Geophysical Research Abstracts
Vol. 20, EGU2018-12128-1, 2018
EGU General Assembly 2018

Estimate of Moderate Resolution Optical Fractional Snow Cover

Igor Appel (1) and Alexander Kokhanovsky (2)
(1) TAG LLC, United States (iappel@earthlink.net), (2) VITROCISET DARMSTADT

Optical remote sensing is used to provide the valuable snow information, first of all, snow extent and snow fraction as well as snow properties. Snow cover significantly modifies the exchange of energy between the atmosphere and land surface. Information on snow fraction improves downstream products retrieved from remote sensing: vertical atmosphere profiles, soil moisture albedo, land surface temperature, soil moisture, heat fluxes, vegetation parameters, etc. The uncertainty of the fractional snow cover estimates must be determined, quantified, and reported to consider the suitability of the product for modeling, data assimilation as well as to improve the retrieval of numerous satellite products.
The community needs reliable remote sensing measurements and climate information on snow fraction, that are well quantified and quality controlled to be effectively used to study changes, trends, and variability in Earth's environment.
Data from Landsat satellites are extensively used to enhance and validate snow fraction retrieval. Those high-resolution data are considered as reference information or ground truth. Our estimation of ground truth at a high resolution scale is based on the hypothesis that Landsat pixels could be reliably analyzed to distinguish snow covered Landsat pixels from snow free pixels.
The Landsat reference data are applied to analyze the performance of the fractional snow cover algorithms at moderate resolution and to compare the alternative techniques used to estimate the uncertainty of snow fraction retrievals characterized by different statistical parameters.
There is no agreed-upon methodology to use high-resolution satellite observations to validate the quality of moderate resolution algorithms retrieving snow fraction. But the algorithm performance technique should be based on processing matched in time moderate resolution and high-resolution observations collected on the same day preferably with time separation of less than an hour.
Our existing experience includes validation of MODIS and VIIRS fractional snow information provided by algorithms based on the Normalized Difference Snow Index (NDSI) for a wide variety of the transitional zones from regions completely covered by snow to snow free areas in quite different environmental conditions, considered as representative data for reliable estimate of moderate resolution fractional snow products.
The following is a brief summary of quantitative assessment of the NDSI-based scene-specific fractional snow cover algorithm performance estimated using comparison with high-resolution satellite observations:
•average regression coefficient is 93% despite some low magnitudes;
•average intercept of linear regression line is less than 1% (negative);
•average slope of linear regression line is 0.98;
•average bias of data is less than 1% ;
•average standard deviation is 10%.
The validation of the fractional snow algorithm also includes the analysis of its stratified performance for the range 0.1 - 0.9 of ground truth fraction estimated for 10% intervals of ground truth.
The inter-comparison of the results provided by different approaches to fractional snow retrieval needs to be considered as a compulsory stage in the development of algorithms and can be recommended to the Sentinel-3 mission.