



Use of time series of optical and SAR images in the estimation of snow cover for the optimization of water use in the Andes of Argentina and Chile

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This paper describes the progress in the bilateral cooperation project between academic and water resources management institutions from the Andes region of Argentina and Chile.

The study zone is located in fragile ecosystems and mountain areas of the Andes (limit zone between the Province of San Juan, Argentina, and the IV Region of Coquimbo, Chile), with arid climate, where snow precipitates in the headwaters of watershed feed the rivers of the region by melting, which are the only source of water for human use, productive and energetic activities, as well as the native flora and fauna.

CONAE, the Argentine Space Agency, participates in the Project through the provision of satellite data to the users and by this it contributes to ensuring the continuity of the results of the project. Also, it provides training in digital image processing. The project also includes the participation of water resource management institutions like Secretaría de Recursos Hídricos of Argentina and the Centro de Información de Recursos Naturales de Chile (CIREN), and of academic institution like the University of San Juan (Argentina) and University of La Serena (Chile). These institutions benefit from the incorporation of new methodologies advanced digital image processing and training of staff (researcher, lecturers, PhD Students and technical).

Objectives:

1- Improve water distribution incorporating space technology for application in the prediction models of the stream flow.

2- Conduct an inventory of glaciers as well as studies in selected watersheds in the Andean region, aiming to know the water resource, its availability and potential risks to communities in the region.

3. Contribute to vulnerability studies in biodiversity Andean watersheds.

Results:

For estimation Snow cover Area, the MODIS images are appropriate due their high temporal resolution and allows for monitoring large areas (greater than 10 km)

The proposed methodology (Use of snow index, NSDI) is appropriate for operational application because it is simple and easy to implement.

From the analysis of multitemporal study in the region using COSMO SkyMed images, it is observed that the values of wet snow coverage, obtained along the 2012 hydrological cycle, are consistent with the dynamics of the same:

The study area has a high rise and steep relief (up to 6400m), therefore the shadows loom large, processing optical and SAR images improve the results.

The behavior of the accumulation process (winter) and snowmelt (summer), is influenced by the elevation of the different study areas. A high percentage (49%) of surface snow at higher elevations to 3000 m. This is due to the accumulation of snow increases with elevation, by the combined effect of low temperatures and increased precipitation snowy orographic effect.

In studies of wet meadows with optical images, a high correspondence between the spectral classes and vigor of vegetation and soil moisture (seen in the field) so are considered as indicators of degradation of these ecosystems was observed