AirMISR KONVEX Quality Summary

AirMISR Radiometric Data Quality

We believe the July-13-1999 AirMISR flight in support of the KONVEX campaign to be a success. The camera successfully slewed to all nine angle positions. The radiometric accuracy and signal-to-noise (SNR) during this specific mission is, to our knowledge, as good as we have reported in the literature. Individual product files contain metadata identifying dropped/corrupt lines, saturated pixels and related image quality parameters.

The radiometric calibration of AirMISR has been done using the same procedures as used to calibrate the MISR cameras; the reported radiometric calibration uncertainties are therefore the same as reported for MISR. (The exception is the camera-to-camera uncertainty, which is believed to be smaller for AirMISR, as the aircraft instrument consists of one gimballed camera.) Thus, we believe the radiometric uncertainties are small, and the camera SNR is high.

The values quoted for the systematic component of the radiometric uncertainty, in fractional units, are:

abs_sys_error 0.016
cam_sys_error 0.000
band_sys_error 0.007
pixel_sys_error 0.003

That is, the systematic component of the absolute, camera-to-camera, band-to-band, and pixel-to-pixel are given above. These systematic components are combined with SNR, to determine the total error uncertainties. As SNR is signal dependent, the uncertainties are likewise signal dependent. SNR, at two radiance input levels, are as follows:

SNR (equivalent-reflectance=1.0) ~ 1000
SNR (equivalent-reflectance=0.05) ~ 200

Using these, the total radiometric uncertainties can be determined:

abs_total_error=sqrt (abs_sys_error^2+(1/SNR)^2)
cam_total_error=sqrt(2)/SNR
band_total_error=sqrt(2)*sqrt(band_sys_error^2+(1/SNR)^2)
pixel_total_error=sqrt(2)*sqrt(pixel_sys_error^2+(1/SNR)^2)

References

References on the radiometric calibration of AirMISR and MISR include the following. Additional references are available from the MISR web site.

Bruegge, Carol J., Wedad A. Abdou, Nadine L. Chrien, Barbara J. Gaitley (1998). AirMISR spectral and radiometric performance studies. In Earth Observing System III, Proc. SPIE 3439, San Diego, CA, 19-21 July.

Bruegge, C.J., N.L. Chrien, R.A. Kahn, J.V. Martonchik, David Diner (1998). MISR radiometric uncertainty analyses and their utilization within geophysical retrievals. Conference issue: New Developments and Applications in Optical Radiometry (NEWRAD '97), Metrologia., 35, 571-579.

Bruegge, C.J., V.G. Duval, N.L. Chrien, R.P. Korechoff, B.J. Gaitley, and E.B. Hockberg (1998). MISR prelaunch instrument calibration and characterization results. IEEE Trans. Geosci. Rem. Sens., Vol. 36, pp. 1186-1198.

Chrien, Nadine L., Carol J. Bruegge, Barbara J. Gaitley (2000). AirMISR laboratory calibration and in-flight performance results. Submitted to Remote Sens. Environment., December 1998.

AirMISR Geometric Data Quality

The geometric calibration has been performed prior to orthorectification to the UTM map projection grid. A set of ground control points collected from USGS 1:24000 topographic maps were used to remove static errors in the camera pointing and airplane position. Using calibration results, geolocation errors of about 1000 m for nadir view to up to 6000 m for most oblique views are reduced down to 30 m for nadir and to up to 300 m for the most oblique view angles. The remaining errors can be regarded as a result of the dynamic errors in airplane attitude and position which are not modeled in the current calibration algorithm.

Feedback:

For questions or comments on the AirMISR products, contact the NASA Langley Atmospheric Science Data Center User Services Office.

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