

New GEWEX Crosscut Project Addresses Mountain Snow and Ice Hydrology and Atmospheric Interactions

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Mountains receive and produce a disproportionately large fraction of global precipitation and streamflow that contributes to floods and essential water supplies for vast sub-humid downstream areas occupied by at least 50% of humanity. Research in alpine catchments is complicated by data scarcity, as there are only a few well equipped research catchments in the world. As a result, snow and ice hydrological processes in these regions are not completely understood, are extremely diverse, and are rarely represented appropriately in hydrological and land-surface models. There is an international need to improve the understanding and modeling of snow and ice hydrological processes in alpine catchments, and these improvements must be supported through careful observations. Due to the limited number of and geographical dispersion of alpine research catchments, there has been relatively little intercomparison of high mountain processes and hydrological behavior throughout the world.

These concerns prompted 25 scientists operating 14 research catchments around the world to develop the International Network for Alpine Research Catchment Hydrology (INARCH). This new GEWEX Hydroclimatology Panel (GHP) Crosscutting Project focuses on alpine catchments that are well equipped to measure snow and ice hydrology. Information obtained from this initiative will be used to investigate the effects of mountain snowpacks and glaciers on water supply and to study variations in energy and water exchange in different high-altitude regions.

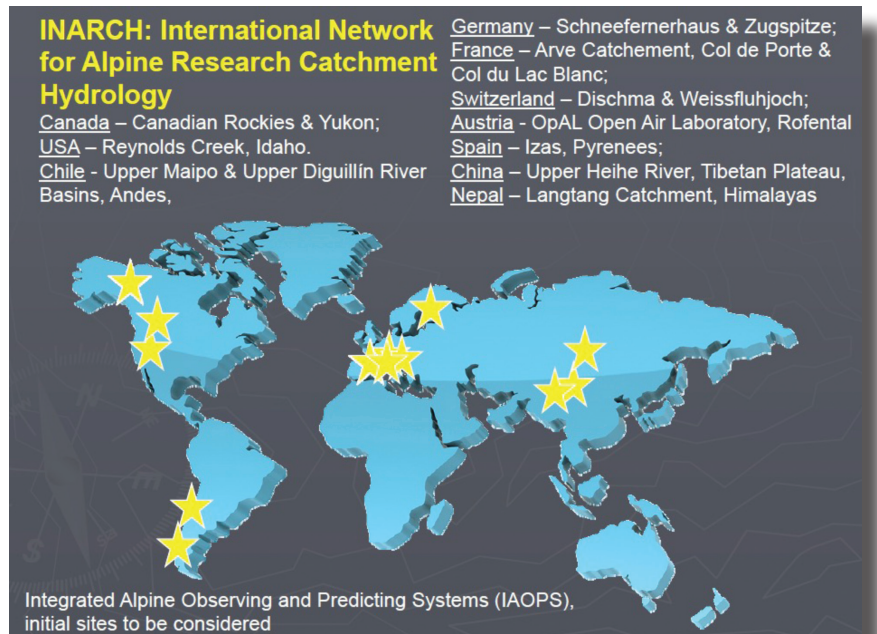
A number of questions regarding alpine catchments were raised during the GHP meeting held in The Hague in July 2014 that led to the creation of INARCH. These include: (i) what is the best methodology for measuring snow and ice hydrology in various alpine regions? (ii) how do land-surface energy and water exchanges differ in various high mountain regions of the Earth? and (iii) what improvements to high mountain hydrological predictability are possible in various alpine regions through improved process physics, representation of spatial variability and incorporation of ground and remote observations? To address these questions, the overall objective of INARCH is to better understand alpine cold regions hydrological processes, improve their prediction, and find consistent measurement strategies. To achieve this objective it is neces-

sary to develop transferable and validated model schemes of varying complexity to support research in data sparse mountain areas.

Surface based data requirements for this project will primarily be met by detailed, openly-available meteorological and hydrological observational archives from long-term research catchments with high temporal resolution (at least 5 years of continuous data with hourly sampling intervals for meteorological data, daily precipitation and streamflow and regular snow and/or glacier mass balance surveys) in selected heavily-instrumented alpine regions, atmospheric model reanalyses, and downscaled climate model outputs.

The methodology to be used by INARCH will include: (i) comparing instrumentation best practices; (ii) suggesting improvements in instrumentation; (iii) developing reliable alpine data sets for model testing and numerical experiments; (iv) conducting process algorithm intercomparisons; (v) conducting model uncertainty and climate sensitivity analyses; (vi) demonstrating improvements to model predictability; (vii) evaluating different downscaling schemes; (viii) fostering research and development for future observing schemes; and (ix) facilitating education and training programs to build and enhance science capacity and communicate the science results to the public. One of the ways that INARCH will build capacity around the world is by contributing to the UNESCO International Hydrological Programme.

The first INARCH meeting will be held in Canada on 22–23 October 2015. In addition, a session on “Improved understanding and prediction of mountain hydrology through alpine research catchments” is planned for the American Geophysical Union Fall Meeting in San Francisco. Additional information about INARCH is available at: www.usask.ca/inarch/.



Location of some initial possible INARCH sites.