

## **Sensitivity analysis of hydrological modelling to climate forcing in a semi-arid mountainous catchment**

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**Abstract** This study analyses the sensitivity of a hydrological model to different ways of interpolating climate forcing on the Elqui basin (5660 km<sup>2</sup>) in the Chilean Andes. A 36-year period (1976–2011) was chosen in order to account for the hydro-climatic variability. Precipitation and using the inverse distance weighted methods were interpolated on a 5 × 5 km grid based on 12 and eight stations, respectively. Elevation effects on precipitation and temperature distribution were considered using a digital elevation model. Two precipitation datasets (with and without a mean altitudinal gradient) and three temperature datasets (using constant or monthly lapse rates based on altitudinal bands) were computed. All dataset combinations were assessed through the calibration of the GR4j model including a snow reservoir. Calibration was performed by the succession of Rosenbrock and simplex algorithms using a multi-objective function. Results show that the dataset based on a constant lapse rate of 6.5°C/km for temperature and no elevation effects for precipitation is sufficient to accurately simulate discharge and the snowmelt regime of the catchment over the last 30 years.

**Key words** hydro-climatic variability; hydrological modelling; snowmelt; altitudinal gradient; River Elqui; Chile