

Early Analysis of the EOS MODIS Snow Cover Data Products

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EXTENDED ABSTRACT

The NASA Terra spacecraft was successfully launched on 18 December 1999 from Vandenberg AFB, California. The Moderate Resolution Imaging Spectroradiometer (MODIS) on board Terra was switched on to Science Mode on 23 January 2000. The first Earth view data acquisition was made on 24 February. Analysis of the MODIS snow data products began that day. The MODIS snow products are produced in the MODAPS (MODIS Adaptive Processing System) at GSFC as a sequence of products from a level 2 swath of data (five minutes of MODIS data) to a level 3 global gridded projection. MODIS snow products are then transferred to the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, where they are archived and will be available for distribution.

Analysis is ongoing to determine the accuracy of the MODIS level 2 snow product (MOD10_L2) for mapping global and regional snow cover. The snow algorithm detected the snow cover deposited by a spring snowstorm that swept across the Midwest from Huron, South Dakota, to Michigan on 7 April. Images of the MOD10_L2 product are exhibited to show the extent of snow cover and to show cloud/snow discrimination and instrument issues that are being investigated. Current MODIS instrument operating parameters, set to minimize cross-talk in the shortwave infrared bands, result in two detectors in band 6 being nonfunctional. Data from band 6 is used in the snow algorithm. Outputs from the two nonfunctional detectors cause the algorithm to erroneously detect snow. This erroneous snow detection is seen as stripes of snow across every MOD10_L2 product. The snow striping problem will be removed from the MOD10_L2 product by replacing the nonfunctional detector lines with data from an adjacent good detector. A flag will be set in the spatial quality assurance data array for every pixel that contains replacement data. Investigation of the operating parameters and cross-talk problem continues. Some early cloud and snow discrimination problems have been corrected, those related to processing bugs. Confusion of cloud and snow problems now appears limited to perimeters of snow-covered regions and to types of thick ice clouds. Collaboration with the MODIS cloud masking group is underway to understand the sources of confusion and to resolve them.

Level 3 snow products are exhibited to show how the MOD10_L2 products appear as higher level composited and mapped snow products. (Images of the snow products are posted on the

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MODIS snow project Web page, at the URL below. The daily snow cover product MOD10A1 algorithm maximizes snow cover and minimizes cloud cover as it is generated from multiple orbits, depending on latitude, of MODIS data. A MOD10A1 product is exhibited to demonstrate how multiple observations from a day are composited to generate a daily mapped snow product. The daily snow climate modeling grid product, MOD10C1, for 23 April 2000, generated from 330 MOD10A1 files, is exhibited to show global snow cover. Also revealed in that product are regions of erroneous snow cover. Global mapping provides clues to regions in which there may be persistent error occurring for some physiographic or climatological feature. A mosaic of 33 eight-day snow products, MOD10A2, generated by compositing eight days of MOD10A1 products is exhibited. The image depicts the maximum snow cover and minimum cloud cover for the period 5–12 March 2000 over North America.

Vicarious validation investigations and independent validation studies are underway to provide quantitative accuracy of the products. Searching for problems in the algorithms and data products is a continuing activity. Minor fixes to the algorithms will be made in the near future. Public release of the MODIS snow data products, with caveats regarding the quality of the data products, is expected during the summer of 2000.

URLs for sources of information

- MODIS snow project snowmelt.gsfc.nasa.gov/MODIS_Snow/modis.html
- NSIDC..... nsidc.org/NASA/MODIS/
- TERRA terra.nasa.gov

Key Words: MODIS, Remote sensing, Snow cover