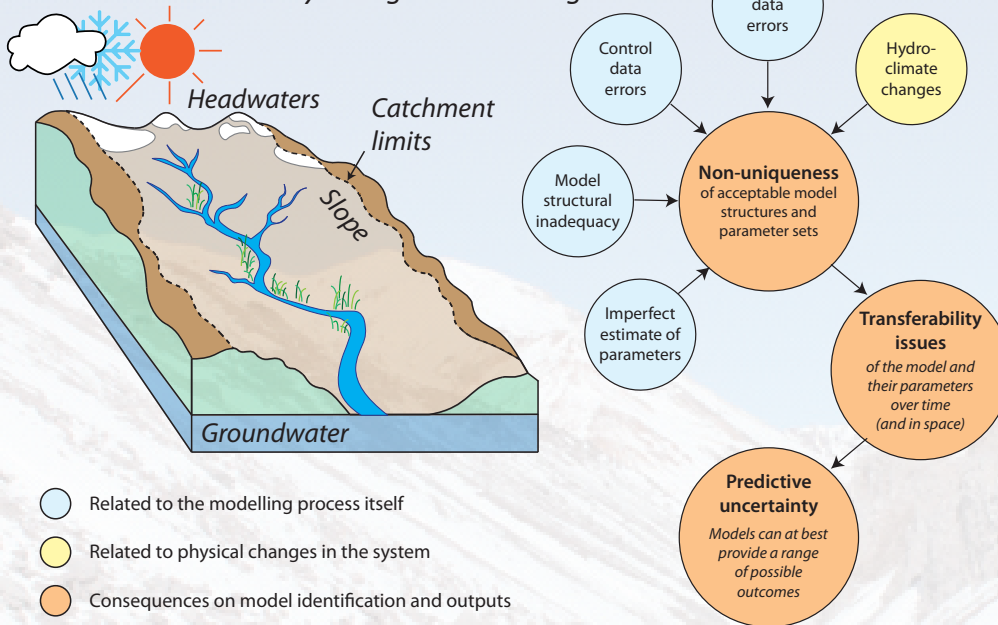


Improving the robustness of hydrological models under changing climate conditions

1 Context and background

The well-known lack of robustness of the hydrological models under changing climatic conditions points to the dependence of the optimal parameter set on the climate characteristics of the calibration period. This leads to increased uncertainty in estimating the hydrological impacts of climate change (see Fig. 1).

Fig. 1. Sources of uncertainty in hydrological modelling



2 Objectives

This study aims to develop an approach to enhance model transferability under climate variability. It seeks to exploit the dependence of the model parameter sets on the climate conditions in order to better account for changes in the catchment behaviour.

Required profile

- General knowledge in hydrology/climatology
- Sensitivity to modelling approaches
- Good skills in programming (R, Matlab, Python) and GIS softwares (ArcGis, Qgis)
- Scientific and technical English
- Organizational and editorial skills, taste for teamwork, autonomy

Structure/Location

HydroSciences Montpellier
HYDROPOLIS - Fac. de pharmacie
15 avenue Charles Flahault
34093 Montpellier Cedex 5

Training period

January-July 2026 (starting in October 2025 for preparation)

How to apply

Applications (CV + cover letter) should be sent by e-mail to Denis Ruelland
(denis.ruelland@umontpellier.fr)

3 Methods

Several conceptual models differing in their time step (annual to daily) and complexity will be used in the modelling experiment. Their increasing degree of complexity will allow testing the parametric climate-dependency from annual to daily time scales. The models will be calibrated according to sliding-time windows in order to identify the relationship between the optimised parameters and the characteristics of precipitation, temperature and evaporation. This relationship will be analysed to propose a method to make vary the parameters over time in order to improve model robustness under changing climate conditions. The proposed calibration approach will be developed and tested based on a large set of catchments with long streamflow measurement chronicles in France and in the USA.

4 Short bibliography

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