

## **Benchmark glaciers network for mass balance monitoring and validation of remote sensing based methods on the Antarctic Peninsula region.**

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Note: It is expected that other countries (e.g. Argentina, England, Germany, Korea, Spain, etc) with active glaciological research in different places on the South Shetland Islands and Antarctic Peninsula areas should also meet this idea.

### **Summary:**

Climatic studies reveal that northern Antarctic Peninsula and surrounding areas have been apparently reacting to the global change with a consistent differential warming trend in the last decades. This warming is significant and probably unmatched for the 1900 years (King 1994; Vaughan et al. 2002). Values are considerably larger than the mean Antarctic trend of +1.2 °C/century and the region has been indicated as a valuable case of study to the better understanding of regionally specific climatic processes (Vaughan et al. 2002).

According with regional warming glacier mass changes are probable. This situation has been verified recently with the destruction of several ice shelves, then modulated temporal reaction of inland glaciers is likely. Nevertheless, not only annual mean temperature and precipitation impact on the sign of mass balance, responses are also controlled by local environmental settings. Therefore, is required the consideration of additional parameters to characterize properly the status of selected glaciers and to recognize their dynamic behaviour.

Nowadays, is a fact that still there is a lack of glaciological systematic measurement in most parts of Antarctica. This is particularly true in the northern tip of the Antarctic Peninsula and South Shetland Islands, where for instance there are not recorded standardized contributions to the World Glaciological Monitoring Service (WGMS) database. Also, Turner et al. (2002) remark that one of main problems to investigate change in precipitation and mass balance across the Antarctic Peninsula is the limited amount of data of both of these quantities. Their exhaustive compilation of mass balance measurements does not include any record northward of 64° S latitude.

Knowledge of glacier mass variations also permits to estimate the contribution of ice sheets to the global sea level rising. Van Lipzig et al., 2002 indicate that knowledge of present-day surface mass balance is indispensable to understand the past and future changes in the mass of the Antarctic ice sheet in relation to sea level. In addition, recent advances in the determination of the mass balance of polar ice sheets give evidence that in Greenland Ice Sheet there is a pattern of near-coastal thinning and reports different conditions for West Antarctic Ice Sheet suggesting that is probably thinning overall. Nevertheless, results are limited for spatial resolution of data and do not provide any indication of the state of mass balance of the glaciers at low elevation along the coast (Rignot and Thomas, 2002; Rignot 2002).

Consequently, current situation represent the opportunity to initiate during the 4th IPY the establishment of a network of benchmark glaciers in selected places of Antarctic Peninsula and South Shetland Islands. This should provide the required basic data for glaciological studies in a sector of Antarctica suggested as sensitive and where early responses to changes are expected. Using classical methods representative glaciers can be intensively studied to understand effects of climate on glacier mass changes and the resulting effect on streamflow. At the same time, complementary dataset will be recorded with the aim to calibrate automatic and semi-automatic methods to extract information using multi sensor satellite data. This multi-method approach will facilitate the densification of information through interpolation and extrapolation of parameters to neighbouring glaciers using high spatial resolution remote sensed data over

a wide coverage. In this way, should be possible to enhance spatial resolution of mass balance estimations in the region, as well as to study dynamic behaviour of ice masses.

Constraints to this idea are related with the harsh environmental conditions and inaccessibility of the territory that surely difficult the operation on remote places. Our proposal consider the definition of benchmark glaciers in places reasonably close to all-year-round operation Comandante Ferraz Station on King George Island and Bernardo O'Higgins Station, on the Antarctic Peninsula. This condition should make feasible field surveys and the viability of activities under a long term basis, allowing at least the annual monitoring.

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