20<sup>th</sup> century.

Data collection for (2002-2003) Volume IX, the FLUCTUATIONS OF GLACIERS 2000-2005 was initiated in fall 2006.

**Glacier Mass Balances**

The GLACIER MASS BALANCE BULLETIN No. 8 (2002-2003) was printed and distributed: <http://www.geo.unizh.ch/wgms/mbb/mbb8/MBB8.pdf>. Within the GTOS glacier network and according to corresponding agreements with the participating countries, mass balance summary results are made available on the WGMS homepage at the end of the year following the measurement year.

Special efforts were undertaken to start mass balance measurements in New Zealand in order to fill one of the most important gaps in the international mass-balance monitoring network. M. Hoelzle spent several months at University of Otago, Dunedin, and strengthened cooperation between NZ scientists and WGMS. Mass balance measurements have now been started on Brewster Glacier. Accompanying projects (energy balance modelling) are being carried out.

Data collection for the GLACIER MASS BALANCE BULLETIN No 9 (2004-2005) was initiated in fall 2006.

### **Glacier Inventories and Satellite Observations of Remote Glaciers**

The GLIMS database at NSIDC is continuously growing and contains now 2D information from more than 50.000 glaciers. Several special meetings at major conferences (EGU, IGS) among GLIMS participants helped to establish standards for glacier definition from a remote sensing perspective. Two publications describing the general/technological achievements of GLIMS were published/in press. A publication on the glacier mapping comparison experiments (GLACE) is in preparation. A new project (GlobGlacier) on glacier monitoring from satellite has been initiated within the framework of ESA's DUE programs. The related initial meeting has been held at GIUZ in June. A supplementary document to the GIP focussing on satellite needs for climate observations has been prepared during an expert meeting in January at the WMO. An IGOS-P cryosphere report has been drafted by a team of experts and is currently in its evaluation phase. The links to the most important meetings are:

GCOS Expert Meeting on Satellite Needs for Climate, Genf, 9.-11.1. 2006:  
<http://stratus.ssec.wisc.edu/igos-cryo/docs/gcos-107.pdf>

"Problems related to the creation of a glacier inventory". Splinter Meeting held at the EGU General Assembly 6.4. 2006: [ftp://ftp.geo.unizh.ch/pub/fpaul/egu\\_splinterm\\_prot.pdf](ftp://ftp.geo.unizh.ch/pub/fpaul/egu_splinterm_prot.pdf)

GlobGlacier project user requirements meeting, Zürich, 22.-23.06. 2006:  
[ftp://ftp.geo.unizh.ch/pub/fpaul/glob\\_glacier\\_meeting.pdf](ftp://ftp.geo.unizh.ch/pub/fpaul/glob_glacier_meeting.pdf)

"Problems related to the creation of a glacier inventory: Can we find consistent solutions?"  
GLIMS Meeting, Cambridge, 17.-18.08. 2006:  
[http://www.glims.org/MapsAndDocs/assets/GLIMS\\_Analysis\\_Tutorial.pdf](http://www.glims.org/MapsAndDocs/assets/GLIMS_Analysis_Tutorial.pdf)

Third IGOS Cryosphere Theme Workshop, 16.-18.10. 2006, Noordwijk, The Netherlands: [http://stratus.ssec.wisc.edu/igos-cryo/docs/cryo\\_theme\\_report.doc](http://stratus.ssec.wisc.edu/igos-cryo/docs/cryo_theme_report.doc)

### **Periodical Assessments**

An overview paper on worldwide glacier monitoring is contained in the new book "Glaciers Science and Environmental Change" (Haerberli, W. 2006. Integrated perception of glacier changes: a challenge of historical dimensions. In: Knight, P. G. (ed): Glacier Science and Environmental Change. Blackwell, Oxford, 423-430) and scenario calculations were published concerning the European Alps (Zemp, M., Haerberli, W., Hoelzle, M. and Paul, F. (2006): Alpine glaciers to disappear within decades? *Geophysical Research Letters*, 33, L13504 (doi: 10.1029/2006GL026319), demonstrating possibilities of using the SRTM-derived DTM in combination with data from integrated monitoring. A paper on "Integrated monitoring of mountain glaciers as key indicators of global climate change: the European Alps" illustrating GTOS-related strategies and their result was presented at the IGS Symposium on "Cryosphere Indicators of Climate Change" in Cambridge, UK. The GCOS Steering Committee was informed about the situation and future perspectives of GTN-G (WH, WMO Geneva, 11 October).

### **Administration and funding**

An expert group consisting of Jon Ove Hagen, Frank Rauh and Wilfried Hagg carried out a site visit in Zurich (14/15 August) for the external evaluation of WGMS. Their report is expected to be available at the fall UCCS meeting at WMO Geneva.

The service continued its work with funding being almost entirely provided by Switzerland. Continuation of work is now really critical. A proposal was prepared and submitted to the Swiss National Science Foundation. It is hoped that this will help assuring the continuation of work during the coming years. Supporting letters were received from important sponsors (UNEP, GCOS, UCCS, ProClim of the Swiss Academy of Sciences, etc.).

A work plan and budget will be put together as soon as the funding situation has become clear (March 2007)

Wilfried Haeberli, Martin Hoelzle, Frank Paul, Michael Zemp

Zurich, October 2006

# **Appendix**

*IGS Symposium on Cryosphere Indicators of Global Climate Change  
Cambridge, 20-25 August, 2006*

## **Integrated monitoring of mountain glaciers as key indicators of global climate change: the European Alps**

*Wilfried Haeberli, Martin Hoelzle, Frank Paul and Michael Zemp  
Glaciology and Geomorphodynamics Group,  
Department of Geography, University of Zurich, Switzerland*

### **Abstract**

The internationally recommended multilevel strategy for monitoring mountain glaciers is illustrated using the example of the European Alps, where especially dense information has been available through historical times. This strategy combines in-situ measurements (mass balance, length change) with remote sensing (inventories) and numerical modelling. It helps to bridge the gap between detailed local process-oriented studies and global coverage. Since the 1980s, mass balances became increasingly negative with values close to -1 m w.e. per year during the five first years of the 21<sup>st</sup> century. The hot/dry summer of 2003 alone caused a record mean loss of -2.45 m w.e., roughly 50% above the previous record loss in 1998, more than three times the average between 1980 – 2000 and an order of magnitude more than characteristic long-term averages since the end of the Little Ice Age and other extended time periods of glacier shrinkage during the past 2000 years. It can be estimated that the glaciers in the European Alps have lost about half their total volume (roughly -0.5% per year) between 1850 and around 1975, another 25% (or -1% per year) of the remaining amount between 1975 and 2000, and additional 10 to 15% (or -2 to -3% per year) in the first five years of this century.

## World Glacier Monitoring Service (WGMS)

### Self-Evaluation Report



Written by staff members of WGMS:  
Wilfried Haeberli, Martin Hoelzle,  
Regula Frauenfelder, Andi Kääh, Jeannette Noetzli, Frank Paul, Michael Zemp

Summer 2005

General remark: The development, status and products of the World Glacier Monitoring Service (WGMS) have been described and analysed in many publications and annual reports to FAGS and the advisory board (ICSI now CCS). As a consequence, only the most important aspects for judging possibilities for future improvements are given in this report, which is deliberately kept as short as possible. Only the historical background is given in some more extent. This is to make clear that there is an important historical background to the present situation and that coordinated worldwide glacier monitoring now faces a challenge of historical dimensions. More details are available in:

- Bishop, M.P., Olsenholler, J.A., Shroder, J.F., Barry, R.G., Raup, B.H., Bush, A.B.G., Copland, L., Dwyer, J.L., Fountain, A.G., Haeberli, W., Kääh, A., Paul, F., Hall, D.K., Kargel, J.S., Molnia, B.F., Trabant, D.C. and Wessels R. (2004): Global land ice measurements from space (GLIMS): Remote sensing and GIS investigations of the Earth's cryosphere. Geocarto International, 19/2, 57-84.*
- Haeberli, W. (2004): Glaciers and ice caps: historical background and strategies of world-wide monitoring. In: Bamber, J.L. and Payne A.J. (eds): Mass Balance of the Cryosphere. Cambridge University Press, Cambridge, 559-578.*
- Haeberli, W., Maisch, M. and Paul, F. (2002): Mountain glaciers in global climate-related observation networks. WMO Bulletin, 51/1, 18-25.*
- Haeberli, W., Barry, R. and Cihlar, J. (2000): Glacier monitoring within the Global Climate Observing System. Annals of Glaciology, 31, 241-246.*
- Haeberli, W., Hoelzle, M. and Suter, S. (Eds.) (1998): Into the second century of worldwide glacier monitoring: prospects and strategies. A contribution to the International Hydrological Programme (IHP) and the Global Environment Monitoring System (GEMS). UNESCO Studies and Reports in Hydrology, 56.*

## **Main message**

Internationally coordinated observation of glacier fluctuations started in the late 19<sup>th</sup> century. The history of this long-term environmental monitoring program is a reflection of excellent worldwide collaboration but has also seen repeated crises. During the past two decades, however, glaciers have been increasingly recognised as key indicators of global climate change. Corresponding quantitative information is compiled thanks to the excellent and voluntary collaboration of a network of local investigators and national correspondents. It now regularly forms part of international assessments (IPCC, GCOS, UNEP reports). During the same time, the funding situation for the central service deteriorated in a rather dramatic way. The discrepancy between the increasing significance and the inadequate funding together with important future challenges and possibilities brought in by new technologies (remote sensing, geo-informatics) make it a most urgent necessity to reorganise global glacier monitoring. To this purpose, an advanced integrative/multilevel strategy has been developed, which – by using numerical modelling to tie together the individual components - allows for a combination of in-situ with remote observations, traditional with new techniques and process understanding with global coverage. In addition, reconstructions of former glacier geometries – to extend the existing fluctuation series back in time – are to be integrated into the global framework of WGMS. The corresponding change in the dimensions of efforts, data formats and international collaboration must be met by a correspondingly enhanced organizational structure and funding basis - a challenge of historical dimensions.

## **Vision**

Worldwide glacier monitoring has traditionally been a program of „in-situ“ measurements (mass balance, length change) with only slowly developing applications of modern technologies (remote sensing, geo-informatics) in glacier inventories. Possible future climate-driven scenarios of rapid decay, disintegration and even complete disappearance of glaciers in many mountain ranges – including the possible loss of glaciers with long mass-balance series within a few decades – call for a systematic inclusion of modern technologies and data basis such as high-resolution satellite imagery, laser altimetry, digital terrain information, geo-informatics and numerical models. An adequate monitoring program for the 21<sup>st</sup> century will primarily be based on such advanced technologies and data bases for reaching global coverage, automated data retrieval and analysis, extrapolation of obtained results in space and time, assessment of impacts, etc. A corresponding organizational structure as part of the global climate-related observing systems (GTOS/GCOS, GEOSS) must comprise an enlarged but effective and truly international lead team with an adequate share of national and international funding. The lead team should involve experts responsible for the three main components: in-situ measurements, remote observations and numerical models. Good contacts with organisations responsible for integrated assessments and impact studies (IPCC) must be foreseen. Close collaboration between the service with its responsibility for developing monitoring strategies and for compiling standardized information, and the WDC Glaciology with its capacity for data management and dissemination is fundamentally important.

## Historical background

The internationally coordinated collection of information about ongoing glacier changes was initiated in 1894 with the foundation of the International Glacier Commission at the 6th International Geological Congress in Zurich, Switzerland. It was hoped that the long-term observation of glaciers would provide answers to the questions about global uniformity and terrestrial or extraterrestrial forcing of past, ongoing and potential future climate and glacier changes. The monitoring strategy consisted of regular and exact surveys at selected glacier tongues, but also included indigenous knowledge to be collected by scientists through communication with mountain inhabitants. It was clearly oriented towards a better understanding of large-scale and long-term processes and as such was thought to require patience in order to bear fruit for future generations. It is this generous thinking and most advanced “trans-disciplinary” concept, which have helped building up one of the longest environmental observation series and a true treasure of climate-related geo-science. During the 20<sup>th</sup> century, the evolution of the international glacier monitoring program and the corresponding views to glacier changes is marked by four distinct phases.

The first phase of international glacier observation and initial years around the turn of the century was characterized by the search for regular oscillations in the climate/glacier-system (11-year cycles of solar activity) as illustrated by the title of the corresponding reports (“*les variations périodiques des glaciers*”) issued by various members of the - multilingual! - Commission. The short glacier re-advances in the Alps around 1890 und 1920 seemed to confirm the impression that climate and glaciers fluctuate in a periodic or at least quasi-periodic way. At the same time, a number of important glacier catastrophes as well as the fast advances of Vernagt Ferner in the Alps or the enormous mass of ice disappearing in Glacier Bay (Alaska) caught the interest of the specialists for extraordinary events to be documented and analyzed. One important expression of the “golden” initial phase was the compilation of high-precision topographic maps of a number of glaciers in the European Alps. These maps are the first maps, which are comparable in accuracy to modern topographic maps and, hence, can be used to derive long-term volume and mass changes of mountain glaciers. They prove that the highest-developed technology had been used from the very beginning and still today constitute a unique document and basis for scientific comparison, which helps through the more difficult time periods of the following decades.

The *second phase of international glacier observation* with the two world wars and the economic crisis in the time between them caused a reduction to a minimum - not only of regular observations but also of interest - with the consequence that strong global warming and glacier shrinkage around the 1930s and 1940s passed rather unnoticed in the scientific literature. It was the merit of P.L. Mercanton in Switzerland to maintain somewhat thin and less frequent reports of glacier-length observations in the Alps and Scandinavia, thus keeping the core of the worldwide network alive, even though at a low level of intensity and scientific analysis.

After this time period of under-nourishment, the *third phase of international glacier observation* saw the reorganization of the international network under the umbrella of the UNESCO in the late 1950s by P. Kasser in Switzerland. Together with this formal step, the introduction of mass balance measurements by W. Ahlmann in Sweden now enabled the inclusion of more numerous and more sophisticated measurements. With the mass balance measurements, the “missing link” between climate and glacier length change had indeed been introduced, allowing for a much better understanding of the process chain relating climate and glaciers. This promising development, however, was soon faced with another deep crisis. Theories about glacier mechanics (kinematic wave theory with unrealistic century-long reaction times) and the still often used but highly problematic statistics about observed glacier changes (percentages of annually advancing/retreating glaciers which suppress the essential cumulative effects so clearly visible in nature) caused widespread credibility losses in scientific, governmental and public circles, almost leading to an interruption of worldwide monitoring: after the sudden death of F. Müller, Switzerland, who had taken over the lead of the monitoring program, ICSI as the responsible ICSU body for the network made no more efforts to continue worldwide glacier observations.

With the fourth phase of international glacier monitoring during the past two decades, improved theories and numerical models about changes in climate, energy and mass balance, ice thickness and flow, and advance and retreat of glacier tongues became available. Excellent international collaboration, advanced observational technologies (remote sensing, geo-informatics) but especially also steadily growing awareness of the continued and more and more striking vanishing of mountain glaciers in most parts of the world finally brought the recognition of glacier changes as key indications of global climate change in international assessments (IPCC) and global observing systems (GCOS/GTOS). Modern glacier inventories combine satellite imagery with digital terrain information; they clearly document the striking ice losses and the bare ground left by the retreating and decaying ice in many places. Integrated, multilevel strategies are being used to document glacier changes through the past as well as the coming decades. They combine (1) information from mass balance, length change and glacier inventories and (2) in-situ measurements for process understanding with remote sensing for large/representative samples with (3) numerical modelling of distributed mass balance and flow for inter- and extrapolation in space and time.

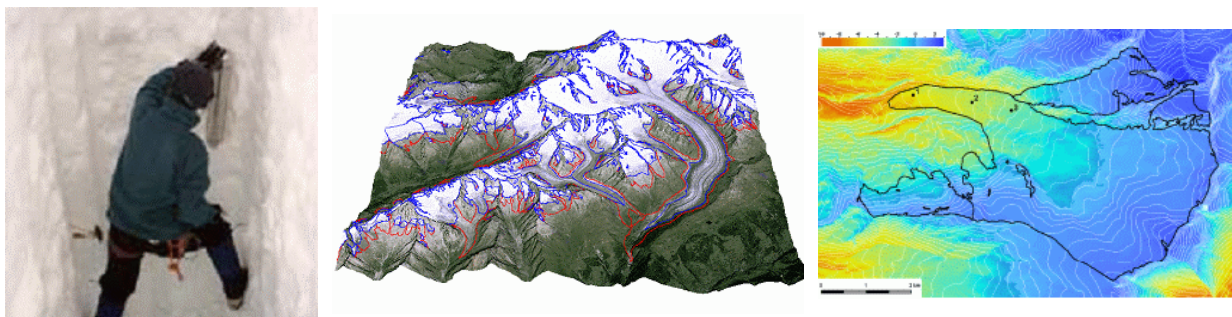


Fig. 1: The three components of the integrated multilevel strategy for glacier monitoring: in-situ measurements, remote sensing and numerical modelling. Sources: M. Hoelzle (left), F. Paul (centre), H. Machguth (right).

Even a wide public today takes note of convincing facts: accelerated vanishing of glaciers as documented in repeated glacier inventories starts taking dramatic forms and the spectacular finding of the roughly 5000 year old and perfectly preserved body of the Oetztal ice man emerging from a small, probably cold and now disappeared miniature ice cap of the Austrian/Italian Alps confirmed that the "warm" or "high-energy" limit of Holocene, pre-industrial glacier and climate variability may have been reached if not passed. The possibility can no longer be excluded that anthropogenic influences on the atmosphere could now and for the first time represent a major contributing factor to the observed glacier shrinkage. If true indeed, this would mean that many mountain ranges could loose their glacier cover within decades.

Since the initiation of worldwide glacier observations in the late 19th century, various aspects involved have changed in a most remarkable way:

1. Concern is growing that the ongoing trend of worldwide and fast if not accelerating glacier shrinkage at the century time scale is of non-cyclic nature - there is hardly a question any more of the originally envisaged "variations périodiques des glaciers".
2. Under the growing influence of human impacts on the climate system (enhanced greenhouse effect), dramatic scenarios of future developments – including complete deglaciation of entire mountain ranges – must be taken into consideration.
3. Such future scenarios may lead far beyond the range of historical/holocene variability and most likely introduce processes (extent and rate of glacier vanishing, distance to equilibrium conditions) without precedence in the Holocene.

4. A broad and worldwide public today recognizes glacier changes as a key indication of regional and global climate and environment change.
5. Observational strategies established by expert groups within international monitoring programs build on advanced process understanding and include extreme perspectives.
6. These strategies make use of the fast development of new technologies and relate them to traditional approaches in order to apply integrated, multilevel concepts (in situ measurements to remote sensing, local-process oriented studies to regional and global coverage), within which individual observational components (length, area, volume/mass change) fit together enabling a comprehensive view.

The challenge is now to build up an adequate worldwide system of coordinated glacier observations for the 21st century. This is a challenge of historical dimensions.

### **Institutional framework**

#### Task

The five main tasks of the service as defined in 1986 by a corresponding expert/steering meeting have been unchanged and are still to

- (1) collect and publish standardized data on glacier fluctuations at 5-yearly intervals;
- (2) manage and upgrade the existing inventory of glaciers and ice caps;
- (3) prepare a bulletin reporting mass balance results of selected reference glaciers and ice caps at 2-yearly intervals;
- (4) stimulate satellite observations of remote glaciers and ice caps in order to reach global coverage; and
- (5) periodically assess ongoing changes.

## WGMS Organisation

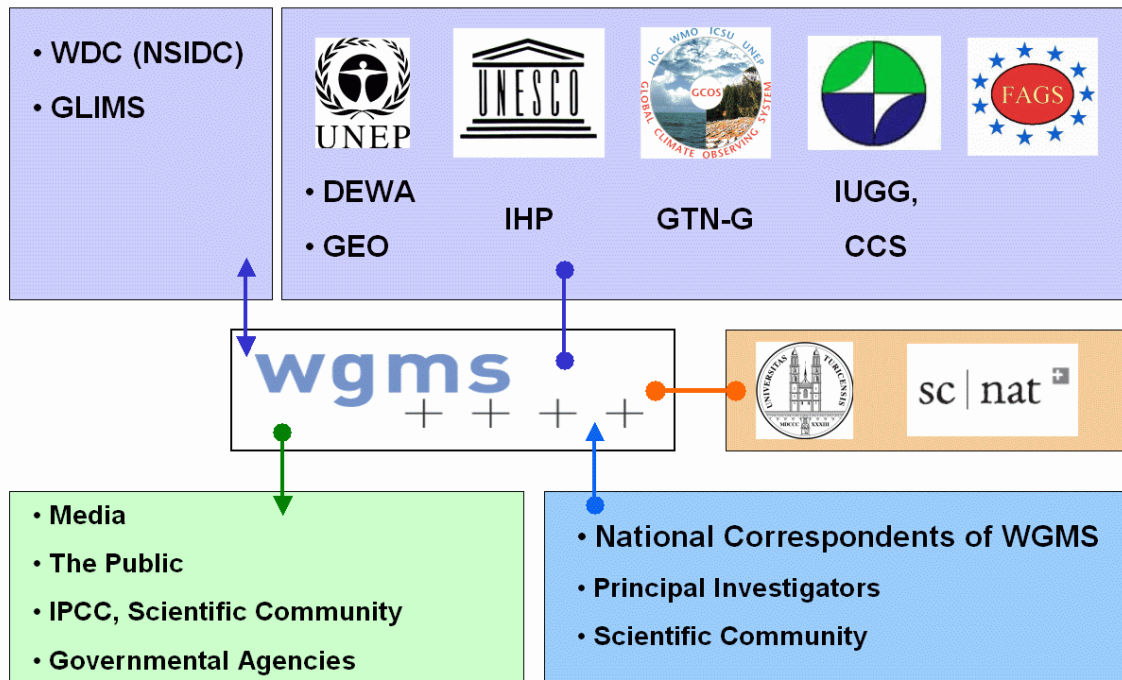


Fig. 2: Current organisation of the WGMS with umbrella organisations (UNEP, UNESCO, GCOS, IUGG and FAGS), national supporting institutions (SCNAT, University of Zurich), collaborations (WDC, GLIMS and National Correspondents of WGMS) and customers (Media, IPCC, Scientific Community, Governmental Agencies, etc.) of data and information.

A short description of the service and links to related glaciological sites are given on the WGMS homepage

<http://www.wgms.ch>

The page also provides a list of relevant publications prepared within the framework of the activities of the service as well as information on the monitoring strategy. Mass balance results are reported one year after the measurement year. Data are available from the WGMS databank (World Glacier Inventory data and Glacier Fluctuation data) as well as from the mirror site at the World Data Centre in Boulder, Colorado (World Glacier Inventory data).

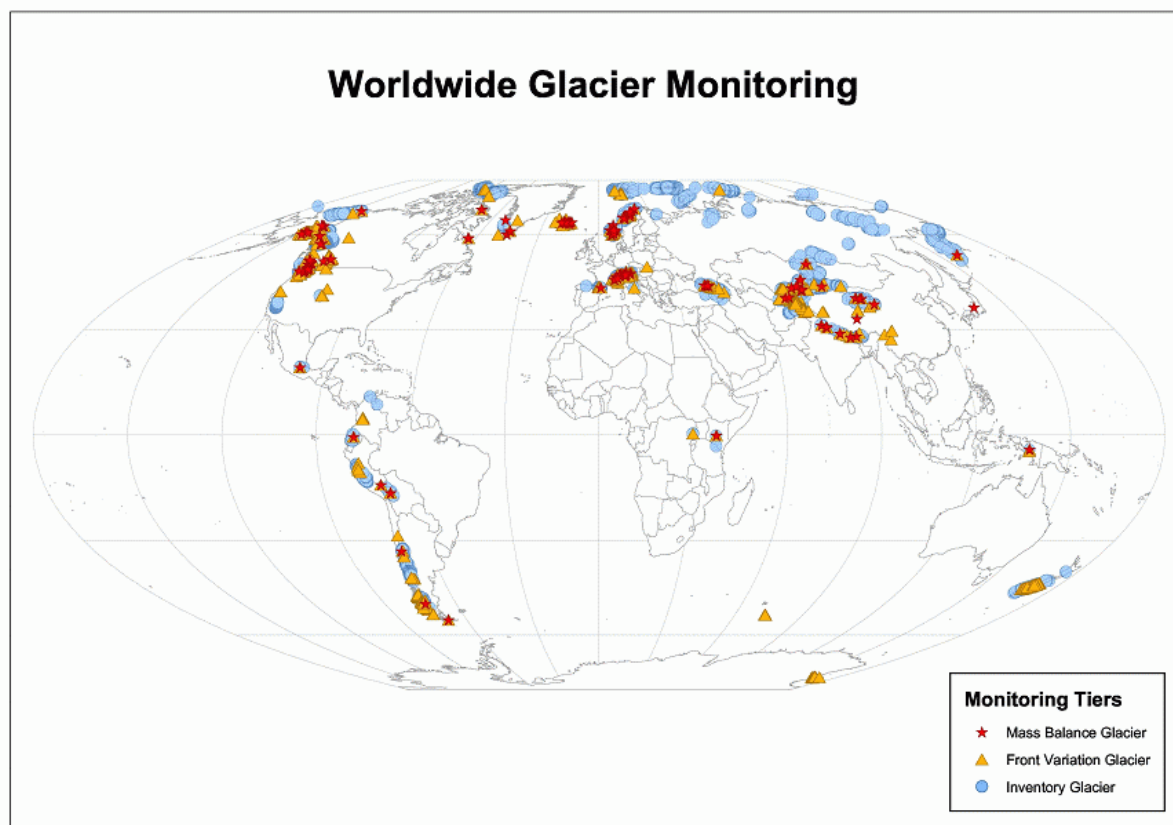


Fig. 3: Overview on worldwide mass balance and front variation series as well as inventory data.

### *Umbrella organisations*

WGMS was established in 1986, combining at that time the former Permanent Service on the Fluctuations of Glaciers (PSFG; mainly supported by UNESCO) and the Temporary Technical Secretariat for the World Glacier Inventory (TTS/WGI; mainly supported by UNEP). Its advisory board is the ICSU Commission on Cryospheric Sciences (CCS, formerly the International Commission on Snow and Ice ICSI/IAHS). WGMS is one of the permanent services of the Federation of Astronomical, Geophysical and Data Analysis Services (FAGS/ICSU), which is now changing its name and status. It runs the Global Terrestrial Network for Glaciers (GTN-G) within the Global Terrestrial Observing System (GTOS) of WMO, FAO, UNESCO, UNEP and ICSU within the Global Climate Observing System (GCOS). Its publications are contributions to the Division of Early Warning and Assessment (DEWA) and of the Global Environment Outlook (GEO) of UNEP and the International Hydrological Programme of UNESCO.

### *Collaboration (National Correspondents of WGMS, WDC, GLIMS)*

The closest collaboration is with the National Correspondents of WGMS, the World Data Center A for Glaciology at Boulder Colorado (WDC) and with the USGS-led GLIMS project (Global Land Ice Measurement from Space).

WGMS maintains a network of National Correspondents in about 30 countries. In all these countries one or several in-situ observations are run. These National Correspondents work as honorary members and are responsible for the collection and submission of glacier fluctuation data for periodic publication in the "Glacier Mass Balance Bulletin" and the "Fluctuations of Glaciers" series (see section Products). In addition, WGMS encourages, consults and assists the implementation and maintenance of national glacier monitoring networks. Thereby, current focus is on the support of monitoring networks in the Southern Hemisphere. In 2005, staff members of

WGMS have been assisting with the implementation of new glacier observation programs in Columbia and New Zealand.

WDC is a traditional partner of WGMS in that it has the main responsibility for data storage, management and dissemination. This attribution of tasks should be strengthened in the future. WGMS on the other hand differs from WDCs in general by actively collecting standardized data using a well-organized network of local investigators and national correspondents. In order to accomplish this task, WGMS continuously develops and adjusts strategies for acquisition of coherent and integrative data sets to optimally fit glacier observations into international programs like GTOS, IHP or DEWA/GEO. Such upgrading and modernizing of the program requires continued analysis of the scientific literature on the topic.

The GLIMS-project is the first internationally coordinated attempt to compile modern glacier inventories reflecting glacier occurrence around the year 2000 from satellite imagery (mainly ASTER, the scenes of which are freely available to the project participants). This unique project is a most important step towards the integration of remote sensing and geo-informatics into worldwide glacier monitoring. As GLIMS is a temporary project, ways have to be found as soon as possible for continued analyses of satellite imagery and other remote sensing technologies – especially laser altimetry – within future worldwide glacier monitoring.

### Products

The following series of reports on the variations of glaciers in space and time were already published by the World Glacier Monitoring Service and its predecessor, the Permanent Service on the Fluctuations of Glaciers:

#### Fluctuations of Glaciers

- IAHS (ICSI) and UNESCO 1967. Fluctuations of Glaciers 1959-1965, Vol. I (P. Kasser, ed.). Permanent Service on Fluctuations on Glaciers, Paris, 52 pp.
- IAHS (ICSI) and UNESCO 1973. Fluctuations of Glaciers 1965-1970, Vol. II (P. Kasser, ed.). Permanent Service on Fluctuations on Glaciers, Paris, 357 pp.
- IAHS (ICSI) and UNESCO 1977. Fluctuations of Glaciers 1970-1975, Vol. III (F. Müller, ed.). Permanent Service on Fluctuations on Glaciers, Paris, 269 pp.
- IAHS (ICSI) and UNESCO 1985. Fluctuations of Glaciers 1975-1980, Vol. IV (W. Haeberli, ed.). Permanent Service on Fluctuations on Glaciers, Paris, 265 pp.
- IAHS(ICSI)/UNEP/UNESCO 1988. Fluctuations of Glaciers 1980-1985, Vol. V (Haeberli, W. and Müller, P., eds.), World Glacier Monitoring Service, Paris, 290pp.
- IAHS(ICSI)/UNEP/UNESCO 1993. Fluctuations of Glaciers 1985-1990, Vol. VI (Haeberli, W. and Hoelzle, M., eds.), World Glacier Monitoring Service, Paris, 322pp.
- IAHS(ICSI)/UNEP/UNESCO 1998. Fluctuations of Glaciers 1990-1995, Vol. VII (Haeberli, W. , Hoelzle, M., Suter, S. and Frauenfelder, R., eds.), World Glacier Monitoring Service, Paris, 296pp.
- IUGG(CCS)/UNEP/UNESCO 2005. Fluctuations of Glaciers 1995-2000, Vol. VIII (Haeberli, W., Zemp, M., Frauenfelder, R., Hoelzle, M. and Käab, A., eds.), World Glacier Monitoring Service, Paris.

#### Glacier Mass Balance Bulletin

- IAHS(ICSI)/UNEP/UNESCO 1991. Glacier Mass Balance Bulletin No. 1 (Haeberli, W. and Herren, E., eds.). World Glacier Monitoring Service, Zurich, 70pp.

- IAHS(ICSU)/UNEP/UNESCO 1993b. Glacier Mass Balance Bulletin No. 2 (Haeberli, W., Herren, E. and Hoelzle, M., eds.). World Glacier Monitoring Service, Zurich, 74pp.
- IAHS(ICSU)/UNEP/UNESCO 1994. Glacier Mass Balance Bulletin No. 3 (Haeberli, W., Hoelzle, M. and Bösch, H., eds.). World Glacier Monitoring Service, Zurich, 80pp.
- IAHS(ICSU)/UNEP/UNESCO 1996. Glacier Mass Balance Bulletin No. 4 (Haeberli, W., Hoelzle, M. and Suter, S., eds.). World Glacier Monitoring Service, Zurich, 90pp.
- IAHS(ICSU)/UNEP/UNESCO 1999. Glacier mass balance bulletin No. 5 (Haeberli, W., Hoelzle, M. and Frauenfelder, R., eds.). World Glacier Monitoring Service, Zurich, 96pp.
- IAHS(ICSU)/UNEP/UNESCO/WMO 2001. Glacier Mass Balance Bulletin No. 6 (Haeberli, W., Frauenfelder, R. and Hoelzle, M., eds.). World Glacier Monitoring Service, Zurich, 93pp.
- IAHS(ICSU)/UNEP/UNESCO/WMO 2003. Glacier Mass Balance Bulletin No. 7 (Haeberli, W., Frauenfelder, R., Hoelzle, M. and Zemp, M., eds.). World Glacier Monitoring Service, Zurich, 87pp.
- IUGG(CCS)/UNEP/UNESCO/WMO in press. Glacier Mass Balance Bulletin No. 8 (Haeberli, W., Noetzli, J., Zemp, M., Baumann, S., Frauenfelder, R. and Hoelzle, M., eds.). World Glacier Monitoring Service, Zurich, 100pp.

#### World Glacier Inventory

- IAHS(ICSU)/UNEP/UNESCO 1989. World glacier inventory - status 1988 (Haeberli, W., Bösch, H., Scherler, K., Østrem, G. and Wallén, C. C., eds.). Nairobi.

Both, the „Fluctuations of Glaciers“ as well as the „Glacier Mass Balance Bulletin“ contain brief syntheses of recent developments in nature and in research. Mass balance data are also made available on the WGMS homepage one year after the measurement year. A publication series about the development of glacier inventory data does not exist but should be created as soon as possible in close cooperation with GLIMS. Besides the official WGMS data reports, scientific papers are regularly published on the development, strategies and policy of the programme (cf. example references at the beginning of the present report). W. Haeberli has been actively involved with the IPCC reports from the very beginning. He is also a member of the Terrestrial Observation Panel for Climate (TOPC) and as such participated in several GCOS/GTOS reports (for instance, the Second Adequacy Report for GCOS).

#### Media information

Many interviews are given to radio/TV stations and newspapers. A systematic media information concept, however, does not exist yet and should be developed.

#### Other potential links

Many connections exist to related programs. Examples are assessments by the European Environment Agency (EEA), the UNESCO FRIENDS project, the Arctic Glacier Mass Balance Program or specific working groups like the International Working Group on Glacier and Permafrost Hazards in Mountain Areas (GAPHAZ) of CCS and IPA. Relations are usually informal and sometimes inexistent (as in the case of the EU-funded project OMEGA).

## **Internal Organisation**

### Collection and compilation of data

Data collection is locally organised by principal investigators and their teams. Data transmission to WGMS is the task of national correspondents who coordinate work in individual countries. The „one-channel-per-country“ principle is absolutely essential for the efficiency of the operational work. It regularly causes minor problems and confusion, which can in most cases be solved within short time. Data collection, processing, editing, reviewing and printing of the volume takes about 1 year for the Glacier Mass Balance Bulletin and about 3 years for the „Fluctuations of Glaciers“.

### Internal work procedures

The general structure of the WGMS is characterised by a flat hierarchy, which allows for an efficient working of the staff members within several small mini-projects, which are defined by clear guidelines and milestones (example: production of MBB). This requires a high flexibility of all the staff members and is only successful within a correspondingly communicative and insightful environment.

The director is leading the service and he is mainly responsible for quality requirements, communication and integration of the service within its international framework. Two members of the WGMS staff are working closely with the GLIMS project. They have specialized knowledge in various remote-sensing methods recently developed important pilot products within the GLIMS project, such as the first satellite inventory to use algorithms for the automated extraction of glacier margins and the use and testing of digital terrain information from the ASTER sensor. They are also responsible for a close connection between GLIMS and WGMS. One member of the WGMS staff is coordinating the application of numerical models and the preparation of WGMS products, including the publications “Fluctuations of Glaciers” and the “Glacier Mass Balance Bulletin”. The main workload of publication, handling scientific and public data requests, database organisation and maintenance has been carried out by three staff members (PhD students) and several student apprentices during the last 5 years.

### Data management

According to the periodicity of the publication of the “Fluctuations of Glaciers” series, there is a “Call for Data” every five years. With the use of standardised “Data Submission Forms” observations on changes in glacier mass, volume, area and length are collected via the National Correspondents of WGMS. The incoming data is loaded into the WGMS database and is pre-processed for publication. In addition, there is an annual and biannual “Call for Data” for a reduced amount of information on mass balance observation to accelerate the publication and availability of this information. Recently, the database was revised and expanded to fulfil the requirements of the fast changing database context (data providers, data users, information technology and WGMS itself) and to enable the storage of meta-information and information on reconstructed glaciers states. The revised data model allows for direct data analyses with GIS-based evaluation tools.

### Publication rules

All data contributors are committed to make their data publicly available in the corresponding WGMS publications. Their names and addresses are given in these reports in order to enable direct contacts in case of interest for more details. Also, the names and addresses of the main sponsoring agencies are made available in the „Fluctuations of Glaciers“. Mass balance data are electronically made available one year after the measurement year. This time limit protects the

investigators and gives them an opportunity to analyse, interpret and publish their own data first – before the information becomes available to the public. Staff members of WGMS primarily analyse and interpret data from the Swiss Alps or sometimes (for instance, within the framework of EU-projects) from the entire European Alps. Analyses and interpretations of global data sets primarily serve to develop and test new procedures such as the conversion of data on cumulative length change into long-term mean mass balances.

#### Data availability

The data and information is freely available to everybody. The publications of the service can be ordered as hardcopies or may be downloaded in PDF-format. Due to the difficult funding situation, there is presently no online possibility to directly and selectively download data. However, the corresponding information is available from the WGMS staff or the WDC at Boulder. The creation of an adequate online data acquisition system has high priority for a better funded service.

#### **Staff and funding**

The WGMS staff exclusively consists of collaborators of the Physical Geography chair (W. Haerberli as faculty member) within the Geography Department of the University of Zurich. A total of 7 persons work part time for the service. They regularly receive the help of students from foreign universities doing their practica work. The integrated workload strongly varies with time but on average may be estimated at about 150%. This is the maximum, which can be offered by the chair in view to its heavy teaching/administration load and strong research commitment.

Funding is mainly through regular funds of the Geography Department and the Physical Geography chair („Glaciology and Geomorphodynamics Group“) led by W. Haerberli. The EU-funded ALP-IMP project contains a component (glacier data for the entire Alps), which enables temporary participation and funding of a PhD student working for WGMS and using WGMS data. Modest annual contributions were received from FAGS/ICSU (3000 US\$) and from the Glaciological Commission of the Swiss Academy of Sciences (700 US\$). UNESCO (6,000 US\$) and the Swiss Academy of Sciences (7,000 US\$) helped with printing the „Fluctuations of Glaciers 1995-2000“ (total printing costs: 30,000 US\$). Most recently, UNEP contributed a sum of 22,000 US\$ for preparing this volume and for working on a popular UNEP publication containing recent glacier data. The Glacier Mass Balance Bulletin (printing costs 6,000 US\$) is paid by the Geography Department.

The funding situation is slightly less catastrophic than a few years ago but still unacceptable. A continuation of the operation – even at the present modest level - will not be possible without a strong increase in regular funding, because the EU-funded PhD position will be lost in 2006 and printing costs remain high. At least half of this funding would have to come from international programmes. Corresponding proposals had been submitted to the GCOS Secretariat in Geneva, to the US Department of State, as part of the GCOS Implementation Plan and to the EU (EESOP) but no reactions were received. GCOS-Switzerland has a policy to sponsor national but not international programs.

In short: the mainly voluntary work carried out during years now for an important international climate-related service depends on the capacity of one single faculty position at one single university of one single country. This is an inadequate situation, which could, in fact, lead to a partial interruption of work in the immediate future. The creation of a strongly enlarged and truly international lead structure with reasonable funding is therefore a most urgent necessity.

## **Strengths, weaknesses, opportunities and threats (SWOT)**

### Strengths

Today, WGMS and its network are well recognized in international climate-related observation programmes (GCOS) and even serve as corresponding pilot project of GTOS. In comparison with other topics (for instance, water or snow), worldwide glacier observations have been extremely well organised for decades now. Clear visions exist for the future with its potentially dramatic development scenarios and correspondingly advanced concepts for integrated monitoring have been developed. As a consequence, public awareness of glaciers as primary indicators of climate change has never been higher than now and will certainly continue to increase in the future. The international service provides an integrated view of, and a voice for, the network to the outside world (interdisciplinary scientific programs, governmental agencies, policymakers, the media and the public). Perhaps its most important function and strength is that it keeps things together, publishes the collected material in a way which is understandable to non-specialists (Glacier Mass Balance Bulletin!) and helps protecting endangered long-term observations in many countries by making these observations part of a coordinated international program.

### Weaknesses

The visibility of WGMS is much better in international programs than in the glacier research community, where coordinated long-term monitoring is often considered to be a task of low intellectual merit. This fundamental misunderstanding together with the sometimes encountered ignorance about existing programs, knowledge and understanding repeatedly lead to unnecessary and usually short-lived parallel efforts. Such developments (the EU-funded program OMEGA has already been mentioned) are confusing for outside people and must be avoided in the future by improving the visibility of WGMS within the glacier community and corresponding peer-reviewers. Even officers of ICSI as the advisory board of WGMS have often been unaware of some most basic elements of WGMS as published in internal reports as well as in official publications. The relation between the service and its advisory board has, therefore, sometimes been sub-optimal. The clearest expression of the corresponding problems became obvious, when the last evaluation of the service (in the late 1990s) considered neither the formally defined tasks of the service nor its funding situation. As a consequence, incorrect impressions developed about who is doing what for what reason and with what sort of means and merits. This most unsatisfactory situation greatly improved during the past few years but can improve still further. Another challenge is to overcome linear thinking by specialists in partial fields. Specialists of glacier mass balance tend to underestimate not only the importance of traditional length-change observation (the only key to the past, a unique demonstration object and, hence, a fundamental basis for regional to worldwide awareness building!) but also of remote sensing and geoinformatics (to reach global coverage and to assess regional impacts). Remote-sensing experts, on the other hand, must learn that in-situ mass balance measurements must go on to calibrate satellite data and to better understand the involved processes. Numerical modellers should concentrate more on the essential problems of their calculations (for instance, accumulation patterns rather than the much more easily modelled melt processes in glacier mass/energy balance models) and accept that simple/robust models can be most useful tools and are complementary to sophisticated models, which are helpful for our process understanding or for sensitivity studies but can only be applied in very few well-documented cases. Last but probably most importantly, funding of long-term monitoring programs has become very difficult in an opportunistic science culture preferably funding short-term „innovative“ research (which, in reality, sometimes is a re-invention of things known for decades already or – as purely academic exercise – leads far away from relevant questions). This last effect is connected to a widespread negative attitude towards fundamentally important long-term observation and now constitutes the

greatest threat to a monitoring activity, which is more than a century old and appreciated by many.

*Opportunities and threats*

Internationally coordinated glacier monitoring faces the challenge to develop an observational system which is able to adequately document the potentially dramatic evolution through the coming decades of many now still glacierised mountain ranges. Such a future-oriented observational system must tie together the well-established network for traditional in-situ measurements and the now developing network for air- and space-borne data collection and analysis with the aid of digital terrain information and corresponding spatial data handling, analysis and modelling. There is an excellent opportunity to successfully accomplish this task, because advanced integrative concepts exist, recognition by international climate-related observing systems is perfect and public awareness is higher than ever before. The first step is to enhance the lead structure in order to make it truly international and involve specialists for in-situ measurements, remote sensing/geo-informatics and for numerical modelling related to monitoring. An adequate international funding basis is essential and must be organized without any delay.

Continuation of the presently unacceptably low funding and concentration on voluntary staff members of one single university chair may very soon – in fact already in 2006 – lead to an interruption of partial activities (for instance, data collection for the Fluctuations of Glaciers 2000-2005) with a corresponding loss of continuity and credibility. The consequence could be a disintegration into a partially collapsing in-situ network and an independent but not necessarily successful remote sensing network. This would then constitute the third deep crisis in the history of worldwide glacier observation: a crisis, which the coming generations would probably consider to be incomprehensible in view of the importance of the task.

Final remark: the staff members who wrote this self-evaluation report have collected a vast amount of experience concerning worldwide glacier monitoring (in-situ as well as remote). They are willing and ready to help developing a modern, truly international service with an enhanced lead structure and adequate funding. At the present level of funding and organisational structure, however, they can guarantee continuation of work only until mid 2006. WGMS presently develops plans for reorganising its structure and projects and to assure adequate funding.

## Evaluation report of World Glacier Monitoring Service (WGMS).

### **Executive summary**

This evaluation report is based on a self-evaluation report by WGMS and a site visit by an expert group on behalf of the IUGG Commission of Cryospheric Sciences (CCS).

Glaciers are key indicators for global climate change; air temperature and precipitation changes. The currently observed acceleration of global warming and glacier degradation with the background of an anthropogenic forcing makes worldwide glacier observations an international challenge. The fast technological development makes it necessary to relate modern techniques to traditional measurements in order to apply integrated, multilevel concepts (in situ measurements to remote sensing, local-process oriented studies to regional and global coverage). Increasing data quantity and the widespread use of new data formats significantly increase the workload for WGMS. This challenge must be met by a new organisation and funding structure. This requires an organisation that should be led by an international steering committee which has a stronger position than one single chair of one single university.

WGMS should be run under the umbrella of the new IACS-International Association of Cryospheric Sciences (former ICSI-CCS). An international steering committee for WGMS should be established by IACS. The committee should represent the data providers as well as the data users, scientists and organisations. This would require experts covering in-situ measurements, remote sensing observations and numerical modelling. The linkage to the umbrella organizations is essential for the credibility and visibility on an international level.

International funding of long term positions are essential for the future existence of WGMS, which should stay at one location to ensure the capability and continuation of the service.

WGMS is the only organization with the established network able to continue the collection of in-situ data in one data base. For more than a century world glacier monitoring has been based on a network of principal investigators that regularly and voluntarily have contributed their data. This is a unique network with free exchange of data and highly appreciated by the glaciological community.

It is of fundamental importance to have the trust and consensus of the work from the glaciological community, from the different national organizations and the principal investigators responsible for in-situ measurements. It is an important task to encourage these investigators to continue their important work. The system of communicating with only one national correspondent is the only feasible for efficient data transfer. To ensure the continuity and quality of the measurements and to strengthen the international

## Appendix M, WGMS Evaluation Report (14.2)

network, regular workshops with all correspondents and principal investigators would be very desirable. A next workshop is recommended soon, within the coming 1-2 years.

The main tasks of WGMS are and should be to collect in situ data, to maintain a world-wide database of observations on the mass balance and extent of glaciers, to establish an efficient system to store and exchange such data, and finally to publish standardized data on glacier mass balance and glacier fluctuations. Collaborations with WDC Glaciology and the GLIMS project must be strengthened, with the aim to enable a better access to the data via an interactive internet database.

\*\*\*\*\*

### **Preface**

The International Commission on Snow and Ice (ICSI) of the International Association for Hydrological Sciences (IAHS) has been the parent organization of WGMS. The importance of the Cryosphere is mirrored in the recent decision by the International Union of Geodesy and Geophysics (IUGG) to change the status of ICSI from that of an association commission on snow and ice to that of a new IUGG Commission for the Cryospheric Sciences (CCS). The CCS is an interim step in the establishment of a new IUGG International Association of Cryospheric Sciences (IACS) in the near future. Glacier monitoring is, and will be, an important part of IACS activities, and consequently WGMS as well.

The five main tasks of the service as defined in 1986 by an expert/steering group have been:

- (1) collect and publish standardized data on glacier fluctuations at 5-yearly intervals;
- (2) manage and upgrade the existing inventory of glaciers and ice caps;
- (3) prepare a bulletin reporting mass balance results of selected reference glaciers and ice caps at 2-yearly intervals;
- (4) stimulate satellite observations of remote glaciers and ice caps in order to reach global coverage; and
- (5) periodically assess ongoing changes

The expert/steering meeting in 1986 suggested regular evaluations of WGMS.

After ten years it is timely, and CCS established a small evaluation committee: Jon Ove Hagen, University of Oslo, and Julian Dowdeswell, University of Cambridge as CCS-council members and external members Frank Rau, University of Freiburg and Wilfried Hagg, Bavarian Academy of Sciences, Munich.

This report is based on the self-evaluation report by WGMS and discussions with the WGMS staff and committee members Hagen, Hagg and Rau during the site visit in Zürich 14-15<sup>th</sup> August 2006, and additional comments from Graham Cogley. Paragraphs taken directly from the self-evaluation report are in *italic*.

## Background

According to IPCC (2001), glaciers are the only natural indicator for global temperature with the highest confidence level. Worldwide glacier observations already started in the late 19th century and soon was coordinated by the International Glacier Commission, founded 1894 in Zurich. After a period with lower interest and activities in glacier monitoring, due to an economic crisis and two World Wars, the international network was reorganized under the umbrella of UNESCO in the late 1950s. WGMS formed in 1986, unifying the former “Permanent Service on the Fluctuations of Glaciers” with the “Temporary Secretariat for the World Glacier Inventory”. The work that has been done by WGMS since then has already achieved broad international reputation as a standardized and quality checked reference data set of worldwide glacier observations. The importance of this information with monitoring and long time series has been confirmed in several authoritative and international climate-change assessment reports and in plans for future research programs. These include IPCC, the Arctic Climate Impact Assessment (ACIA) and the World Climate Research Programme on Climate and Cryosphere (WCRP/CliC).

*Since the initiation of worldwide glacier monitoring, various aspects involved have changed in a most remarkable way:*

- 1. Concern is growing that the ongoing trend of worldwide and fast if not accelerating glacier shrinkage at the century time scale is of non-cyclic nature - there is hardly a question any more of the originally envisaged “variations périodiques des glaciers”.*
- 2. Under the growing influence of human impacts on the climate system (enhanced greenhouse effect), dramatic scenarios of future developments – including complete deglaciation of entire mountain ranges – must be taken into consideration.*
- 3. Such future scenarios may lead far beyond the range of historical/holocene variability and most likely introduce processes (extent and rate of glacier vanishing, distance to equilibrium conditions) without precedence in the Holocene.*
- 4. A broad and worldwide public today recognizes glacier changes as a key indication of regional and global climate and environment change.*
- 5. Observational strategies established by expert groups within international monitoring programs build on advanced process understanding and include extreme perspectives.*
- 6. These strategies make use of the fast development of new technologies and relate them to traditional approaches in order to apply integrated, multilevel concepts (in situ measurements to remote sensing, local-process oriented studies to regional and global coverage), within which individual observational components (length, area, volume/mass change) fit together enabling a comprehensive view.*

Additionally, the general increase of data amount, the implementation of new technologies for mass balance measurements (e.g. DTM-comparisons or altimetry data) and new data formats like spatial data sets will increase future workload. The

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requirements of data management, database capacity and data distribution capabilities will increase accordingly.

The challenge is now to build up an adequate worldwide system of coordinated glacier observations for the 21st century by continuing the collection of in situ data on glacier mass balance and fluctuations in addition to including data from new monitoring techniques.

### **Vision and strategy**

*Worldwide glacier monitoring has traditionally been a program of „in-situ“ measurements (mass balance, length change) with only slowly developing applications of modern technologies (remote sensing, geo-informatics) in glacier inventories. Possible future climate-driven scenarios of rapid decay, disintegration and even complete disappearance of glaciers in many mountain ranges – including the possible loss of glaciers with long mass-balance series within a few decades – call for a systematic inclusion of modern technologies and data basis such as high-resolution satellite imagery, laser altimetry, digital terrain information, geo-informatics and numerical models. An adequate monitoring program for the 21<sup>st</sup> century will primarily be based on such advanced technologies and data bases for reaching global coverage, automated data retrieval and analysis, extrapolation of obtained results in space and time, assessment of impacts, etc. A corresponding organizational structure as part of the global climate-related observing systems (GTOS/GCOS, GEOSS) must comprise an enlarged but effective and international lead team with an adequate share of national and international funding.*

We support the idea that a lead team should involve experts responsible for the three main components: in-situ measurements, remote observations and numerical models. Good contacts with organisations responsible for integrated assessments and impact studies (IPCC) must always be foreseen. Close collaboration between the service with its responsibility for collecting and compiling standardized information, and the WDC Glaciology with its capacity for data management and dissemination is fundamentally important.

The development of new data acquisition technologies and the operational availability of remote sensing data require a rethinking of the data to be included in WGMS. Should mass balances as the key value only consist of directly measured in-situ data or should they also include data derived from remote sensing data analysis or may they even include modelled mass balance information?

The committee discussed the possibility of including additional mass balance data derived from future remote sensing analysis (e.g. repeat pass laser scanning) and modelling results. While a definitive decision remains pendant, it had been pointed out clearly that each extension of the current data sampling strategy has to follow the requirements for standardised and checked data records guaranteeing the high quality of

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the products distributed by WGMS. However, if data from other sources will be included, this must be clearly indicated by detailed meta-information.

WGMS provides the baseline information needed both for remote sensing observations and for different modelling approaches of reconstructions and future predictions of glaciers. The architecture of the database should make it possible to integrate reconstructed (modeled) mass balance series into the database. Such data should be clearly marked as not measured data.

It remains unclear from the self-evaluation report how numerical modelling could be integrated in the service in the future. Will WGMS carry out modelling and include the results in their products? Or will they just provide standards for simplifications that are allowed or model approaches that are accepted by the community? This topic needs clarification.

### **Data and data access**

The committee recommends that the main task for WGMS should be to provide standardized data only. Data processing is one of the main achievements of the service. It is not feasible to be a “warehouse” in which everybody can pick out raw data. However, data access should be made easier. Recent issues of *Fluctuations of Glaciers* and the *Glacier Mass Balance Bulletin* in PDF format are indeed easy to download, but PDF is not a useful format for data. WGMS needs to find a way of becoming a convenient place from which to obtain the glaciological data of which it is the primary holder. In particular, the standardized mass balance data should be more easily available via interactive online data search. Therefore, the data should be made accessible directly from the WGMS web site or could be provided by the data center at NSIDC or WDC Glaciology (WDCG). This would be consistent with current data distributing strategies, since the data center already is the mirror site of WGMS and hosts the WGI (World Glacier Inventory). Close collaboration between WGMS with its responsibility for compiling standardized information and the WDCG with its capacity for data management and dissemination is fundamentally important.

The provision of more detailed meta-information following international standards (e.g. ISO standard 19115 or Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata) is regarded as an essential task for the near future. This metadata should provide critical information e.g. on data sources, data quality, measurement or interpolation techniques, address of data holder, and should also be made available via the internet database accompanying each data record. The storage of the record-specific meta-information as XML data would result in a high compatibility with standard GIS-packages and data analysis software.

### **Products**

Additional to the online database, WGMS should further provide their products in printed form. The “Mass Balance Bulletin” is a valuable format for the public and policy makers and “Fluctuations of Glaciers” contain large colour maps that cannot be reproduced by common printers. Moreover, having paper copies distributed all over the world is also an important aspect in terms of data safety.

### **Funding**

It is remarkable that WGMS have been able to keep the service running over so many years and even develop it to the high standard it has today with the very uncertain and low funding situation. We must be aware that WGMS will not be able to continue in its present form without a more long-term secure funding. In this context, it is impossible to rely only on national Swiss funds to run the service. We appreciate the efforts of WGMS to secure national Swiss funding and fully support these efforts. However, we should realize that international support is most likely a necessity to be able to keep the service running on a long term. Worldwide glacier observation is an international task and great challenge that cannot be further executed by a single chair of a single university.

### **Organization**

*WGMS was established in 1986, combining at that time the former Permanent Service on the Fluctuations of Glaciers (PSFG; mainly supported by UNESCO) and the Temporary Technical Secretariat for the World Glacier Inventory (TTS/WGI; mainly supported by UNEP). Its advisory board is the ICSU Commission on Cryospheric Sciences (CCS, formerly the International Commission on Snow and Ice ICSI/IAHS). WGMS is one of the permanent services of the Federation of Astronomical, Geophysical and Data Analysis Services (FAGS/ICSU), which is now changing its name and status. It runs the Global Terrestrial Network for Glaciers (GTN-G) within the Global Terrestrial Observing System (GTOS) of WMO, FAO, UNESCO, UNEP and ICSU within the Global Climate Observing System (GCOS). Its publications are contributions to the Division of Early Warning and Assessment (DEWA) and of the Global Environment Outlook (GEO) of UNEP and the International Hydrological Programme of UNESCO.*

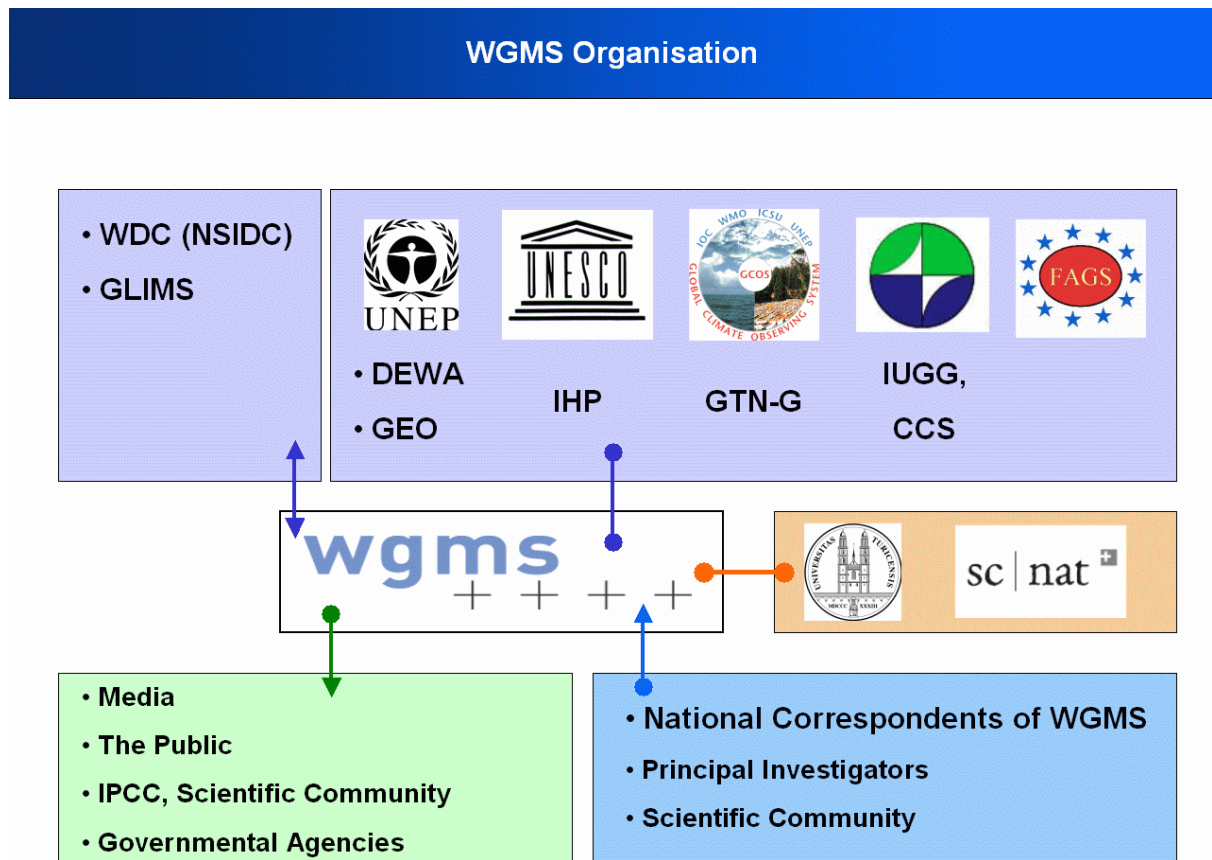


Fig. 2: Current organisation of the WGMS with umbrella organisations (UNEP, UNESCO, GCOS, IUGG and FAGS), national supporting institutions (SCNAT, University of Zurich), collaborations (WDC, GLIMS and National Correspondents of WGMS) and customers (Media, IPCC, Scientific Community, Governmental Agencies, etc.) of data and information.

WGMS should be run under the umbrella of the new IACS-International Association of Cryospheric Sciences (former ICSI - CCS). An international steering committee for WGMS should be established by IACS. The committee should involve experts responsible for in-situ measurements, remote observations and numerical models. The linkage to the umbrella organizations is essential for the credibility and visibility on an international level.

### Internal organization

#### Collaboration (National Correspondents of WGMS, WDC, GLIMS)

WGMS maintains a network of National Correspondents in about 30 countries. In all these countries one or several in-situ observations are run. These National Correspondents work as honorary members and are responsible for the collection and submission of glacier fluctuation data for periodic publication in the “Glacier Mass

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*Balance Bulletin” and the “Fluctuations of Glaciers” series. In addition, WGMS encourages, consults and assists the implementation and maintenance of national glacier monitoring networks.*

We think that the system with national correspondents is a prerequisite for efficient data transfer and a fundamental basement for the success of WGMS. WGMS is the only organization with the established network able to continue the collection of in-situ data in one data base. It is of fundamental importance to have the trust and consensus of the work from the glaciological community, from the different national organizations and the principal investigators responsible for in-situ measurements. We think that regularly workshops where the correspondents (and principal investigators) are invited to ensure the continuity and quality of the measurements can be very useful in this matter. This is will also vitalise the cooperation and motivate the investigators for future activity. We recommend that such a workshop should be arranged as soon as possible, preferably within the coming 1-2 years.

*The World Data Center for Glaciology at Boulder Colorado (WDC-G) is a traditional partner of WGMS in that it has the main responsibility for data storage, management and dissemination. This attribution of tasks should be strengthened in the future. WGMS on the other hand differs from WDCs in general by actively collecting standardized data using a well-organized network of local investigators and national correspondents. In order to accomplish this task, WGMS continuously develops and adjusts strategies for acquisition of coherent and integrative data sets to optimally fit glacier observations into international programs like GTOS, IHP or DEWA/GEO.*

We strongly support the idea that WDC-G could be responsible for data distribution and public data access. We would favour an integration of the WGMS mass balance data into the WDC system similar to the current integration of the WGI at NSIDC. The data should be accessible via an interactive user interface as it is currently provided for the WGI. The database structure should be updated in order to hold the detailed record-specific meta-information.

*The Global Land Ice Measurements from Space (GLIMS)-project is the first internationally coordinated attempt to compile a comprehensive glacier inventory reflecting glacier occurrence around the year 2000 from satellite imagery. This project is an important step towards the integration of remote sensing and geo-informatics into worldwide glacier monitoring.*

The efforts of GLIMS and WGMS/WGI activities should be combined further in a multi-level observing strategy. Ideally the data sets should be homogenised in the near future. Hereby, the WGI could provide ‘static’ information, while the GLIMS analyses provide multi-temporal and spatial information based on satellite image data. As one of the main tasks for future glacier inventories remain the integration of polar ice masses, in particular the local glaciers and ice caps surrounding the ice sheets of Greenland and Antarctica. To achieve the goal of a single future glacier inventory of the Earth, a revised

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glacier classification scheme e.g. as proposed by the GLIMS consortium ([http://www.glims.org/MapsAndDocs/assets/GLIMS\\_Glacier-Classification-Manual\\_V1\\_2005-02-10.pdf](http://www.glims.org/MapsAndDocs/assets/GLIMS_Glacier-Classification-Manual_V1_2005-02-10.pdf)) has to be adopted to facilitate a consistent world-wide glacier identification by maintaining the continuity of the existing WGI. Hereby, the integrity of the glacial classification depends mainly on two points:

- Accurate and specific class definitions to ensure the clarity for all users
- A variety of suitable classes that enable the description of glacier morphology in **all** regions of the world with the utmost of accuracy

The proposed international steering committee should represent the data providers as well as the data users, scientists and organisations. This would require experts covering in-situ measurements, remote sensing observations and numerical modelling.

An important question is to what extent the steering committee would be able to take the responsibility for the funding situation. The rights and duties of the steering committee have to be defined as well.

It would be logic if the new cryospheric association (IACS) as the former parent organization (ICSI/CCS) of WGMS took the responsibility to establish and run the steering committee.

### **“In house organisation”**

We would prefer a service at one location with long term positions to ensure the capability and continuation of the WGMS.

### **Additional and minor comments:**

The web-pages should focus more on the content of their products: not only mass balances but for instance special events like natural hazards, ice avalanches, surges, etc. The international visibility of the service should be increased by regular posts on CryoList and by a special issue of ICE. A better linkage between WGMS and NSIDC webpages should be provided.

The data from the WGI display a certain degree of heterogeneity, which is evidently inevitable with such a comprehensive data set compiled from diverse sources. Nevertheless, it is recommended to revise the inventory and to correct evident errors and ambiguities. Furthermore, a consistent and non-ambiguous application of null-values (e.g. -9999) is suggested. This revision could be realised as a first step towards the integration of WGI and GLIMS glacier inventories in the near future.

## Appendix N, UCCS Newsletter 2 (17.1)

### IUGG/CCS Newsletter 2 (October 2006)

Dear Colleague,

This is the second newsletter from the IUGG Commission for the Cryospheric Sciences, IUGG/CCS formerly known as ICSI. The status within the IUGG of UCCS has been hectic for the bureau with organization and planning of activities, especially the upcoming IUGG General Assembly in Perugia next year. It is our hope that you find the following of interest.

#### Contents:

1. *The joint IGS/CliC/UCCS International Symposium on Cryospheric Indicators of Global Climate Change, held in Cambridge, UK, 21–25 August 2006*
  2. *The IUGG General Assembly in Perugia, Italy, 2007*
  3. *A joint IAMAS/IAPSO/UCCS(IACS) Assembly in Montreal 2008*
  4. *IUGG/CCS Bureau Meetings*
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#### **1. The joint IGS/CliC/UCCS International Symposium on Cryospheric Indicators of Global Climate Change, held in Cambridge, UK, 21–25 August 2006**

The first event organized by the newly formed UCCS was the International Symposium on Cryospheric Indicators of Global Climate Change, held in Cambridge, UK, 21–25 August 2006, which was co organized by the International Glaciological Society (IGS), the WCRP core project Climate and Cryosphere (CliC). The symposium attracted an in IGS history unprecedented large number of attendees as well as abstracts. A total of 224 delegates attended the meeting, 292 abstracts were submitted before the symposium, and by the time of the symposium some 111 talks and 105 posters were scheduled and approximately 80 papers were finally submitted for the proceedings volume to be published in the *Annals of Glaciology* 46. The symposium was the first organized by the IGS where parallel sessions had to be organized in order to accommodate all talks. The IGS staff and local organizers did a highly professional job to have the symposia run very smoothly.

During the symposium, Prof. Richard Alley was awarded the IGS Seligman Crystal. He gave a much appreciated speech during the ceremony. In an effort to spotlight the younger generation of scientists and also raise awareness for UCCS, we decided to award two students attending the meeting for best poster and best talk. An awards committee consisting of Prof. Atsumu Ohmura, Prof. Peter Jansson, Assoc. Prof. Regine Hock and led by Prof. Jon Ove Hagen scrutinized the talks and posters and awarded the best oral to Peter Kuipers Munneke from the University of University, the Netherlands, for his presentation: “*A model for studying Antarctic snow surface albedo under clear and cloudy conditions*”. The best poster presentation to Matthias Huss from ETH Zurich, Switzerland titled: “*Retreat scenarios of Unteraargletscher, Switzerland, using a coupled ice-flow mass-balance model*“. This award, which we intend as a recurring event, consisted of a USD 100 cash prize and diploma signed by the UCCS President Georg Kaser and the head of the awards committee, Vice President Jon Ove Hagen.

#### **2. The IUGG General Assembly in Perugia, Italy, 2007**

Planning for the IUGG general Assembly is in progress. The program of UCCS co-sponsored workshops is reproduced below, listed by host Associations, conveners are given in square brackets

## Appendix N, UCCS Newsletter 2 (17.1)

### IAG

JGS005: *Observations of the Cryosphere from Space* (UCCS, IAMAS, IAPSO, IAHS, CliC, IGS) [[Isabella Velicogna](#), [Konrad Steffen](#)]

### IAHS

JHW001: *Interactions between snow, vegetation, and the atmosphere* (UCCS, IAMAS-ICPM, iLEAPS, IGS)

JHW002: *Climate-Permafrost-Hydrology Interactions: The impact of changing climate on cold regions hydrology* (UCCS, IAMAS, IAPSO, CliC, IGS, IPA) [[Philip Marsh](#); [Lev Kuchment](#), [Tingjun Zhang](#), [Oliver Frauenfeld](#); [Tetsuo Ohata](#)]

JHS001: *Debris Transport in Glaciers* (UCCS, INQUA, IGS) [[Michael J. Hambrey](#)]

JHS002: *Natural ice microstructures* (UCCS, IAMAS, IGS) [[Jean-Bruno Brzoska](#), [Martin Schneebeli](#); [Ed Adams](#); [Pierre Etchevers](#); [Charles Fierz](#)]

### IAMAS

JMS026: *Ice cores and Climate* (UCCS, IGS) [[Dorthe Dahl-Jensen](#)]

JMS027: *Glacier fluctuations in the Asian High Mountains* (UCCS, IAHS, CGI, Ev-K2-CRN, ICIMOD, HKH-FRIEND, IGS) [[Claudio Smiraglia](#); [Olga Solomina](#); [Jiawen Ren](#); [Mandira Shrestha](#); [Christoph Mayer](#)]

JMS028: *Consequences of Large Scale Circulation Variability on Snow and Ice Extent* (UCCS, IAHS-ICSIH, GEWEX, IGS)

JMS029: *Snow Avalanches – Field Observations and Modelling* (UCCS, IGS) [[Karl Kleemayr](#); [Andi Schaffhauser](#); [Betty Sovilla](#); [Guido Luzi](#); [Margarita Eglit](#)]

JMS030: *Extraterrestrial Ice* (UCCS, IAG, IGS) [[Manfred Lange](#); [Ralf Greve](#)]

### IAPSO

JPSCCS04: *Arctic Glaciers and Ice Caps Mass Balance/Calving* (UCCS, IAMAS, CliC, IASC, IGS) [[Jon-Ove Hagen](#); [Johannes Oerlemans](#); [Julian Dowdeswell](#); [Jacek Jania](#); [Andrey Glazovskiy](#)]

JPSCCS05: *Life in icy environments: interactions between the biology and chemistry of ice* (UCCS, IABO, IGS) [[Martyn Tranter](#); [John Prisco](#)]

### IAVCEI

JVS003: *Ice –Volcano Interactions* (UCCS, IAHS, IGS) [[Ben Brock](#); [Andrés Rivera](#)]

In addition, we try to organize a *Cryospheric Open Session* that is still under negotiation with the Local Organizing Committee [[Hilmar Gudmundsson](#)]

## 3. A joint IAMAS/IAPSO/UCCS(IACS) Assembly in Montreal 2008

During the past year, ideas for a joint assembly meeting with International Association of Meteorology and Atmospheric Sciences (IAMAS) and the International Association for the Physical Sciences of the Oceans (IAPSO) has materialized. The assembly will take place in Montreal in 2008 and planning is still in initial stages. We will provide more information on this event as the planning progresses.

## 4. IUGG/CCS Bureau Meetings

4.1. I would briefly mention the Paris Bureau meeting with giving the link to the respective minutes site.

4.2. During the 2005 Paris meeting, Bureau members decided to meet in a Retreat Meeting in order to discuss the IUGG/CCS to IACS transmission issue in an extended way. For this, all Bureau members including the Past President Gerry Jones met for three days in Karthaus, South Tyrol, in the Italian Alps. It consisted of two parts. The first was to work off usual and formal business load, the respective minutes are at the ICSI web-site ([www.gliaciology.su.se/ICSI](http://www.gliaciology.su.se/ICSI)). The larger part was kept informal and was dedicated to a variety of topics that the Bureau will face when the Commission becomes an Association next summer. A summary paper of this discussion is in preparation.