EGU21-7779, updated on 26 Oct 2021
https://doi.org/10.5194/egusphere-egu21-7779
EGU General Assembly 2021

Improvement of the simulation of high and low flows in the LSM based hydrological modeling chain SASER applied to the Ebro river basin

Omar Cenobio-Cruz[1], Anaïs Barella-Ortiz[1], Pere Quintana-Seguí[1], and Luis Garrote[2]
[1]Observatori de l'Ebre (URL - CSIC), Spain (ocenobio@obsebre.es)
[2]UPM, Madrid, Spain

The SASER (Safran-Surfex-Eaudysee-Rapid) hydrological modeling chain is a physically-based and distributed hydrological model that has been implemented over two domains: Iberia and the Pyrenees. Currently, it is used for drought studies (HUMID project) and water resources analysis (PIRAGUA project).

In this modeling chain, SAFRAN provides the meteorological forcing, SURFEX is the LSM that performs the water and energy balances and Eaudyssée-RAPID simulates daily streamflow. SAFRAN and SURFEX are run at a spatial resolution of 5 km for the Iberian implementation and 2.5 km for the Pyrenean one. Daily streamflow is calculated by the RAPID river routing scheme at a spatial resolution of 1 km in both cases. SAFRAN analyzes daily observed precipitation, which is then interpolated to the hourly scale. For precipitation, relative humidity is currently used to hourly distribute the daily precipitation.

SASER is able to simulate adequate streamflow on the Ebro basin (KGE>0.5 on 62% of near-natural gauging stations when the LSM is run at 2.5 km of spatial resolution). However, due to the lack of a hydrogeological model, low flows are often poorly reproduced by this scheme. Furthermore, peak flows could also be improved.

This work aims at improving high and lows by correcting the distribution of hourly precipitation and adding linear reservoirs to improve low flows.

The increase of the spatial resolution from 5 to 2.5 km has caused a relevant improvement of peak flows. However, most of the peak flows are still underestimated. One way of improving simulated streamflow is improving the hourly distribution of the precipitation, as SAFRAN distributes precipitation through the day with unrealistic low hourly intensities. This will impact runoff generation and, thus, peak flow. We have used two ERA-Interim driven RCM simulations from the CORDEX project to improve the hourly distribution of precipitation. As a result, we now produce more realistic temporal patterns of hourly precipitation.

The current SASER implementation is not able to sustain low flows. A physical-based solution (hydrogeological model) would be desirable, but as it is difficult to implement we chose to

introduce a linear reservoir, following the steps of Artinyan et al (2008) and Getinara et al. (2014). The reservoir is able to improve low flows in most near-natural subbasins. The challenge now is how to set its parameters in non-natural basins.