EPIC Geolocation Quality Summary

Algorithm Revision 05

Product Version 02

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Goddard Space Flight Center
Greenbelt, Maryland

National Aeronautics and
Space Administration

1 EPIC QUALITY SUMMARY

This is a brief summary of known algorithm and software implementation issues in the EPIC L1A/B geolocation. For more information regarding the geolocation algorithm, please refer to the "EPIC Geolocation and Color Imagery" document.

2 GEOLOCATION ERROR

The current version of the geolocation has been optimized for relative geolocation, the correlation between the different bands. Further version will focus on improving the absolute geolocation, the relationship between the pixels and their physical locations. These include atmospheric refraction, improved optical model, and timing corrections.

The below paragraph has been supplied by Dr. Lyapustin's group.

The geolocation error is characterized by matching the ground reference points identified in both EPIC and MODerate resolution Imaging Spectroradiometer (MODIS) images. Ground reference points are selected as the coastlines where there are no clouds. Geolocation error is generally within two EPIC pixels around the center of the image and tends to increase when moving away from the center. It is found that the geolocation error can reach up to 50 km at the boundaries of EPIC images. Users should use the data with caution when performing time-series analysis or developing algorithms that require aligning EPIC images with other data sources (e.g., land cover map, Digital Elevation Map). The geolocation error is relatively smooth in space and therefore it is possible to simply translate the EPIC image to minimize the geolocation error if the area of interest is not large (< 1000 km).

3 ATMOSPHERIC REFRACTION

Correction for atmospheric refraction is not included in this version of geolocation. This results in an error in the calculation of the altitude across the Earth that is relatively small near 90 degrees and increases to the outer ranges of the disk. The effect on latitude and longitude is a spatial compression at larger view angles. The error is estimated to be about .5 degrees view angle at the edge.

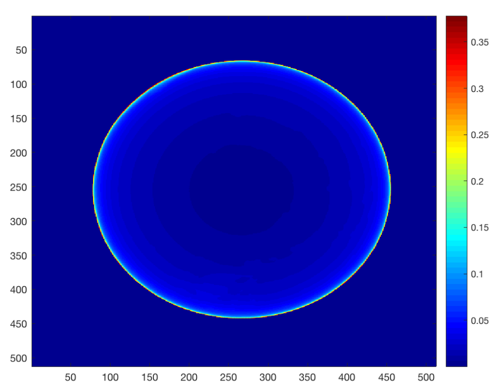

Figure 1- Sample atmospheric refraction correction, degrees

Figure 1 shows the uncorrected altitude angles. The correction for EPIC is more complicated, requiring accuracy across a wider set of angles and wavelengths.

4 OPTICAL ERROR

Due to the replacement of the field lens group during refurbishment, there are some disparities between the documented optical prescription and the telescope's actual. Although this version of the geolocation has an improved optical model, more work is being done to improve the accuracy of the optical prescription and distortion models.

5 CENTROIDING

EPIC imagery requires an Earth centering step known as "centroiding". During centroiding, an x, y offset is calculated for translating the Earth to the center of the image. For more details, consult the EPIC geolocation algorithm document.
Accuracy of centroiding in the L1A is on average +/- 1 pixel or less, although the error occasionally can be greater in some situations. Additional registration is done in the L1B to compensate for this by using a statistical correlation algorithm.

6 STAR TRACKER ACCURACY

DSCOVR is in a Lissajou orbit, which has a slow, approximately 6 month period roll. The star tracker is used to determine the z-axis rotational orientation of Earth to the spacecraft, ie, where North is in the image. From analysis, it is apparent that the star tracker accuracy is no better than .5 degrees, which means that the geolocation can have an equivalent roll error.

7 GEOLOCATION WITH MOON

The Moon is occasionally imaged for calibration purposes. In these situations, the geolocation will run and produce an L1A dataset. No L1B will be produced. The L1A product does contain latitude and longitudes, but the accuracy for these products are very coarse and unvetted.

8 NO L1A/B PRODUCTS WHEN EARTH AND MOON ARE IN VIEW

The geolocation software will not product a L1A or L1B product when both the Earth and Moon are in view. This is due to the object centering algorithm (centroiding) being able to handle only one object in the field of view. The color images released during these events are produced using a special imaging sequence to limit effect of Earth's rotation, plus a manual centering and a special statistics-based band registration process.