Global Earth Mapping with NASA's Multi-angle Imaging SpectroRadiometer (MISR)

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Usually, remote sensing image data has been only radiometrically and spectrally corrected, as a part of standard processing, prior to being distributed to investigators. In the case of the spaceborne MISR instrument with its unique configuration of nine fixed pushbroom cameras, continuous and autonomous coregistration and geolocation of image data are required prior to application of scientific retrieval algorithm. To address this problem, the MISR ground data processing system includes photogrammetric processing. From the entire MISR production, system three segments can be singled out as photogrammetric in nature. These are 1) inflight geometric calibration, 2) georectification, and 3) cloud height retrieval.

Inflight geometric calibration is designed in response to specific requirements for standard processing: 1) balance between limited hardware resources, huge data volume, and processing time, and 2) autonomous and ongoing production throughout the mission. The data obtained through inflight geometric calibration significantly simplify georectification part of the standard processing. In particular, the most challenging part of the georectification is the image-to-image registration between new MISR imagery and reference imagery. The georectification gives fundamental input to scientific retrieval including cloud-top height retrieval. In order to fully use the MISR image data to perform stereo retrieval of cloud-top heights, we were able to separate the effects of cloud motion and cloud height in the image disparities.

The Multi-angle Imaging SpectroRadiometer (MISR) is a part of the payload for NASA's Terra spacecraft, a part of NASA's Earth Observing System (EOS) launched in December 1999. The MISR instrument continuously acquires a systematic, global, multi-angle imagery in reflected sunlight in order to improve studies of the ecology and climate of the earth. This paper provides overview of the photogrammetric aspect of the production and discusses quality of the product as obtained during first two years of the mission.