AirMISR SAFARI Quality Summary

AirMISR Radiometric Data Quality

The science flights made by AirMISR in support of the SAFARI campaign on September 6, 7, 13 and 14, 2000 were successful. The camera successfully slewed to all nine angle positions. The radiometric accuracy and signal-to-noise (SNR) during this mission was as good as the Science Team has 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 accomplished using the same procedures as those 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, it is believed that the radiometric uncertainties are small, and the camera SNR is high.

The values quoted for the systematic component of the radiometric uncertainty, based on vicarious calibration of the instrument, in fractional units, are:

abs_sys_error = 0.030
cam_sys_error = 0.000
band_sys_error = 0.010
pixel_sys_error = 0.005

That is, the systematic component of the absolute, camera-to-camera, band-to-band, and pixel-to-pixel are given above. The pixel-to-pixel uncertainty is large enough to cause some visible striping in the imagery where the scene contrast is low and the image display is stretched to highlight small radiometric differences.

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:

$abs\_total\_error=sqrt(abs\_sys\_error^2+(1/SNR)^2)$
$cam\_total\_error=sqrt(2)/SNR$
$band\_total\_error=sqrt(2)*sqrt(band\_sys\_error^2+(1/SNR)^2)$
$pixel\_total\_error=sqrt(2)*sqrt(pixel\_sys\_error^2+(1/SNR)^2)$

AirMISR Geometric Data Quality

Sept. 6, 2000 - Mongu Tower

The geometric calibration has been performed prior to orthorectification to the Universal Transverse Mercator (UTM) map projection grid. The orthorectified Landsat Thematic Mapper (TM) scenes (175-070, 175-071) obtained through Earth Science Enterprises (ESE) Scientific Data Purchase are used to collect a set of ground control points in order to remove static errors in the camera pointing and airplane position. Using calibration results, geolocation errors of about 1000 meters (m) for nadir view to up to 5000m for the most oblique views are reduced to an average of about 150m regarding both, absolute geolocation and coregistration between the nine view angles.

Sept. 7, 2000 - Kruger National Park

The geometric calibration has been performed prior to orthorectification to the UTM map projection grid. A set of ground control points collected from South Africa, Surveyor General 1:50000 topographic maps were used to remove static errors in the camera pointing and airplane position. Using calibration results, geolocation errors of about 1000m for nadir view and up to 6000m for the most oblique views are reduced to 60m for nadir and up to 400m for the most oblique view angles. This result is true for 73 images out of 75 total acquired during 9 imaging runs. The images corresponding to the DF views from runs 2 and 4 contain larger geolocation errors of up to 800m. 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.

Sept. 13, 2000 - Namibia

The geometric calibration has been performed prior to orthorectification to the UTM map projection grid. The orthorectified Landsat TM scenes

(p179r073, p175r075, p180r074) obtained through ESE Scientific Data Purchase are used to collect a set of ground control points in order to remove static errors in the camera pointing and airplane position. Using calibration results, geolocation errors of about 1000m for nadir view and up to 6000m for the most oblique views are reduced to an average of about 200m regarding both, absolute geolocation and coregistration between nine view angles. These remaining errors are regarded as a result of the dynamic airplane attitude and position changes which are not fully modeled in the current calibration algorithm.

Sept. 14, 2000 - Namibia

The geometric calibration has been performed prior to orthorectification to the UTM map projection grid. The orthorectified Landsat TM scenes (p180r075 and p181r073) obtained through ESE Scientific Data Purchase are used to collect a set of ground control points in order to remove static errors in the camera pointing and airplane position. Using calibration results, geolocation errors of about 1000m for nadir view and up to 5000m for the most oblique views are reduced to an average of about 150m regarding both absolute geolocation and coregistration between nine view angles for most the imagery acquired in this flight. However, the geometric calibration was not possible for the D cameras (fore and aft) view angles during the first seven runs. The images acquired with the most oblique view angles were too distorted so that identification of ground control points was not possible. These images will remain uncalibrated.

References on AirMISR and MISR are available from the MISR web site.

Feedback:

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

Document Creation Date: November 17, 2000
Document Modification Date: May 15, 2001