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Assessing the quality of the snow model used in the European Flood Awareness System (EFAS) against MODIS satellite observations over 8 years

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The European Flood Alert System is under development at the European Commission Joint Research Centre since 2003 to foster international information exchange on early flood warning within Europe. The aim of EFAS is to provide catchment-wide flood forecasts indicating the probability of upcoming events between 3-10 days in advance with emphasis on transnational river basins. EFAS is designed to use full sets of Ensemble Prediction Systems (EPS) in the short- and medium term.
EFAS consists of a rainfall-runoff model with a routing component (LISFLOOD) that is set-up on a 5km grid for entire Europe and runs in pre-operational model twice a day. The LISFLOOD model also includes a snow model based on a degree-day scheme. For this, each pixel is divided in 3 zones in order to represent the heterogeneity of the area regarding altitude. Then, snow is melt according to the air temperature, the amount of rainfall, and a calibrated snowmelt rate.
The aim of this study is to compare the snow simulated by the LISFLOOD model (in fact the snow cover fraction) to the observed MODIS Snow Cover Area data. The period of this study is July 2002 – June 2010 and the area covers the entire Europe. For this work, the LISFLOOD model is forced by observations, not by forecasts, which means that the initial states of EFAS are in fact analyzed.
A first comparison has been performed, between the version of the LISFLOOD model previously used in EFAS (until November 2011), and the current version. For the new version, better meteorological input (precipitation and temperature) were used, and the snow model has been improved (artifact to mimic glaciers, better distribution of the three altitudinal zones – Gaussian instead of linear-, and seasonal variation of the snowmelt rate). This comparison showed the important overall improvement of agreement for the new LISFLOOD version between the model and the observed MODIS data.
The second step was to measure the impact of some of the important parameters related to snow that LISFLOOD uses in its current version: the temperature at which the snow melts (by default 1°C), the temperature that discriminates precipitation between rainfall and snowfall (1°C), and the amplitude of the seasonal variation of the snowmelt rate (1°C). We will try to isolate conditions on which the default values of these parameters are valid, and on which they could be improved (sun exposure for instance).