

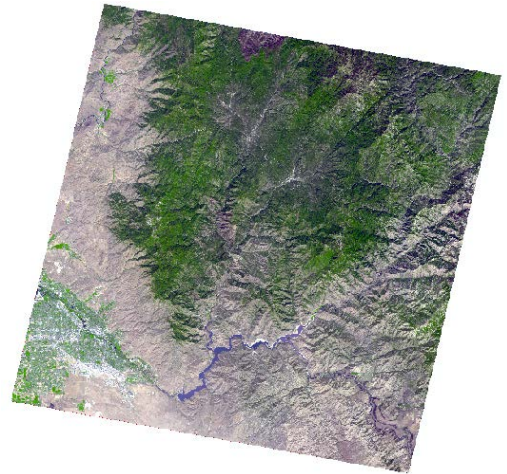
# AST\_L1T Quick Reference Guide

## Overview

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Level 1 Precision Terrain Corrected Registered At-Sensor Radiance (AST\_L1T) product, Figure 1, created by the NASA Land Processes Distributed Active Archive Center (LP DAAC) provides GIS-ready data with a single resampling from the ASTER Level 1A product (AST\_L1A).

AST\_L1T reuses proven Landsat geometric algorithms, with modifications, for application to the ASTER dataset. The AST\_L1T uses the appended radiometric and geometric corrections in the AST\_L1A product and cross-talk corrections as the systematic basis on which to apply terrain and precision corrections.

AST\_L1T image data have been rotated to a north-up map orientation and cover an approximate area of 60 kilometers by 60 kilometers.



**Figure 1. Simulated true color AST\_L1T image acquired August 28, 2014.**

## Correction Characteristics

There are four possible levels of correction, Table 1. The most frequent levels of correction achieved are **terrain + precision** and **terrain + systematic**. While both of these include elevation corrections, the precision aspect of the terrain + precision correction requires the correlation statistics for the GCPs to reach a minimum threshold. When terrain + precision correction is not possible, such as when the image contains heavy cloud cover, was acquired at nighttime, or contains only thermal infrared bands 10–14, the resulting correction will be terrain + systematic. **Precision correction** occurs more infrequently and when there is no corresponding elevation data. **Systematic correction** occurs when the image fails the prior three correction levels. An AST\_L1T that has achieved systematic correction is essentially a rotated AST\_L1B.

**Table 1. AST\_L1T Levels of Correction**

Level of Correction	Corrected with DEM* (terrain)	Corrected with GCP** (precision)	Rotated North Up
terrain + precision	✓	✓	✓
terrain + systematic	✓		✓
precision		✓	✓
systematic			✓

\* Global Land Survey (GLS) 2000 Digital Elevation Model (DEM)

\*\* GLS2000 Ground Control Point (GCP)

The type of correction for each granule can be found metadata attribute field labelled 'CorrectionAchieved', as illustrated in Figure 2.

OBJECT	= CORRECTIONACHIEVED
NUM_VAL	= 1
VALUE	= "Terrain+Precision"
END_OBJECT	= CORRECTIONACHIEVED

**Figure 2. Metadata field showing the level of AST\_L1T 'Correction Achieved'.**

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## Product Structure

The AST\_L1T is a multi-file product. The number of spectral bands available in each science data file depends upon the number of telescopes used during data acquisition. Users are advised that the shortwave infrared (SWIR) bands (bands 4– 9) have saturated values for acquisitions beginning April 2008, rendering them unusable (refer to the [ASTER SWIR User Advisory](#) for additional details).

The AST\_L1T data product consists of:

- ❖ Science data
  - Up to 14 spectral bands of at-sensor scaled radiance in Hierarchical Data Format – Earth Observing System (HDF-EOS) format, Table 2, in the Transverse Mercator projection.
  - A subset of the HDF embedded metadata provided in XML format.

**Table 2. ASTER telescopes, bands, pixel size, and units.**

Telescope	Bands	Pixel Size	Units
Visible Near Infrared (VNIR)	1, 2, and 3N	15 m	Radiance
Shortwave Infrared (SWIR)	4, 5, 6, 7, 8, and 9	30 m	Radiance
Thermal Infrared (TIR)	10, 11, 12, 13, and 14	90 m	Radiance

- ❖ Geographic Information System (GIS)-Ready geographic tagged image file format (GeoTIFF) composites
  - A visible near infrared, and/or a thermal infrared, full resolution color composite GeoTIFF image(s), rotated north up in Transverse Mercator projection.

**Table 3. AST\_L1T Full Resolution GeoTIFF browse band combinations and units.**

Bands Available	Red	Green	Blue	Pixel Size	GeoTIFF Units
VNIR/SWIR	B4	B3N	B2	15 m	Radiance
VNIR only	B2	B3N	B1	15 m	Radiance
TIR	B14	B12	B10	90 m	Degrees Kelvin scaled from 16-bit to 8-bit

- ❖ Quality assurance (QA) and low resolution browse files
  - An associated quality assurance (QA) text file
  - A QA Joint Photographic Experts Group (JPEG) file
  - One or more associated low resolution browse JPEGs (VNIR, SWIR, or TIR)



**Figure 3. AST\_L1T QA browse, VNIR full resolution browse, and TIR full resolution browse GeoTIFF images**

The AST\_L1T data product combines aspects from multiple ASTER data products as identified in Table 4.

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**Table 4. Similarities among ASTER products.**

Data Product	Radiometric Correction	Geometric Correction (satellite)	Geometric Correction* (terrain)	Geometric Correction* (precision)	North-up Map Orientation	GIS-Ready Color Composite
AST_L1T	✓	✓	GLS2000	GLS2000	✓	✓
AST_L1B	✓	✓				
AST14OTH	✓	✓	AST14DEM	AST14DEM	✓	
TerraLook	✓	✓				✓

\* AST\_L1T precision correction requires correlation statistics to reach the minimum threshold, with terrain correction applicable for all areas with GLS200 DEM coverage.

## Getting Help

For additional information, refer to the AST\_L1T data product landing page, [https://doi.org/10.5067/ASTER/AST\\_L1T.003](https://doi.org/10.5067/ASTER/AST_L1T.003), and the LP DAAC Frequently Asked Questions accessible via: <https://lpdaac.usgs.gov/faq-page> > ASTER > Precision Terrain Corrected (AST\_L1T).

Optionally, users may communicate with LP DAAC User Services staff using the web form or one of the various methods provided at: [https://lpdaac.usgs.gov/user\\_services/contact\\_us](https://lpdaac.usgs.gov/user_services/contact_us).