

## **IUGG General Assembly 2015 – Prague, Czech Republic**

### **SGmG Conference Report**

Nico Mölg

#### **General benefits and achievements**

Since I've been working in research for several years but never visited a big conference, one of the greatest benefits was to finally meet a number of people that I'd only known from literature or distant communication. Generally a big benefit, I tried to get in touch with some of the potentially important people for our works or possible future work and to receive and give input on the contents that the researchers presented; because of a highly efficient and thorough organisation (e.g. fingerfood and beverages every day starting from 6 p.m.) and additional evening events (e.g. see "Special events") I had plenty of opportunities to do so.

#### **Oral presentation**

After some additional nights of preparation and last-minute-help from colleagues I was ready for my presentation on the large-scale glacier development in the Karakoram, one of today's hotspots of glaciological research (including verbal acknowledgments to SGmG for funding). I kept the talk short and somewhat provocative in order to receive as much feedback and as many questions as possible. This strategy worked well and after ten minutes of discussion the convener prevented further questions, but some from the audience were approaching me after the session to continue discussions.

#### **Poster presentation**

Additional to the talk I presented a poster (see below) on the production recommendations and difficulties of modern glacier inventories (large parts of it used for the Randolph Glacier Inventory) with a focus on specific conditions in High Asian glaciers. Even though the poster was placed somewhat unluckily away from the main coffee table and crossing areas, an astonishingly large number of scientists came visiting. I had the chance to talk to some of the potential users as well some "older cracks" and we had some excellent exchange of opinions and views.

#### **Special events**

Even though I'm not an official member of the Randolph Glacier Inventory Working Group, I've already in the past contributed substantial amounts of data to the RGI and taken part in e-mail discussions. For this reason I was invited to take part in the regular meeting and workshop of the Working Group under the lead of Graham Cogley. Apart from being highly interesting in itself, being part of the discussion and decision process has given me a deeper understanding of how decisions (that are touching a high share of the global glaciological community) are taken and how one can bring one's ideas into the consideration. I hope I will have the chance to continue following the work of the Working Group or maybe even become a future member, since I'm convinced of the importance of the work this group is doing.

APECS (Association of Polar Early Career Scientists) organised an event on the steps and strategies young scientists need to start a successful scientific career ("How to become a successful scientist"). The event was organised as a panel discussion with a strong focus on communication and interaction with the audience. Podium guests were Charles Fierz (SLF), Eleanor Frajka-Williams (????), and Daniel Farinotti (WSL/ETH). The discussions were worthwhile and informative and were generally

highlighting the strong efforts each and everyone needs to make together with smart personal marketing and self-confident appearance. "Just being smart doesn't make you a successful scientist".



## Challenges in creating a glacier inventory for the Karakoram - Pamir region



Universität Zürich UZH

Philipp Rastner<sup>1</sup>, Nico Mölg<sup>1</sup>, Tobias Bolch<sup>1</sup>, Tazio Strozzi<sup>2</sup> and Frank Paul<sup>1</sup>  
<sup>1</sup>University of Zurich, Department of Geography, Switzerland  
<sup>2</sup>Gamma Remote Sensing, Gumligen, Switzerland

Contact: philipp.rastner@geo.uzh.ch

- Objectives**
- Glacier inventories provide an important baseline dataset for tracking glacier changes, regional extrapolation of local observations, glaciological modelling and climate change impact assessment.
  - For many regions in High Mountain Asia only inventories of variable quality were available a year ago, limiting the accuracy of the related calculations.
  - Due to the current and future importance of glacier melt water for livelihood in many of the regions, there was an urgent demand for an inventory of higher accuracy.
  - To overcome this situation, we mapped all glaciers in the Karakoram and Pamir mountain

- ranges using Landsat TM and ETM+ satellite scenes acquired around the year 2000.
- The automatically mapped outlines were manually corrected (e.g. for debris, snow, shadow, water) and the ASTER GDEM2 was used to create drainage divides and a complete inventory.
- The study region has some specific challenges for creating a glacier inventory (e.g. surge-type glaciers that occasionally connect to a larger main glacier).
- As in the meantime several new inventories are available for the study region, we also compare our outlines with these new datasets.

**1. drainage divides**

Correct separation of glaciers in the accumulation area requires an accurate DEM. Both the SRTM DEM and the GDEM2 have quality issues in this regions requiring intense manual correction of divide positions to avoid sliver polygons.  
 => We employed automated methods to derive drainage divides but also spent a large amount of time in adjusting their positions to the extent of glaciers.

**2. perennial snow**

Due to the high elevation of the terrain, real glacier extents are often hidden by seasonal snow or perennial snow fields cover steep mountain flanks.  
 => We manually removed most of the more obvious seasonal snow fields but included all perennial snow fields where it is not known if ice is underneath.

**3. debris cover**

Landsat band 543 FCC  
 PALSAR coherence image

There is an abundant number of (mostly large) debris-covered glaciers in the study region. Due to the high solar elevation and limited topographic contrast, these regions are often difficult to identify.  
 => We used coherence images from ALOS PALSAR and high-resolution images as available in Google Earth to identify and map glacier boundaries.

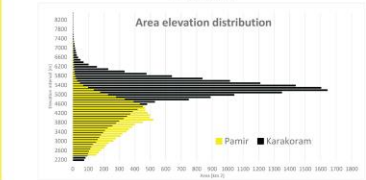
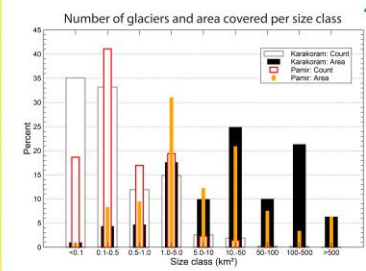
**4. surging glaciers**

1996  
2000  
2009  
2013

**5. shadow**

Due to the high and steep terrain, some regions in the north partly exhibit deep shadows hiding upper glacier parts.  
 => We manually corrected these were required using true colour image composites and local contrast enhancement.

- 6. results**
- The total area of mapped glaciers >0.02 km<sup>2</sup> is 21688 km<sup>2</sup> in the Karakoram and 11774.9 km<sup>2</sup> in the Pamir mountain range.
  - Most glaciers are in the 0.1-0.5 km<sup>2</sup> size class for Pamir, whereas for the Karakoram it is the class <0.1 km<sup>2</sup>.
  - Glaciers between 1 and 5 km<sup>2</sup> contribute more than 30% to the total area in Pamir, whereas for the Karakoram regions it is only 17%.



**7. comparison**

7a  
7b  
7b.a

- The Chinese and ICIMOD glacier inventories are more conservative in the mapping of debris covered gl. tongues.
- ICIMOD is generally excluding the steep upper parts.
- Surge type glaciers are not mentioned specifically in both.
- The Chinese/ICIMOD inventories cover only part of the Karakoram region.
- > Results derived from the different inventories vary considerably

Areas per elevation

Legend: ICIMOD glacier inventory (yellow), Chinese glacier inventory (green), Karakoram inventory (black)

The high number of surge-type glaciers create problems in properly identifying glacier entities as they connect / disconnect from larger glaciers during/after a surge.  
 => We analysed time series of satellite images to identify the surge-type glaciers and disconnected them from the main glaciers by manual digitising of a boundary.