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The Cryosphere Discussions

Interactive comment on "Retrieval of snow grain size and albedo of Western Himalayan snow cover using satellite data" *by* H. S. Negi and A. Kokhanovsky

H.S. NEGI

negi_hs@yahoo.com

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1. For future consideration/research: There will probably be a daily MODIS BRDF product, similar to MOD43 or MCD43, in the planed Collection 6 processing that could possibly be used for monitoring snow albedo.

Reply: Thanks for your suggestion, this we make a note for our near future study.

2. Two DEMs were used in the study, did they have similar resolution and accuracy? Could DEM accuracy have affect on results?

Reply: The DEM generated using contours and spot heights had 30m resolution for the

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part of lower and middle Himalayan study areas but, where the contours map was not available to us, free downloaded SRTM DEM at 90m resolution was used after resampling at 30m. An exercise was carried out to check the affect of different resolutions DEMs on the retrievals and found that there is not much variations in the statistics such as mean, minimum, maximum, standard deviation etc. of the retrieved images, but pixel to pixel deviation were observed in different images, where retrievals from coarse resolution DEM were found overcorrected than retrievals from good resolution DEM. We recommend that DEM at the same image resolution will be more accurate for retrievals. We also carried out the same study using ASTER 30m DEM and these results were found close to our 30m DEM generated from contours. Now in the revised paper ASTER 30m DEM has been used in place of SRTM 90m DEM for the part of upper Himalaya.

3. Pg 614, Why select the atmospheric model based only on surface temperate? The state of the atmosphere effects the model outputs. I'd like a reason/discussion of why only temperature was used instead of including aerosol climatology or... in selecting the model presented in the paper.

Reply: The FLAASH based on the MODTRAN model was used for atmospheric correction where one has the provision for selecting standard atmospheric model based on known water vapor information or alternatively this can be selected based on surface temperatures. Simultaneously the column water vapor amount for each pixel in the image can be determine by the radiative transfer equations, where we have used the water vapour absorption feature at 1135nm wavelength. Now we have carried out the detail exercise by selecting different standard atmospheric models and observed that in our case (hyperspectral data) the results depend purely on the water retrieval method from the image. Now accordingly we have made this correction in the revised paper and removed the standard atmospheric models in table-1.

The FLAASH model includes a method for retrieving an estimated aerosol/haze amount from selected dark land pixels in the scene. The method is based on ob-

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servations 2-Band (K-T) by Kaufman et al. (1997) of a nearly fixed ratio between the reflectances for such pixels at 660 nm and 2100 nm. A dark-land pixel is defined to be one with a 2100 nm reflectance of 0.1 or less and a 660:2100 reflectance ratio of approximately 0.45. If the input image contains bands near 800 nm and 420 nm, an additional check is performed, requiring the 800:420 radiance ratio to be 1 or less, which eliminates pixels likely to be shadows and water bodies. If no suitable dark pixels are found, then the value in the initial visibility field is used. This require an Initial visibility value even we set the aerosol retrieval parameter to 2-Band (K-T).

4. Grammatically throughout the paper, check that the correct tense is used, since the work is done, past tense should be used when describing what was done.

Reply: Corrections has been made in the revised paper.

5. Pg 607 line 16, can delete “initially” pg 607 line 21, sentence that begins “They...”: Who is they? Use the author(s) name and state what DISORT was used for. Could restructure sentence to “... absorption feature using the DIS....” pg 611 line 9, replace observe with are pg 611 line 12, replace a part with of a part of pg 611 line 19, replace and with and is pg 613 line 10, length is the word to use instead of height pg 624 line 17, 1024 should be 1240

Reply: All the above suggested changes have been incorporated in the revised paper.

6. Fig. 4 and 11, need better text quality for axis and legend.

Reply: Mentioned figures text quality for axis and legend have modified in revised paper.

References:

Kaufmann, Y. J., A. E. Wald, L. A. Remer, B.-C. Gao, R.-R. Li, and L. Flynn: The MODIS 2.1-mm Channel-Correlation with Visible Reflectance for Use in Remote Sensing of Aerosol. IEEE Transactions on Geoscience and Remote Sensing. Vol. 35, pp. 1286-1298, 1997.

Interactive comment on The Cryosphere Discuss., 5, 605, 2011.