Hydrological Modeling in Ungauged Watersheds Using Parameter Regionalization and Hydrograph Transfer: The N'Sele River Basin (DR Congo) (Poster)

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ABSTRACT

Hydrological modeling of ungauged catchments remains a major challenge in applied hydrology, particularly in Central Africa, where the degradation of observation networks limits the use of classical approaches based on direct calibration. In the Democratic Republic of Congo, this issue is especially acute in the N'Sele River catchment, the main tributary of the Congo River at the scale of Kinshasa. This basin faces significant hydraulic development challenges in the context of an almost complete lack of exploitable hydrometric data.

The objective of this research is to develop and evaluate an integrated hydrological modeling methodology adapted to ungauged basins, based on the regionalization of hydrological parameters and hydrograph transfer, using meteorological reanalysis data and the rainfall–runoff model HEC-HMS. This approach aims to produce reliable streamflow estimates despite severe data constraints.

Reanalysis data were selected as an alternative to deficient in situ observations, enabling the reconstruction of continuous and spatially coherent rainfall time series. Hydrological modeling was then performed using HEC-HMS. In the absence of a gauging station on the N'Sele River, parameter regionalization based on physical similarity and area ratio methods was applied, using the Inkisi catchment as a reference basin for parameter transfer.

The results demonstrate that this approach provides a reliable and reproducible methodological solution for hydrological modeling of ungauged catchments in Central Africa, offering strong operational potential for hydraulic planning and water resources management.

Keywords: Ungauged basin, regionalization, hydrograph transfer, hydrological modeling.