RIVER RUNOFF AND REGIONAL CLIMATE OF A SMALL GLACIATED CATCHMENT AREA IN THE ANDES IN SOUTHERNMOST PATAGONIA, CHILE

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The river runoff from a small partly glaciated catchment area in southernmost Patagonian Andes in Chile is measured to analyse the influence of regional precipitation and climate dependent glacier ablation on runoff. The first data from March to September 2002 were compared to climate data recorded at an automatic weather station in the area. The poster presents the first detailed hydrometeorological investigation from this part of the Andes.

The investigation area is located at 53°S in southernmost South America exactly east of the main divide of the mountain range of the Andes at 72.5°W. The catchment area of about 15 km² comprises parts of the Gran Campo Nevado Ice Cap reaching up to 1500 m asl, and the outlet glacier Glaciar Lengua which ends at a proglacial lake at 100 m asl. The Gran Campo Nevado Ice Cap is the major ice mass between the Southern Patagonian Ice field in the north and the Strait of Magallan to the South. Climate in the area is characterised by whole-year round cool and super-humid conditions with a mean annual air temperature of 5,6°C at sea level and an annual precipitation sum of approximately 7,000 mm. The Río Lengua itself meets approximately 3.5 km downstream from the proglacial lake into the fjord system of Canal Garjado which is a branch of Seno Skyring.

A continuous hourly record of water levels in the river was obtained from two digital water depth sensors. Runoff was calibrated against river level by measuring runoff at different times with the tracer method of salt dilution and with velocity measurements employing a hydrometric vane. Mean runoff was computed to about 3 m³/s with peak flows exceeding 10 m³/s.
Ablation on the glacier was estimated using the degree-day method with a degree-day factor that has been calibrated previously using data from a temporal energy balance weather station on Glaciar Lengua. The correlation between runoff and air temperature and precipitation returned significant correlation coefficients of $rt=+0.46$ and $rp=+0.55$ (precipitation) using 3-hourly data. Averaging and allowing for time lag between meteorological variable and runoff greatly enhances individual correlation coefficients to values above $r=0.7$. However, correlation with precipitation is always higher and more stable in time than correlation with air temperature, indicating that despite the large proportion (40%) of glacierised ground within the catchment, river runoff is mainly governed by precipitation and not so much influenced by changes in glacier melt. This can be attributed to the very high annual precipitation of 7,000 mm which falls on almost completely water saturated ground and glacier on those parts of the glacier that lie below 500 m asl. Since the runoff measurements of Río Lengua are permanently recorded during the next years, the future data will provide a possibility to compute mean spatial precipitation and glacier mass balance in the catchment area. This can be compared to precipitation measurements at standard meteorological tipping gauges and measured ablation on the glacier.

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