New airGR developments: semi-distribution and data assimilation

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airGR (Coron et al., 2017, 2020) is an R package that offers the possibility to use the GR rainfall-runoff models developed in the Hydrology Research Group at INRAE (formerly at Irstea). It allows running seven hydrological models (including GR4J) dedicated to different time steps (hourly to annual) that can be combined to a snow accumulation and melt model (CemaNeige).

Thanks to the success of the airGR package, that was downloaded 45,000 times so far among 50 countries in the world and was used in dozens of publications since its release\(^1\), its development team carries on its efforts to offer new features and improve the computer codes. This is how after offering a first add-on, the airGRteaching package, expressly developed for educational purposes, the team now offers tools dedicated to semi-distribution and data assimilation.

Using (semi-)distributed models is often necessary to explicitly represent spatial climatic and physiographic heterogeneities and to allow an analysis of their impact on the watershed response. Consequently, in the latest version of the airGR package, we introduced the semi-distribution of GR models, which are traditionally lumped, on a sub-basin basis. This development will also ultimately enable possibilities of implementing on a modular way different transfer functions as well as integrated water resource management (see package airGRiwrm in Abstract EGU21-2190).

In addition, a new package, called airGRdatassim, was recently proposed (Piazzi et al., 2021a, b) as an add-on to the airGR package. airGRdatassim enables the user to assimilate discharge observations via both Ensemble Kalman filter (EnKF) and particle filter (PF) schemes. Besides improving the simulations of GR models, this new package extends the potential applications of airGR to forecasting purposes by allowing for a reliable assessment of the initial conditions of streamflow forecasts.

References:


