Hydrol. Earth Syst. Sci. Discuss., 8, C446–C448, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C446/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Assimilation of MODIS snow cover area data in a distributed hydrological model" *by* G. Thirel et al.

Anonymous Referee #1

Received and published: 15 March 2011

General comments

The study illustrates an application of two data assimilation techniques for updating snow state of a distributed hydrologic model (LISFLOOD). The main objective was to evaluate the efficiency of particle filter and Ensemble Kalman filter assimilation methods for snowmelt runoff simulations. The methodology is tested for the Morava catchment. The results indicate that the particle filter method improved the discharge simulations.

The MODIS data assimilation is very interesting and relevant topic, within the scope of HESS. So the study is interesting, however before being considered for publication, it is necessary to clarify and revise/improve several points:

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

1) Please compare in more detail how SCA was implemented/assimilated into hydrologic models in previous studies (Introduction section) and STATE MORE CLEARLY what is novel here (with respect to previous studies).

2) The methodology is not always clear and/or well justified:

a) Please consider to extend the pure mathematical formulation of data assimilation with clear hydrological reasoning and adding more description what/where and why is updated within the model. The conversion between SCA and SWE is interesting, but not justified. I would expect that this relationship (function) depends on different settings (e.g. climate region, initial SWE state, season), thus I'm wondering to what extent one functional relationship (as proposed here) is able to describe the spatio-temporal variability between SWE and SCA. It will be very interesting and important to show how it fits with real observations from the study region (or region with similar physiographic characteristics).

b) Probably I missed something, but I do not understand the reasoning applied for creating ensemble members. It is very difficult (if even possible) to interpret the MODIS assimilation efficiency, if so many factors are combined together. Please also clarify what is expected by using such large intervals for precipitation and air temperature changes (what is the accuracy of model inputs-precipitation and air temperature- when such large changes are applied)?Is it MODIS that improved the streamflow simulations?

c) The next question is the frequency of updating. In my opinion, seven days are simply too coarse for expecting some real improvement in streamflow simulations. I understand that cloud coverage is an issue, but it is probably not necessary to remove all the clouds before SCA estimation. How will the assimilation efficiency change with the frequency of data assimilation?

3)It is important to add more hydrological interpretations of the results.

HESSD

8, C446–C448, 2011

Specific comments

1) p.3: SCA can be derived also from microwave products (where cloud coverage is not a problem), not only form optical sensors.

2) pixel resolution of MODIS: why it is 420m? The standard product is either 500m or 0.05deg. Please clarify.

3) the sequence (order) used for cloud removal is not justified.

4) conversion SWE-SCA. What is meant by "observed SCA values higher than 0.8 were not used . . ."? Does it mean that for cases when MODIS indicates e.g. full snow coverage and model no snow, no assimilation was applied?

5) The period used for analyses is rather unusual (starts on January, 10 and ends on December, 10). Why?

6) I would suggest to merge the sections 4.3 and 4.4 into the section 2, in order to clarify the background for data assimilation.

7) Please specify in more details (e.g. by equation) the efficiency criteria of ratio-RMSE and ratio-bias.

8) Please correct the reference to Zaitchik (year of publication is 2009).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1329, 2011.