

MAMM Ascending Geometry & Radiometry Evaluation

Introduction:

The Modified Antarctic Mapping Mission (MAMM) mosaic of ascending Radarsat 1 swaths was completed late 2005. This report documents the geometry and radiometry evaluated from the MAMM ascending mosaic. The mosaic was compiled first by framing the swaths. The frames were then assembled into blocks, which were georeferenced using ground control points (GCP's) and between-frame tie points. Radiometric balancing was applied to minimize the radiometry differences between swaths. Upon the completion of all of the blocks, an additional "Grand Geometry" step, implemented with block-to-block tie points, corrected for geometry differences between blocks. "Grand Radiometry" was also performed, wherein block-to-block radiometry differences were minimized.

Geometry Evaluation:

Geometry evaluations for the MAMM ascending mosaic were completed first with a version of the entire mosaic resampled to 100m and subsequently with full resolution (25m) Tile subsets of the continent. Evaluations with the 100m resampled mosaic were to characterize broad-scale geometric characteristics, and identify, if necessary, problem areas. Full resolution evaluations were intended to illuminate more precisely differences between the mosaic and geometry benchmarks. Finally, the primary geometry benchmarks for the MAMM ascending mosaic were the AMM_v2 mosaic, for reasons of consistency and comparability, and various ground control points and other features with known locations, for "ground truthing".

Evaluation of 100m Resampled Mosaic

The purpose of evaluating the entire MAMM ascending mosaic at a 100m resampled resolution was to identify broad-scale geometry characteristics and identify problem areas. To that end, two different evaluations were performed. The first evaluation compared a vector file of the AMM1_v2 derived coastline to the coastal area of MAMM. The second evaluation was completed by digitizing stationary features inland, e.g. the sheer margin of ice streams.

100m Coastline Evaluation

The 100m resample of the MAMM ascending mosaic was loaded into ERDAS Imagine. The vector coastline derived from the 25m AMM_v2 data was draped over the MAMM mosaic. Zoom for the window was set to 100 percent, and a geometrically linked overview window of the AMM_v2 mosaic was tiled adjacent to the MAMM mosaic for the purpose of identifying an updated current location. As the coastline was evaluated, snapshots were taken using Gadwin Print Screen, which automatically saved a sequential file as the "Print Screen" key was pressed on the keyboard. Extraneous areas were cropped out of the jpegs using the "Batch" function in IrfanView.

Results:

Seven areas of known rocky outcrops in the 100m Coastline comparison can be viewed in appendix A. These represent known stationary areas and served as a check for global or local displacements visible at the 100m scale. One area, labeled “Point 3” in the appendix, had notable and regular displacement to the northwest.

The remaining 400+ areas evaluated along the coast can be seen individually, or as a slideshow on the CD enclosed with this report and contain no measurable offsets that cannot be attributed to changes in ice margins. A single exception is that there are some layover effects that can be observed on islands near the Antarctic Peninsula due to poor DEM data for the area.

file: *MAMM_Ascending_Coastline_100m.pdf*

100m Interior Evaluation

The interior evaluation was performed with ERDAS Imagine. The following areas were digitized to ArcINFO Arc files from the AMM1_v2 mosaic and overlaid the MAMM mosaic or otherwise compared on a point by point basis: Lake Vostok, Vostok Station, the margin of ice stream flowing into Slessor Glacier, an island boundary in the Ronne Ice Shelf, an ice stream boundary in the Ronne, an ice stream boundary in the Ross Ice Shelf, an island boundary in the Ross, and the sheer margin along the remnants of Byrd Glacier in the Ross. No displacements were identified during this evaluation.

file: *MAMM_Ascending_interior_features_100m.pdf*

Evaluation of 25m Mosaic Tiles**25m Interior Feature Analysis**

The first evaluation of the mosaic at 25m resolution was completed on select tiles on the interior, where linear features digitized in the AMM_v2 mosaic tiles, and overlaid MAMM tiles for identification of offsets. Seven regions were chosen for the evaluation based on the clarity of linear features on the interior that could be seen in both mosaics. The seven features were Vostok Station, the road to Vostok station along Vostok lake, Mulock Glacier in the Transantarctic Mountains, Byrd Glacier, a glacier in the Elsworth Mountains, Rutford Ice Stream, and Recovery Glacier. The two features associated with Vostok were the most consistent between mosaics, but none of the features analyzed had any offsets not attributable to satellite layover associated with DEM errors.

file: *MAMM_Ascending_interior_features_25m.pdf*

25m Coastal Feature Analysis

The final analysis performed on the mosaic was an analysis of GCP's, research stations, and some linear features in tiles along the coast. A total of 12 GCP's were checked along the coast, in addition to Palmer Station, Rothera Point, Dumon D'Urville Station, Davis Station, and Syowa Station, as well as some investigations into offsets found in the Bunger Hills region.

All the points surveyed were within 3 pixels (approx 75m) of their location in AMM1, with the exception of points in the Bunger Hills region. Areas analyzed to all around the Bunger Hills region had no offsets, and the offsets found in the Bunger Hills

were not consistently offset in any one direction. From this, it was concluded that the problem areas in the bunder hills were due to poor DEM quality for that region.

file: *MAMM_Ascending_Coastal_25m.pdf*

Radiometry Evaluation:

A tile-by-tile evaluation of radiometric artifacts was also performed for the MAMM ascending mosaic. Radiometric artifacts were divided into 4 categories: Automatic Gain Correction (AGC) artifacts, block boundary artifacts, frame boundary artifacts, and beam type difference artifacts. The breakdown of numbers of each is as below:

95	AGCs
18	Block boundary artifacts
3	Frame boundary artifacts
1	Beam type difference artifact

All radiometry documentation can be accessed individually by tile from a web interface.

file: *Radiom_doc.html* or **file: *Radiom_doc.zip***