fuse: An R package for ensemble Hydrological Modelling

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Summary

Fuse (C. Vitolo et al. 2012) is an R package (R Core Team 2016) that implements the framework for hydrological modelling FUSE (Clark et al. 2008) and based on the Fortran code kindly provided by Martyn Clark in 2011. The package consists of two modules: the soil moisture accounting module (fusesma.sim) and the gamma routing module (fuserouting.sim).

The fuse framework takes as input rainfall and potential evapotranspiration time series (areal averages over the river catchment area) and returns a simulated time series of river discharges. It can be used to understand the variability of expected hydrological responses based on model structures.

The package contains default parameter ranges (fusesma.ranges and fuserouting.ranges) and three data objects: fuse_hydrological_timeseries (sample input dataset), parameters (sample parameters) and modlist (list of FUSE model structures).

An early version of this package was used as modelling backend of web applications for the Environmental Virtual Observatory pilot project(C. Vitolo et al. 2015,Wilkinson et al. (2015)).

The fuse package could in future be submitted to CRAN and included in the Task View dedicated to Analysis of Ecological and Environmental Data (Envirometrics). This already includes a number of packages for hydrological modelling such as (Buytaert 2011), (Metcalfe, Beven, and Freer 2016) and (Reusser and Francke 2011). These packages only implement a single model structures,while fuse would complement them providing a framework for ensemble modelling. The package hydromad (Andrews, Croke, and Jakeman 2011) also implements ensemble modelling but it is not currently on CRAN.

A new version of the fuse Fortran code was recently released on GitHub. Fortran users are advised to refer to this latest version of fuse. This package is not an interface for the latest Fortran code but any contribution in this direction is welcome.

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