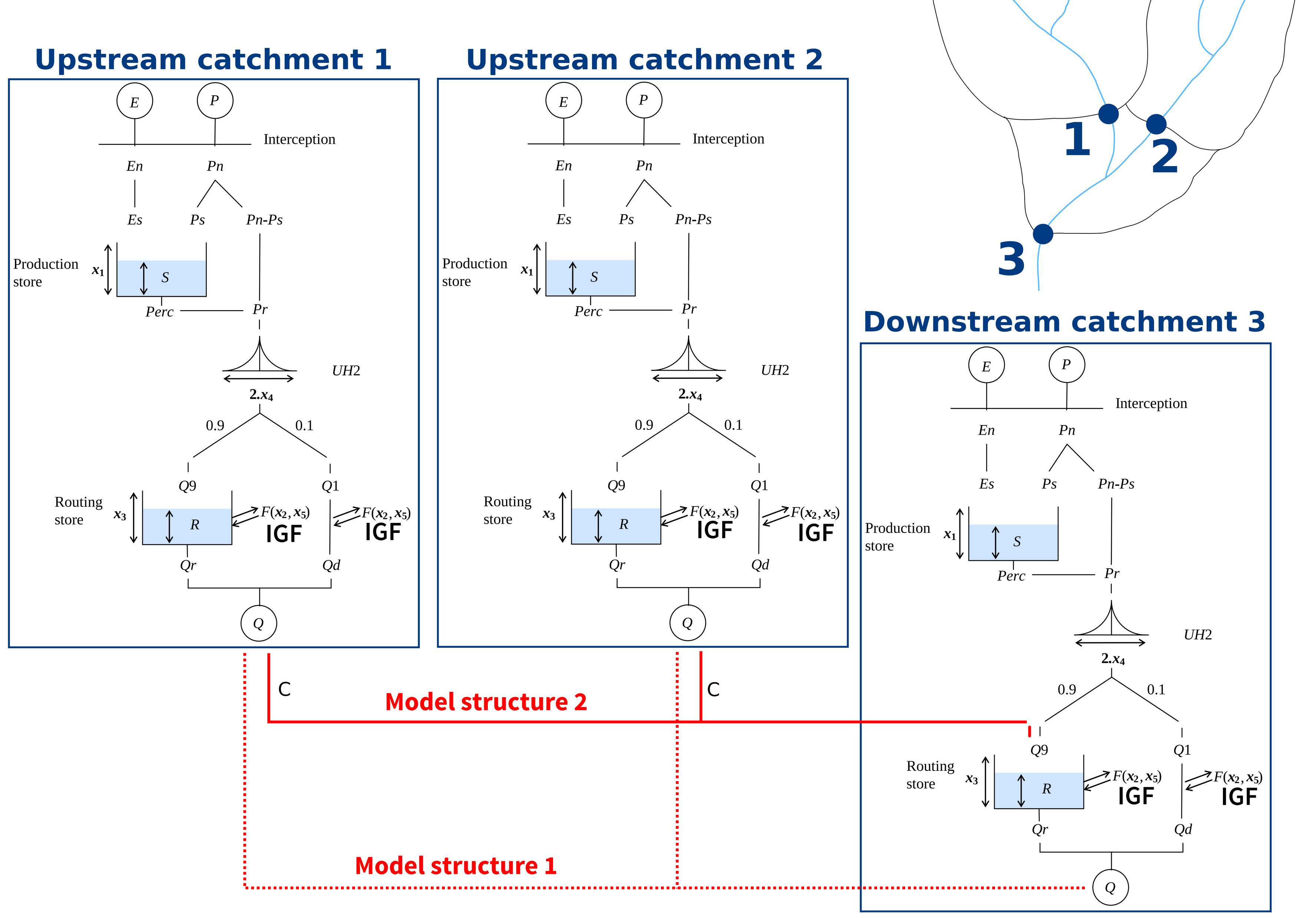
Evaluation of a semi-distributed model through an assessment of the spatial coherence of Intercatchment Groundwater Flows

Alban de Lavenne, Guillaume Thirel, Vazken Andréassian, Charles Perrin, Maria-Helena Ramos

EVALUATION OF A SEMI-DISTRIBUTED MODEL THROUGH AN ASSESSMENT OF THE SPATIAL CONSISTENCY OF INTERCATCHMENT GROUNDWATER FLOWS

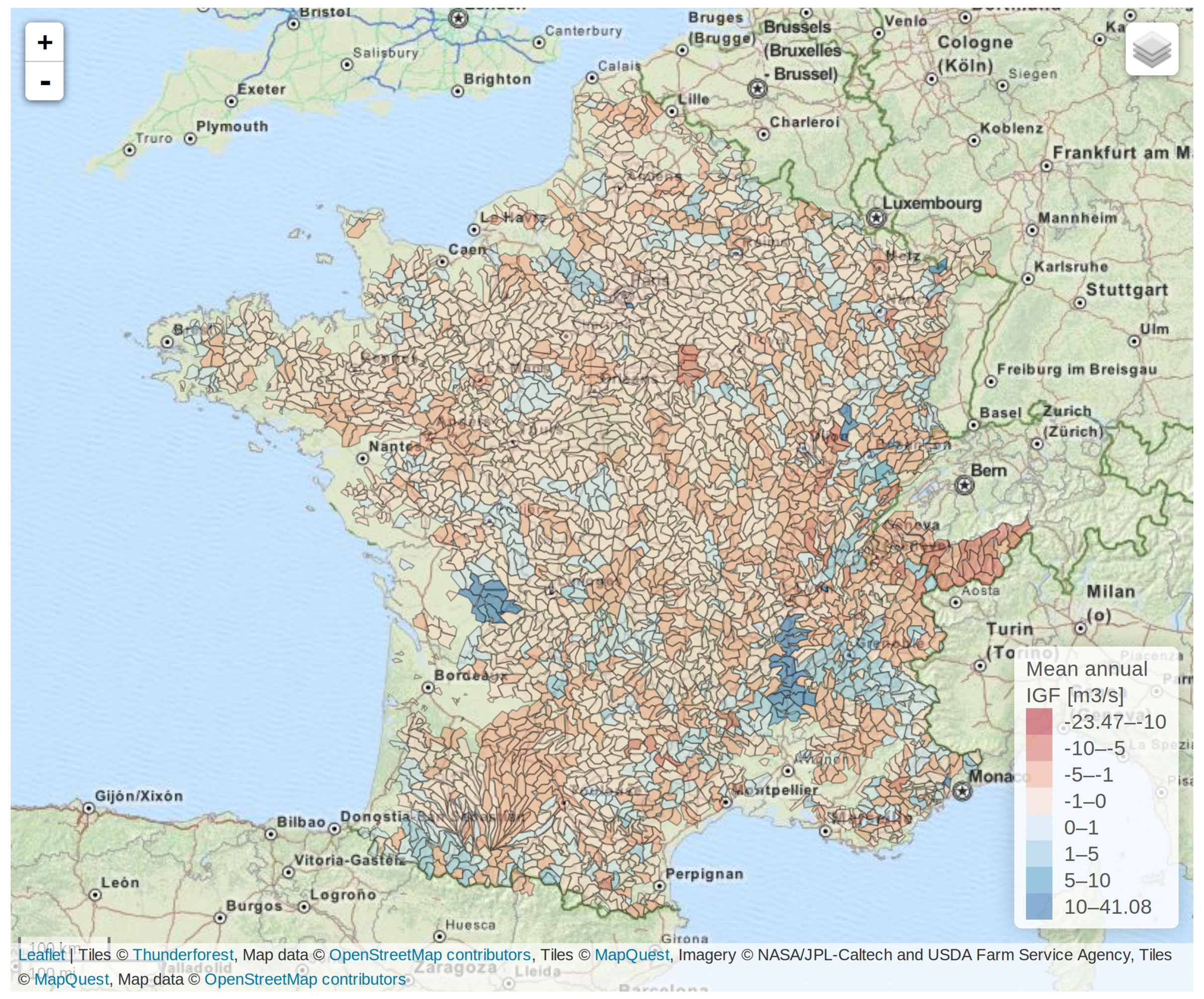
We propose to evaluate two structures of a semi-distributed model using spatial consistency of simulated intercatchment groundwater flows (IGF). The idea is that the water that is lost in one place should be recovered somewhere else within the catchment to guarantee a spatially consistent water balance in time.

GRSD model structure

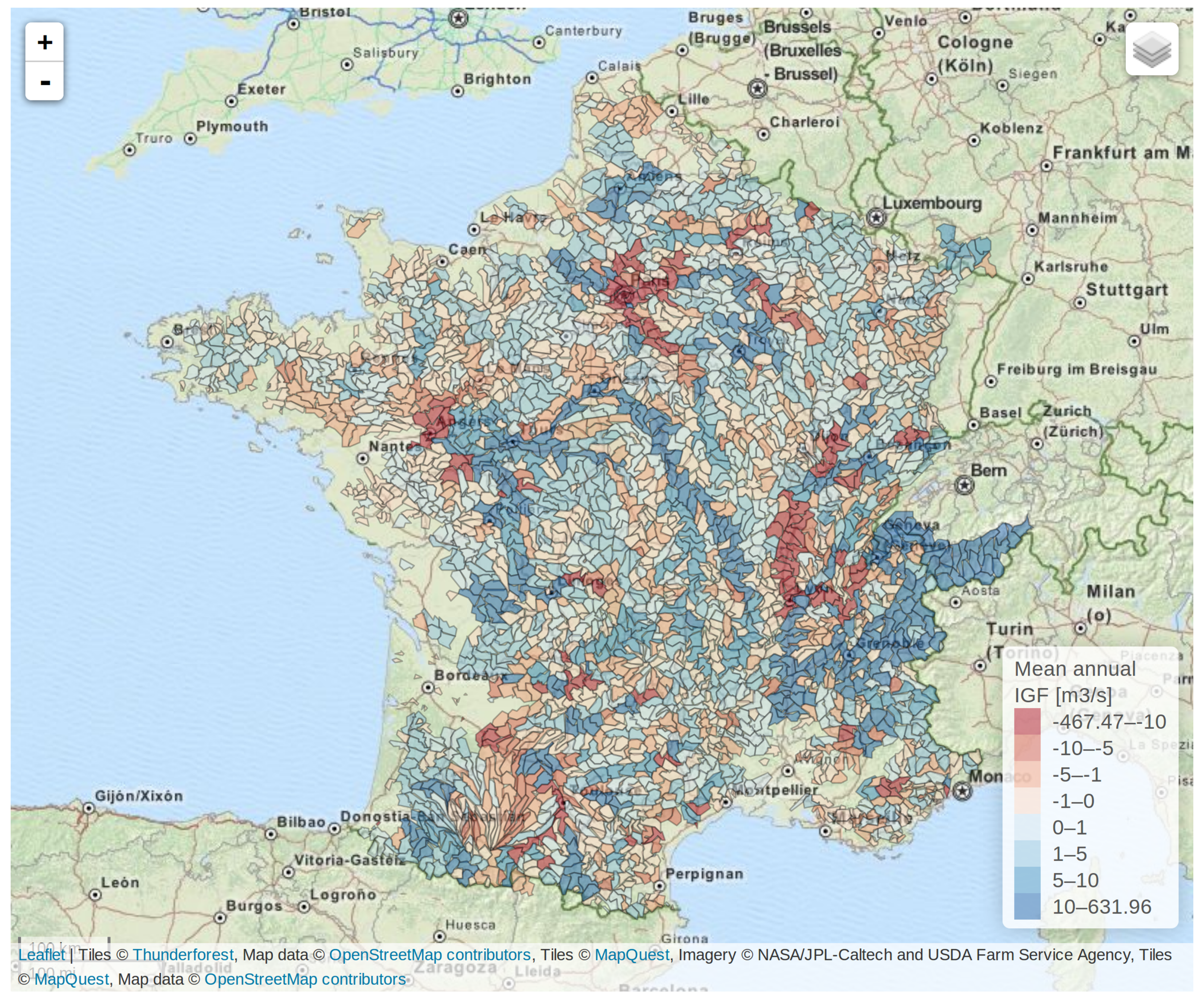


The semi-distributed model GRSD is based on an implementation of a lumped daily GR5J model (5 parameters) on each subcatchment. GR5J is composed of two stores: a production store (capacity *X1*) and a routing store (capacity *X3*), which is filled by the output of a unit hydrograph (of time base *X4*). Two other parameters, *X2* and *X5*, are used to quantify the IGF. Outflow simulations of upstream catchments are routed downstream using a streamflow celerity (parameter *C*).

Model structure 1



Model structure 2



Two model structures are modelling intercatchment groundwater flow in a different way (figure left):

Structure 1: Upstream simulations are directly routed downstream so they are not considered in IGF.

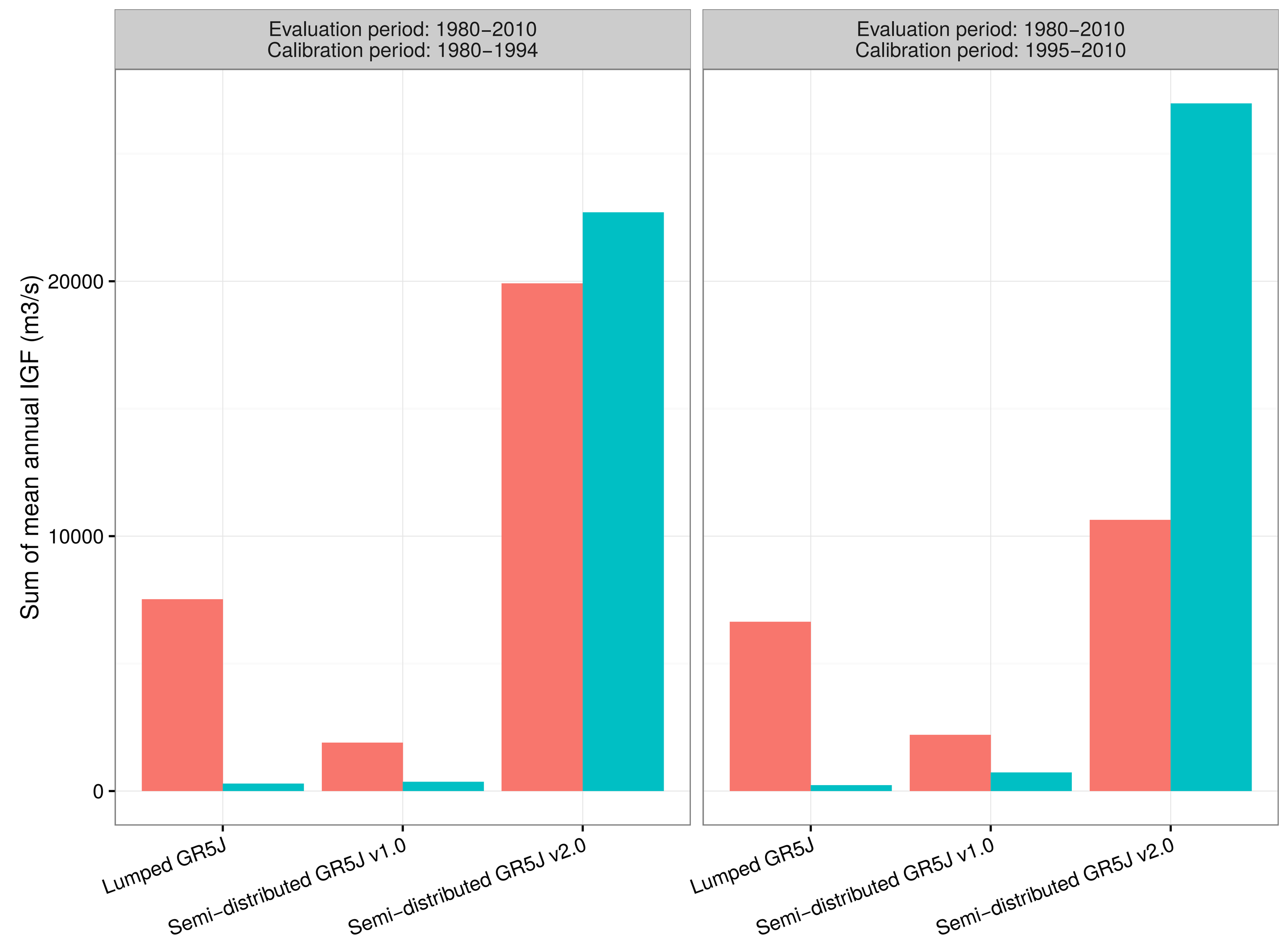
Structure 2: Upstream simulations are filling the downstream routing reservoir, so it can be included in IGF.

IGF spatial consistency

- The two model structures give totally different maps of intercatchment groundwater flows.
- Structure 1: most of the catchments are leaking.
- Structure 2: leakage concerns mostly upstream catchments whereas downstream catchments are gaining water (spatial consistency).

Water balance analysis

- Structure 1: most of the water that is released to the groundwater is never recovered somewhere else.
- Structure 2: enables to nearly close the water balance for one of the two calibration periods.
- New constraints have to be found on the model structure and calibration in order to reinforce this spatial consistency.



*de Lavenne A., Thirel G., Andréassian V., Perrin C., Ramos M.-H.
Irstea, HBAN, Antony, France. *alban.de-lavenne@irstea.fr

EGU General Assembly 2016 – 18-22 April 2016 – Vienna – EGU2016-11745