



Assessment of the water balance over France using regionalized Turc-Pike formula

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With extensive use of hydrological models over a wide range of hydro-climatic contexts, bias in hydro-climatic data may lead to unreliable models and thus hydrological forecasts and projections. This issue is particularly pregnant when considering mountainous areas with great uncertainties on precipitations, or when considering complex unconservative catchments (e.g. karstic systems).

The Turc-Pike water balance formula, analogous to the classical Budyko formula, is a simple and efficient mathematical formulation relating long-term average streamflow to long-term average precipitation and potential evaporation. In this study, we propose to apply this framework to assess and eventually adjust the water-balance before calibrating an operational hydrologic model (MORDOR model).

Considering a large set of 350 french catchments, the Turc-Pike formula is regionalized based on ecohydrologic criterions to handle various hydro-climatic contexts. This interannual regional model is then applied to assess the water-balance over numerous catchments and various conditions, such as karstic, snow-driven or glacierized and even anthropized catchments. Results show that it is possible to obtain pretty realistic corrections of meteorological inputs (precipitations, temperature or potential evaporation) or hydrologic surface (or runoff). These corrections can often be confirmed a posteriori by exogenous information. Positive impacts on hydrologic model's calibration are also demonstrated. This methodology is now operational for hydrologic applications at EDF (Electricité de France, French electric utility company), and therefore applied on hundreds of catchments.