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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Estimating degree day factors from MODIS for snowmelt runoff modeling" *by* Z. H. He et al.

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General comments The manuscript presents a method of estimating spatially variable degree day factors (DDFs) based on snow-covered area given by MODIS, ground-based measured and interpolated snow depth, precipitation and air temperature data. Although the method is inevitably connected with uncertainties, the idea is worth to be published. The approach is described clearly enough to be used by other scientists. DDFs estimated by the method are used in a hydrological model. Detailed description and discussion of the results obtained by modeling based on two different ways of DDFs estimation is presented. The discussion is sometimes too detailed to my taste. However, some readers may find it useful, therefore I do not propose any changes

regarding the this. The results do not prove significant improvement when using the spatially distributed DDFs obtained by the proposed method. Despite that I believe that hydrological modeling at certain scales should be better based on DDFs obtained by the proposed method than only calibrating the DDF as one of model parameters. The reason is that under favorable conditions, the spatially distributed DDFs obtained by the proposed method may be closer to the reality, i.e. to water volumes released from snow during snowmelt. They are physically better justified compared to DDFS obtained just as calibrated model parameters. Under "certain scales" mentioned above I mean catchments that are large enough considering the MODIS resolution and small enough to make the interpolation of other input data reasonable.

Specific comments: I have the following comments which address rather modeling and other issues than the method of distributed DDFs estimation itself:

1. Section 2.3. and elsewhere – I propose to avoid using the term "validation of estimated DDFs". The word "validation" is confusing. Because the true DDFs values are not known, they can not be validated. Comparison of runoff and snow pattern simulations with DDFs obtained by two different ways is not validation of the DDFs. In other words, similar values of simulated runoff and snow patterns do not guarantee that DDFs, i.e. volumes of water released per degree-day are the same as the ones observed in the nature. Fig. 9 presents a nice example that runoff simulation may be acceptable even if the snow-covered area during the snowmelt (which depends also on spatial differences in melting, i.e. the DDFs) is different from the reality. 2. Use of precipitation and air temperature data from the whole Austria to interpolate values for a relatively small basin in its southern/south-western part is in my opinion not needed. Data from smaller territory around the studied catchment would presumably provide better description of local climatic conditions in further studies. 3. I recommend using "baseflow" instead of "groundwater baseflow". Although no unique definition of baseflow is accepted in hydrology (many different definitions exist), baseflow generally characterizes sustained streamflow during dry periods. Expression "groundwater

baseflow" is confusing, because it might imply that groundwater flow is known (which is rarely the case) and that only part of that groundwater flow is defined as groundwater baseflow . 4. Stepwise calibration might be an alternative calibration approach that some readers may find interesting. However, a more detailed inspection of Figs. 5 and 6 shows that the hydrological model quite often does not simulate the streamfow at the beginning of the snowmelt season very well (2001, 2004, 2006, 2008, 2009, 2010). The model needs some time to simulate increased streamflow or an event. It is not an uncommon behavior, but further development of the model may consider this issue.

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