Jul 12th, 9:30 AM - 9:50 AM

Modelling Flash Floods at Sub-daily Time-step: Comparison of the Performances of the Conceptual SWAT Model and the Process-oriented MARINE Model

Laurie Boithias
ECOLAB, Université de Toulouse, CNRS, INPT, UPS, l.boithias@gmail.com

Anneli Lenica
Institut de Mécanique des Fluides de Toulouse (IMFT) - Université de Toulouse, CNRS-INPT-UPS

Hélène Roux
Institut de Mécanique des Fluides de Toulouse (IMFT) - Université de Toulouse, CNRS-INPT-UPS

Kévin Larnier
Institut de Mécanique des Fluides de Toulouse (IMFT) - Université de Toulouse, CNRS-INPT-UPS

Karim C. Abbaspour
Eawag, Swiss Federal Institute of Aquatic Science and Technology

See next page for additional authors

Presenter/Author Information
Laurie Boithias, Anneli Lenica, Hélène Roux, Kévin Larnier, Karim C. Abbaspour, Sabine Sauvage, and José Miguel Sanchez-Perez

-

Modelling Flash Floods at Sub-daily Time-step: Comparison of the Performances of the Conceptual SWAT Model and the Process-oriented MARINE Model

Laurie BOITHIAS [a], Anneli LENICA [b], Hélène ROUX [b], Kévin LARNIER [b], Karim ABBASPOUR [c], Sabine SAUVAGE [a], José Miguel SANCHEZ-PEREZ [a]
[a] *ECOLAB, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France*
[b] *Institut de Mécanique des Fluides de Toulouse (IMFT) - Université de Toulouse, CNRS-INPT-UPS, Toulouse FRANCE*
[c] *Eawag, Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland*
Email address: l.boithias@gmail.com

Abstract: Due to climate change, the frequency of intense rainfall events and consequent flash floods are expected to increase in the next decades across the Mediterranean coastal basins. To date, few spatially-explicit models are able to simulate flash floods with accurate details. The MARINE model is one of them: it is a process-oriented fully distributed model operating dynamically at the rainfall event time-scale. It includes infiltration and saturation excess processes along with subsurface, overland and channel flows. It does not describe ground-water processes as the model's purpose is to simulate individual flood events during which ground-water processes are considered negligible. The SWAT model is a conceptual time-continuous semi-distributed model that dynamically simulates above- and below-ground processes assuming several simplifications in equations. It has been recently upgraded to sub-daily time-step calculations. However, its sub-daily module has only been tested in small catchments (~1 km²). Considering a ~800 km² Mediterranean river coastal basin (southwestern France) as a case-study, the objective of this study was to assess the ability of the SWAT model to simulate the discharge during flash floods by comparing its performances to the performances of the MARINE model. We first calibrated and validated the two models based on the same input dataset (topography, land-use, soil classes, and hourly rainfall data). We then compared the performances of the two models during 6 major flood events (2009-2013). Nash-Sutcliffe efficiencies vary from -0.79 to 0.54 for the SWAT model and from 0.32 to 0.80 for the MARINE model. Results show that the SWAT model is able to reproduce peak discharges with a satisfactory accuracy with respect to the MARINE model. Next step will be to implement the SWAT model to simulate the hydrology of the Gulf of Lion along with the suspended sediment load input into the Mediterranean Sea.

***Keywords**:* Model comparison; Sub-daily simulation; Surface runoff; River discharge; Mediterranean watershed.