

Cryosphere group

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- **Key Science Questions**

1. Do we have the necessary data for mountain cryosphere research?
2. What are the gaps in cryosphere research?
3. How do we link various cryosphere programs?

- **What results are available? (Current knowledge)**

There is a broad range of uncoordinated studies in the mountainous regions of Central Asia that address changes in glaciers' volume and extent, snow cover variations, changes in montane permafrost and their cumulative impact on runoff originating from the regional cryosphere.

- **What should be done?**

1. In permafrost and frozen ground studies, models of their dynamics and spatial distribution should be developed and used to assess effects of changes in permafrost and frozen ground on climate, hydrology, and natural hazards (e.g., landslides, floods, etc.);
2. In glaciers' studies (GLIMS, mapping and volume changes), an error analysis with a standardized procedure should be implemented, the data access issues should be addressed (e.g., the old aerial photos are practically unavailable for researchers), and, thereafter, the role of large glaciers and glacial processes on local and regional climate and hydrology should be assessed;
3. In cryospheric hydrology studies, better glacier melt models that are using remote sensing data as input should be developed and moraine lake and wetland changes related to glaciers' change should be systematically assessed;
4. In snow cover studies, the availability of snowline and snow cover extent information from satellites as well as snow surveys and precipitation in situ data is still inadequate for climate and hydrology change analyses over most of mountainous regions of Central Asia (this deficiency can be alleviated by data sharing and by expansion of the ground-based observational networks);
5. Global Cryospheric Watch (cf., Figure on the right) approach should be implemented in the region.

- **Message to decision makers**

During the past several decades, we observed dramatic changes in all components of the cryosphere of the mountainous Central Asia. Some of these changes (first of all, glaciers' and seasonal snow cover retreat) feed back to regional climate changes enhancing them, affect the probability of natural hazards such as landslides, and closely intervene with water supply to densely-populated regions in the valleys and further downstream. Urgent and thorough studies are warranted to better describe the processes that cause these cryosphere changes and, thereafter, to project their further dynamics. As the first easy step, the sharing of the existing data/information among the scientific community must be emphasized.

