Hydrology and Earth System Sciences Discussions

Interactive
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.

C. Corbari et al.

Received and published: 30 January 2009

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

Response: we state that “the work proposes the use of NOAA AVHRR (Advanced Very High Resolution Radiometer) satellite images (NOAA, 2000) to calibrate a distributed model …”. and “Snow coverage retrieved from satellite images needs to be corrected to fill in falsely uncovered pixels due to the presence of shaded area”. These sentences, together with the new title, should, on our opinion, well clarify the objective.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Comment: 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.

Response: the sentence was reformulated adding some more details on how we elaborated satellite images: “These images are characterized by a nominal spatial resolution of 1.1 km at nadir while the resolution decreases to 3 km at the very edge of the scan. For the selected images, the study area is centred in the satellite scan to overcome this problem. Selected images are georeferenced using common software for remote sensing analysis.”

Comment: 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.

Response: AVHRR is a whiskbroom sensor and the area is scanned cell by cell in the perpendicular direction.

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

Response: As we state in the paper, we left to the software the task to georeferencing and correcting the images.

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

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Response: the word was corrected

Comment: 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.

Response: Nash and Sutcliffe is widely used in hydrology as a measure of model efficiency, generally, in terms of hydrograph simulation. We agree that its application to snow coverage is a bit unusual, so we substituted the index with a pixel to pixel analysis based on contingency table. The Nash and Sutcliffe efficiency is reported when describing the results of hydrograph simulation with the distributed model.

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

Response: the sentence was corrected

Comment: 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.

Response: a new section was added with the description of the hydrological distributed model that includes how station data were interpolated.

Comment: 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.

Response: Conclusion has been completely rewritten to better explain results of the work.

Comment: 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.

Response: the title was changed to: Topographic correction of snow coverage retrieved from satellite images to improve model calibration. This should better highlight the objective of the work.

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

Response: We hope that, thank to helpful suggestions of the referee, the paper could be published.

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

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper