Hydrology and Earth System Sciences Discussions

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Comment

Interactive comment on "Assessing snow water equivalent of an Alpine catchment using snow dynamic model calibrated with satellite images" *by* C. Corbari et al.

Anonymous Referee #2

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In the paper a simple snow pack model is coupled with a distributed hydrological model to simulate hydrographs at two small rivers in Alps. The snow model is calibrated by comparing the simulated snow extent with snow extent derived from satellite data. A supervised image classification is used to derive the snow cover distribution from satellite data. Application of the calibrated snow model in the hydrological model allows for accurately reproducing the observed hydrographs.

Generally the idea of the paper appears quite reasonable. The presentation of the material is overall satisfactory. However there are several issues that need attention.

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Some of them are quite serious and have to be fixed (see below):

Introduction A clear formulation of the objective of the work is need in the introduction. This is important.

Section 2.3 Please give mode details with respect to the format of satellite images you use. Are they reprojected to a certain grid ? Later it is said that DEM data were resampled to match the spatial resolution of AVHRR data of 1100 m. The problem is that the spatial resolution of AVHRR is 1.1 km only in nadir. The size of the instrument field of view increases with the increase of the satellite zenith angle up to 3 km at the very edge of the scan.

How image navigation was performed ? What is the accuracy of image navigation ? Were ground control points used to adjust the image navigation ?

These issues may not be critical for the rest of the study, but still have to be properly addressed to make the approach clear.

Section 3 Geometrical considerations used to predict shadowed pixels in the satellite imagery account only for the solar zenith angle and azimuth. This is not correct. They also should account for the satellite viewing geometry including satellite zenith angle and satellite azimuth. This error should be fixed.

The other issue here is the parallax effect. Was anything done to account for the pixel displacement caused by parallax ?

Page 5 -row- should be changed to -raw-

Section 4.2 Since the criterion to estimate the efficiency of snow detection and mapping (Nash and Sutcliffe) is not quite widely used, at least a very brief comment is needed on what formula (10) represents.

Section 5.2 Page 8, line 3: replace -real height- for -snow depth-

Section 5.3 Please explain how station data were interpolated (?) across the watershed

area to run the distributed hydrological model. This is especially important for the precipitation data.

Conclusion: The study is mostly focused at the selection of best values for Tup and Tlow in the snow model. Tup and Tlow are temperature values defining the fraction of solid and liquid phase in precipitation. As it follows from the paper the major conclusion is that the best result is most frequently achieved when in the model the phase of precipitation is changed at 0C. Surprisingly this result is not mentioned in the Conclusion section.

Considering the major focus of the paper I would suggest changing the title of the paper. My feeling is that the paper is primarily focused on tuning the model rather than on the assessment of the snow water equivalent.

Overall: The paper needs more work.. I would not recommend it for publication in its current form..

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 3129, 2008.

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