Semi-distributed modelling of the monthly water balance in an alpine catchment

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Hydrological Processes, Volume 19 Issue 12, Pages 2339 – 2360, Special Issue: Mountain Hydrology

http://www3.interscience.wiley.com/cgi-bin/fulltext/110574063/PDFSTART (Subscription required)

Abstract

The need for estimates of distributed water balance in alpine catchments is addressed. Such estimates are an essential prerequisite for the efficient planning and management of water resource use. Specifically, the maximum appropriate spatial resolution that can be obtained in water balance estimates is assessed, given limited information of physiographic parameters and meteorological variables, in a complex topographical environment. This is done using a combination of existing modelling methodologies. The use of spatial disaggregation into subregions of similar climatic and topographic properties has been used as an optimal method for considering all stages of water balance estimation, from input data generation to model parameterization and water balance simulation. Various techniques for the spatial interpolation of precipitation and temperature point observations are evaluated in terms of their applicability to mountainous terrain, and external drift kriging is found to be the most suitable. A water balance model is introduced for an alpine catchment, capable of integrating dominant hydrological processes, for the computation of monthly and regional distributed water balances. The conceptual model is characterized by minimal model complexity, with most of the parameters estimated a priori from catchment physiography, in order to avoid an automatic model calibration. The hydrological water balance model is applied to the transboundary Gail river catchment, located between Austria and Italy, south of the main alpine divide.

Keywords

water balance • alpine catchment • monthly scale • semi-distributed parameterization