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AUTOMATIC CLOUD COVER ASSESSMENT USING THEMATIC MAPPER DATA

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ABSTRACT

The TM Image Processing System (TIPS) at NASA Goddard Space Center uses a sequential band classifier to assess cloud cover of the TM Image Data automatically. The basic approach is to use a visual band (Band 3) to separate clouds, snow and bright features (sand) from the rest of the earth; the thermal band (Band 6) to distinguish clouds and snow from bright areas; and finally the near infrared band (Band 5) to differentiate clouds from snow. During the TM Archival Generation, a 128 pixel x 128 pixel subsampled image is extracted in Bands 3, 5 and 6 for each WRS scene. Then the automated classification is performed for each quadrant of the scene and the cloud cover scores are reported to the EROS Data Center by the Mission Management Facility.

In order to ensure the accuracy of the classification for varying environmental conditions, calibration has been conducted offline to obtain the thresholds for Bands 3, 5 and 6 respectively. These three bands of data were checked against the assigned thresholds to determine the cloud pixels and were shown together with the cloud data on a Comtal display. The cloud data were compared to the expected values based on visual inspection of the Comtal display and film products and measurements for selected scenes.

During the calibration period, we noticed the radiance values of cloud pixels from Band 6 showed a substantial variation making the use of a fixed threshold insufficient. An experiment was performed to identify the parameters that influence the Band 6 data. The results showed a dependence on not only the sun elevation angle but also the snow cover percentage. Therefore, the threshold for Band 6 data was adjusted according to these two parameters. A simple relationship between the threshold of Band 6 and

sun elevation angle has been established for snow free scenes. In addition, the snow cover percentage is used to lower the threshold of Band 6 for a subsequent iteration, if the algorithm detects snow cover. Based on the thresholds obtained from this calibration, tests have been run to evaluate the accuracy of the thresholds obtained from this calibration. Fifty scenes of TM image data were tested and ninety percent of them were classified correctly based on visual inspection of the Comtal display and film products.

The automatic cloud cover assessment is rapid, accurate, and free of the human error and inconsistencies involved in manual cloud cover assessment. A by-product of the ACCA is the assessment of snow cover along with cloud cover.