

**WGMS Summer School on
Glacier Mass Balance Measurements and Analysis**
2-7 September 2013
Zermatt, Switzerland

draft report for ICE, the news bulletin of the International Glaciological Society

In September 2013 the World Glacier Monitoring Service organized a Summer School on Mass Balance Measurements and Analysis in Switzerland. The summer school was carried out within the framework of the project "Capacity Building and Twinning for Climate Observing Systems" (CATCOS), which is led by MeteoSwiss and funded by the Swiss Agency for Development and Cooperation (SDC). The summer school was co-sponsored by the Global Climate Observing System (GCOS), the Global Cryosphere Watch of the World Meteorological Organization (GCW/WMO), and the International Association of Cryospheric Sciences of the International Union of Geodesy and Geophysics (IACS/IUGG).

The course was dedicated to participants from the Andes and from Asia who are involved in ongoing mass balance measurements in their regions with the aim to strengthen both the glaciological expertise and the regional exchange between observers in order to improve the availability and quality of glacier mass balance observations from these regions. So, from 80 applications a total of 15 training positions were offered to a maximum of two candidates from countries in the two regions of focus, the Andes and Central Asia. The international teaching team consisted of researchers of Switzerland, France, Austria and Nepal.

The summer school was held from 2-7 September at Hotel Riffelberg, situated above Zermatt at an altitude of 2548 m asl with a nice view to the famous Matterhorn. The location lies in walking distance to the ablation area Findelengletscher, a mass balance glacier, where part of the field work exercises took place. The course consisted of presentations and practicals in both office and field work.

During Monday afternoon after all participants and instructors had arrived at Riffelberg, we gathered to a first icebreaker welcome drink to get to know each other and sort out in which language the mutual conversations turn out to be most efficient. Although the "official" summer school language was english of course, due to the origin of the participants from South America and Central Asia spanish and russian proved to be of great social importance.

The first day of the course started with a welcome by the IACS president Charles Fierz, followed by a presentation of the CATCOS project by S. König. Presentations by Michael Zemp, Martin Hoelzle and Antoine Rabatel gave an overview of the international context of glacier mass balance monitoring and its theoretical background. To get down to business finally, Horst Machguth showed methods how to get from point measurements to glacier-wide balance estimates. In the following exercises the concepts were deepened using mass balance data from nearby Findelengletscher.

The second day was dedicated to field work exercises and safety training in the ablation area of Findelengletscher (2600-3200 m asl). After a nice walk to the glacier tongue of Findelengletscher, we separated in groups to drill ablation stakes, do GPS survey of frontal and stake positions and practice crevasse rescue training. After a day of field work on Findelengletscher with perfect weather conditions all of us enjoyed the excellent dinner at Hotel Riffelberg and some the nice sauna at the Hotel.

In the morning of the third day we took the train down to Zermatt and from there the cable cabin to Klein Matterhorn to reach the accumulation area of Theodulgletscher (3200-4100 m asl), where we performed accumulation measurements and learned safety procedures when travelling on the snow covered part of a glacier. After another outdoor day in bright sunshine some of the glaciologists took the chance to visit the ice palace of Klein Matterhorn. Regional differences in glacier travel safety procedures and their advantages and shortcomings gave us plenty to talk about on this evening.

The fourth day was held in the seminar room again with a presentation on high altitude sickness, outlooks on uncertainty assessment and reanalysing of mass balance measurement series, on the use of computer modelling and snowline monitoring from terrestrial and space borne surveys for mass balance analysis, and on the use of new photogrammetric methods for mass balance monitoring. Discussions after each talk and during the field and office practicals allowed putting the international concepts into regional context and clarifying technical details.

In conclusion, this summer school introduced best practices for glacier mass balance measurements and analysis and dedicated time for discussing potential adaptations in order to fit regional peculiarities. It was interesting to bring people together, who are all supposed to measure the same thing - the surface mass balance of a glacier - but due to the different climate settings and different logistic needs and facilities face different problems and might have to slightly adapt their measurement strategies.

The course evaluation by the participants resulted in a very good overall satisfaction with a desire for more training courses, maybe organized in the Andes and Asia.

Bernhard Hynke

Link to the summerschool website with all presentations and exercises:
http://www.wgms.ch/mb_summerschool.html

Fotos:



Participants and teachers of the WGMS summer school in Zermatt



The venue of the Summer School, Hotel Riffelberg (2548m) with Matterhorn in the background.



Michael Zemp, Director of the WGMS giving the introduction lecture at the Summer School.



Impressive mountain scenery with Monte Rose and Lyskamm in the back and Gornergletscher in the foreground.



Michael pointing out different moraines on our walk to Findelengletscher.



Edwin Loarte Cadenas and Wenbin Wang are drilling an ablation stake on Findelgletscher.



Jorge Louis Ceballos coming up from a crevasse during the safety training.



Glacier safety training in the accumulation area of Theodulgletscher.



Sharad Joshi, Wenbin Wang, Ryskul Usabaliev and Jorge Louis Ceballos practicing crevasse rescue training.



Matthias Huss and Horst Machguth explaining measurements in a snow pit.



How to deal with firn corers.