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Advanced Spaceborne Thermal Emission and Reflection Radiometer

ASTER Higher-Level Product User Guide

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Jet Propulsion Laboratory
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SECTION 1: Introduction

Document Purpose and Overview

This document explains the structure and content of each higher-level ASTER data product. Users will need this information to understand the many metadata fields included in each product as well as the science and other data contained in the product body. ("Metadata" is accessory information such as time and location of acquisition, various quality information, and which telescopes were used.)

Section 2, the ASTER Product Primer, explains the overall structure of higher-level ASTER products and attempts to remove some of the mysteries and confusion over metadata. It explains the difference between hdf and met files, and what the different components of the hdf file contain.

Section 3, ASTER Product Overview, contains a description of each higher-level ASTER product. Sections 4 and 5, Product Definitions, provide a description of each metadata attribute and product body components. Section 4 includes those items that are shared among all products, and Section 5 includes the product-specific items.

Appendix A lists the contents of an important component of every higher-level ASTER product called **formatted_product_summary**. This hdf global attribute contains most or all of the metadata that most users will need--if you want to understand a data granule (ie, roughly, a scene), this is the first place to look for information. This is especially important for new users of ASTER data, as the product structure may otherwise be intimidating.

Appendix B includes a metadata attribute cross-reference table. If you know the name of a metadata attribute that you are interested in, but do not know which hdf attribute it is in (e.g., coremetadata.0 or productmetadata.0), consult this list. However, if you use formatted_product_summary, you will not often need to do that.

Additional Resources

URLs:

http://asterweb.jpl.nasa.gov/

This is the US ASTER website, containing information on the instrument, how to obtain data, the Level 1 Product Specification, and much more.

http://edcdaac.usgs.gov/

Website of the EROS Data Center DAAC, where ASTER data are archived. This is an excellent gateway to other resources, including the EDG and the ASTER On-Demand Product Request site (this is where to order most Higher Level products, as these are generated only “on-demand; sometimes they are called “custom products”).

http://edcimswww.cr.usgs.gov/pub/imswelcome/

Direct path to the EOS Data Gateway (EDG), the search and order system for all EOS products. All archived ASTER products are ordered from here (L1a, L1b, Decorrelation Stretch, DEM)

http://www.gds.aster.ersdac.or.jp/

Homepage of the ASTER Ground Data System in Japan, containing much information on ASTER, on the Level 1 products and all products offered by GDS, and GDS services.

http://www.science.aster.ersdac.or.jp/astere1.htm

The Japanese ASTER User Guide provides excellent information on the ASTER instrument and operations, as well as on the Level 1 products.

http://e0ins02u.ecs.nasa.gov:10800/

The On-Demand Product Request pages allow users to order on-demand ASTER products.

http://hdfeos.gsfc.nasa.gov/hdfeos/workshop.html

This site contains a vast amount of information and references on HDF-EOS, including on-line tutorials and downloadable documents. Good for beginners and all other levels of users.

Documents

Higher-Level Data Product Quality Assessment Plan. JPL D-13841. October 1999. This document defines and explains QA Planes and QA Alerts--critical for a full understanding of ASTER higher-level products. Available from US ASTER website at http://asterweb.jpl.nasa.gov/

ASTER Level 1 Product Specification. Available from US ASTER website at http://asterweb.jpl.nasa.gov/

HDF User's Guide. Available at hdfeos workshop website at http://hdfeos.gsfc.nasa.gov/hdfeos/workshop.html

Algorithm Theoretical Basis Documents. Available from http://eospso.gsfc.nasa.gov/atbd/astertables.html

SECTION 2: ASTER Product Primer

All products stored in the EOSDIS Core System (ECS), including ASTER products, contain a large amount of standardized metadata. Most products contain additional instrument-specific and product-specific metadata. All this metadata provides great detail about the data and the conditions under which it was acquired and processed.

The standard format for all ECS products is a variety of hdf called HDF-EOS. This new format is unfamiliar to most users and, while very versatile, is more complex than some more familiar formats.

Both of these facts can make it difficult for you (the End User) to find the single piece of metadata you are looking for. There are too many places to look and too many pieces to sift through once you get there. To summarize the initial feelings of many users, these products are complicated and confusing.

The purpose of the ASTER Product Primer is to provide an overview of the basic organization and contents of ASTER products. It explains the difference between the metadata in the .hdf and the met file, describes each of the objects within the .hdf file, and where to go to find different types of metadata. It also explains where to look for more information on hdf and other topics.

Also, it contains a very brief but important section called "**Some Key Pieces of Information About ASTER Products**". Be sure to review that.

Top-Level Organization of ASTER Products

ASTER products are in HDF-EOS format, the standard format for all ECS products. The details of this format can be found in documents listed in the Additional Resources section in the Introduction. This format imposes certain constraints on the organization of ASTER products so that they follow the standard.

The major components of ASTER products (which correspond to global hdf attributes), along with a brief description of each, can be found in Table 1. Most users find the organization of the first three components to be rather unfriendly but, fortunately, ASTER products have a global hdf attribute called formatted_product_summary. Although the information it contains is extracted from the first three components, it is organized in a much more logical manner, making it easier to find items of interest. Note: There is also a global hdf attribute called "product_summary_information"--this contains the same information as formatted_product_summary but it is in ODL format, a machine-oriented format that is much harder to read.

There is also a component containing very detailed product-specific information, as well as two components that carry over information from the Level 1 file used as input.

HDF Global Attribute	Description
coremetadata.0	ECS standard metadata
productmetadata.0	ASTER standard metadata; AKA "Generic Header"
xxxx_specific	Product-specific metadata; xxxx=product
formatted_product_summary	Logically organized easy to read metadata summary
Instrument and Spacecraft	Telescopes used, gain settings, pointing angles, etc
Spatial	Scene location
Temporal	Time of acquisition
Quality	Cloud coverage, other QA info
Calibration	Calibration database versions
Processing	Processing info such as time, versions...
Scene Information	Scene rotation, sun position...
product_summary_information	ODL formatted version of formatted_product_summary
level_1_carryover	Metadata from Level 1 input product
badpixelinformation	Bad pixels of the Level 1 input product

Table 1. **Summary of the major components of ASTER products.**

hdf Files and met Files

When you order an ASTER product you receive two separate files -- an "hdf" file and a "met" file. The hdf file contains a large amount of metadata and also the science data, whereas the met file contains only metadata. However, because there is some overlap between the files it is not obvious where to look when a certain piece of metadata is needed.

This section will explain the purpose and origin of each type of file, and later sections will describe the files' basic contents.

Purpose of each type of file

While it may not be obvious, each type of file does have a specific reason for being. The hdf file is a copy of exactly what was created by the product generation software-- a single "granule" (for ASTER this corresponds to a single 60 km by 60 km scene, plus all the associated "granule-level" metadata). The met file is a little more difficult to explain until it is understood where it comes from. This is explained in the next section but, until then we could say that the met file contains a subset of the metadata in the hdf file (granule-level metadata) plus some additional information that describes the general product ("product-level" metadata, also called "collection-level" metadata).

(Here, "product" refers to the general category of a granule, such as Decorrelation Stretch, whereas "granule" refers to a specific instance of the product, i.e., a file. Therefore, there are roughly 10 ASTER products, but thousands of granules are generated each week.)

Where do these files come from?

Although you don't have to know the answer to this question, it is an area of confusion for most users. It is useful for understanding the differences between these files, and will help you decide where to look for what you want. Of course, the explanation is not simple, and perhaps lengthier than you wish to read. If so, just skip this section, but remember this: **the best place to look for metadata of interest is in the global hdf attribute called "formatted_product_summary", which is explained later in this document.**

So, where do these files come from? We'll answer this question first by explaining the simple case -- archived products such as routinely generated Decorrelation Stretch. Then we will explain the slightly more complicated case of non -archived products such as the atmospherically corrected products.

Figure 1 summarizes the major events that occur surrounding the generation of the hdf and met files. The first step is for the Level 2 product generation software to create the granule. This granule is then "ingested" into the ECS storage system for archiving. One step during this ingestion process is to extract certain pieces of granule metadata--selected by ECS and ASTER algorithm developers--to store in an online database in support of product search and order.

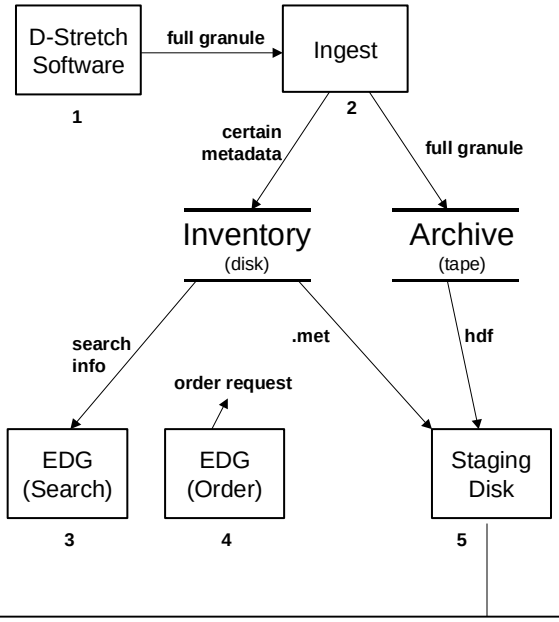

Figure 1. Origin of hdf and met files. This example using the Decorrelation Stretch product shows where its hdf and met files come from.

In addition to the ever-growing "granule-level" metadata (such as quality information), this online database contains static metadata that describe each product (such as the product's name,

what instrument it comes from, and contact information). This static, product-level metadata is known as "Collection-level" metadata. Collection-level metadata is information that applies to an entire collection of granules: for ASTER, such a “collection” is simply a product, such as Decorrelation Stretch.

So, at this point we have a lot of metadata stored online, as well as a granule in the archive that contains science data and metadata. The next step is for the user to search for, and then order, a product using the EOS Data Gateway (EDG). The system responds to this order by extracting the hdf file from the archive and placing a copy on a staging disk. Also, it creates a copy of the appropriate online metadata -- this is the met file -- and places that on a staging disk. This met file contains all the granule-level metadata extracted during ingest and stored online by the system (well, almost--see below), plus the appropriate collection-level metadata.

For products that are not archived, and so not ordered using EDG, this sequence is slightly more complicated. In this case the EDG is used to locate the 1a or 1b granule, and the On-Demand Product Request software used to order it. This request goes to the DAAC, where it is handled in the same manner as for archived products. In fact, the granule is actually archived, though only temporarily, and it is deleted after the user pulls the data from the staging disk. In any case, the user still obtains the hdf and met files, and their content is the same as for archived products.

The granule-level metadata in the met file may differ slightly from the metadata extracted from the granule during ingest. This is because there are several Quality Assessment fields that can be modified after the granule is archived. The met file will contain the latest values for these fields, whereas the hdf file contains the original values.

What Is in the hdf File?

The short answer to this question, to use one set of commonly applied terminology, is "metadata" and "data" (the data are often call the "product body"). That is rather imprecise--what the users of these terms are really doing is distinguishing two format categories: ODL (for metadata), and everything else. These are described below for your reading pleasure.

Metadata

Metadata are contained in a series of components within the hdf file (each component is a global hdf attribute). These components are in ODL format (Object Description Language), a widely used format for certain types of information that always has the form of ATTRIBUTE = VALUE. It is widely used because it is easy to parse and search…if you are a machine. Most normal people find it extremely verbose and sometimes poorly organized, making it hard to find specific attributes of interest. With enough practice you will probably adjust to that. Alternatively, you can use an EOS-provided tool to streamline it into a much more readable format. This tool, called ufm for “user friendly metadata” is available at

http://hdfeos.gsfc.nasa.gov/hdfeos/ufm1_3.html

Although the hdf file contains a variety of global attributes, one of these is special. The hdf attribute called **formatted_product_summary** is a composite of most of the useful information in all the other components, organized in a logical fashion, and in human-friendly format (not ODL). This global hdf attribute was created specifically to provide ASTER users with a single place to go for metadata information, thus minimizing the need for understanding details of the hdf file and of metadata organization. A summary of the contents of this component appears in Appendix A.

However, if you need to look at some of the other components, for example, for information not in the summary, here is an explanation of those. A complete listing of the contents of each of these is available in Section 5. Also, Appendix B contains an index of metadata attributes that cross-reference to the global hdf attribute that contain them. With that, if you know the name of a metadata attribute, you can find which hdf attribute to search in.

StructMetadata.0. This is for system use during creation and archival of the product, and should be ignored by users.

coremetadata.0. This contains information common to all ECS products such as the spatial and temporal boundaries of the granule, the production time of the granule, and certain quality information. True “core” attributes, as well as Product-Specific Attributes (PSAs) are included. It is sometimes referred to as “inventory”.

productmetadata.0. This contains information common to all ASTER products, such as the database version used during Level 1 processing, pointing angles, and which telescopes were on.

xxx_specific. This contains product dependent metadata, and so varies from product to product ("xxx" will be replaced with a name or indicator for a real product). Typically it includes the values of any run-time parameters and various processing statistics.

formatted_product_summary. As already described, this contains most of the useful information that can be found in all the other components, but organized into a single, coherent whole. In general, this is the first place you should go to find product information, and typically it should be the only place you'll need to go to learn about the granule.

product_summary_information. This is an ODL-formatted version of the previous attribute.

level_1_carryover. This contains a copy of the metadata from the original Level 1 granule. Because the quality and characteristics of the higher-level granule depend on the L1 input granule, access to this information could be important.

badpixelinformation. This identifies the bad pixels found during Level 1 processing and is carried over from the Level 1 input granule.

Product Body

The term Product Body is sometimes used for all parts of the product that are not in ODL format. For ASTER products the body conforms to HDF-EOS "Swath" format, a standard EOS format described in great detail elsewhere (see Additional Resources in Introduction). ASTER products contain a geolocation area and a variety of other data areas that vary in contents and format. Most “science data” is contained in "planes" consisting of lines of pixels that correspond to the lines of pixels in the input product. There are also some specialized planes that contain pixel-level Quality Assessment data. Here is a summary of each of the major body components.

Geolocation Fields. Geolocation information is contained in an 11 by 11 grid for each granule. Such a grid is a standard item for HDF-EOS "swath" format products (see the HDF-EOS specification for details). Geolocation of any individual science pixel is obtained by interpolation between the grid points. Some users interpolate between the four corners instead of using the swath grid, however this is not recommended due to accuracy considerations.

Data fields. These fields contain various types of science data, depending upon the product. Typically each band corresponds to a data plane (such as “surface radiance for band 6”), but some information may exist in other formats (such as the emissivity histograms for Surface Kinetic Temperature).

QA Fields. Each Level 2 ASTER product contains two or three data planes for *pixel*-level QA information. The first QA data plane is common to all L2 ASTER products while the other data planes are product-specific. These data planes are described in detail in the ASTER Higher-Level Data Product Quality Assessment Plan. Note that *granule*-level QA information is available in the metadata.

What Is In the met File?

As discussed previously, the information in the met file is extracted from the online metadata database at the time a product order is filled. The basic components of the met file are provided below. Note that if a QA field has been updated since the granule was created, the met file will contain the updated value of the field. The fields subject to possible update are:

- OperationalQualityFlag
- OperationalQualityFlagExplanation
- ScienceQualityFlag
- ScienceQualityFlagExplanation

"Collection" level metadata. This type of metadata applies to all granules within a “collection” (for ASTER, a collection is a product, like Surface Radiance--VNIR, SWIR, or Surface Kinetic Temperature). It contains information such as the product's name, what instrument it comes from, and contact information. Some of this information may also be contained elsewhere.

“Core” metadata. For higher-level products this is a copy of coremetadata.0, but includes any updates to the QA fields listed above. Note that for Level 1 products it is a slightly reformatted

version of the same information (this reformatting occurs during ingest of Level 1 products and helps to make the data more easily searchable).

PSAs. These are Product-Specific Attributes, which are non-core attributes that have been made searchable--that is, placed online so they are available to the EDG search engine. Having said that, PSAs are included in coremetdata.0.

Some Key Pieces of Information About ASTER Products

Here is a short list of facts that all users of ASTER data should know.

1. **Product Summary.** If you need a piece of metadata, go first to the "formatted_product_summary" section described above. This section includes all of the most commonly used metadata, is easy to find, and exists in a user-friendly version meant only for people (ie, no ODL).

2. **Geodetic vs Geocentric Coordinates.** While all metadata use geodetic coordinates, the L1 swath data are in geocentric coordinates, which are slightly different. L2 and higher products generated in the US have swath data that are in geodetic coordinates.

3. **UTM Map Projection.** The default map projection, applied during generation of 1b, is UTM. However, these granules are path oriented (following the ground track) rather than map oriented (with North up). Thus, ASTER scenes are rotated from North by an amount equal to SceneOrientationAngle (a metadata attribute whose value you can find in the Product Summary).

4. **Expedited Data Differences.** Expedited data are slightly different from non-expedited, differing in the following ways:

a. No TIR short-term calibration information included
b. No band 3b
c. Registration quality may be lower, especially if scene has few features.
d. No xAR_ID

SECTION 3: ASTER Higher-Level Products

Table 2 lists each of the ASTER higher-level Standard Data Products and some of their basic characteristics.

Following that is an abstract of each product. These summaries give a brief overview of the product and the algorithm used to create it.

Product ID	Level	Parameter Name	Production Mode	Units	Absolute Accuracy	Relative Accuracy	Horizontal Resolution (m)
AST06	2	Decorrelation stretch--VNIR	routine	none	N/A	N/A	15
AST06	2	Decorrelation stretch--SWIR	routine	none	N/A	N/A	30
AST06	2	Decorrelation stretch--TIR	routine	none	N/A	N/A	90
AST04	2	Brightness temperature	on-request	degrees C	1-2 C	0.3 C	90
AST07	2	Surface reflectance	on-request	none	4%	1%	15, 30
AST09	2	Surface radiance--VNIR, SWIR	on-request	W/m2/sr/µm	2%	1%	15, 30
AST09	2	Surface radiance--TIR	on-request	W/m2/sr/µm	2%	1%	90
AST05	2	Surface emissivity	on-request	none	0.05-0.1	0.005	90
AST08	2	Surface kinetic temperature	on-request	degrees K	1-4 K	0.3 K	90
AST14	3	Digital elevation model (DEM)	on-request	m	>= 7 m	>= 10 m	30
AST13	2	Polar surface and cloud classification (not yet available)	on-request	none	3%	3%	15, 30, 90

Table 2. ASTER higher-level standard data product summary.

Decorrelation Stretch

Product ID: AST06
Lead Invest: Ron Alley
Product Level: 2
Production Mode: routine
Absolute Accuracy: N/A
Relative Accuracy: N/A
Horizontal Resolution: 15, 30, and 90 m
Units: none
Product Size (MB): 84, 21, 3 for VNIR, SWIR, and TIR, respectively

Product Description

This product, which is available for each of ASTER's three telescopes, is a decorrelation stretched image of ASTER radiance data. The decorrelation stretch is a process to enhance (in image processing parlance, "stretch") the color differences found in a color image by a method that includes the removal of the inter-channel correlation found in the input pixels; hence, the term "decorrelation stretch". The image is produced at pixel resolutions of 15 m for VNIR, 30 m for SWIR, and 90 m for TIR. Decorrelation-stretched images provide an overview that enhances spectral reflectance variations.

Algorithm Description

If one views the pixels in an ASTER scene as a set of 3-vectors, a linear transformation can be found which results in removing the correlation among the vectors in the transformed space. This is an eigenvector problem, and can be thought of as a rotation of the coordinate system of the original vector space. Within this rotated space, each component is rescaled (contrast stretched) by normalizing the variances of the eigenvectors. If processing were to stop here, the result would be a principal component image. To produce the decorrelation stretched image, the principal component image is modified by the linear transformation that rotates the vectors back into the original coordinate system.

In practice, the original transformation, the variance normalization step, and the reverse transformation are combined into a single algebraic step.

Applications

These images are used as a visual aid in reviewing the ASTER scene data and making the selection of suitable scenes for further analysis and research. In particular, a decorrelation-stretched image would show the potential user which scenes have spectral variations large enough to be useful for subsequent spectral analysis

Constraints

The decorrelation stretch algorithm is best suited to the case where the input data of all three channels have a joint distribution that is Gaussian (or near Gaussian) in form. Fortunately the

algorithm is fairly insensitive to substantial deviations from the ideal. One should be aware, though, that if the distribution of the input pixels is strongly bimodal (or multimodal), the effectiveness of the decorrelation stretch is weakened, and there will be less diversity of color in this image than in other images.

Additionally, the decorrelation stretch algorithm is a method of color enhancement that exploits whatever interchannel differences that may exist. Implicit in this technique is the assumption that the differences are real, and not noise or processing artifacts. The algorithm single-mindedly produces a color enhanced output; if noise is a major component of the scene variation, the algorithm will enhance those noise differences to produce an output that, while colorful, will be painfully noisy.

Brightness Temperature at Sensor

Product ID: AST04
Product Level: 2
Absolute Accuracy: 1-2 C
Horizontal Resolution: 90 m
Product Size (MB): 84

Lead Invest: Ron Alley
Production Mode: on-request
Relative Accuracy: 0.3 C
Units: degrees C

Product Description

The body of this product is the brightness temperature for ASTER's five thermal-infrared bands (8-12 μm, bands 10-14). Brightness temperature is the apparent observed temperature, assuming a surface emissivity of 1.0 (i.e., as if the object were a blackbody). The calculations are performed starting with the radiance at sensor as input; no atmospheric correction is included for this product.

Algorithm Description

The amount of radiance that an ASTER channel will observe when viewing a source of a particular temperature is calculated in the following manner. The spectral radiance at each wavelength (to a 0.01 μm precision) is computed using the Planck function. This value is multiplied by the normalized spectral response function at that wavelength, and the results of this calculation are integrated over the range of wavelengths that have a sensor response.

The above calculation was made for each of the five ASTER TIR channels at all temperatures (to a 0.01 degree C precision) that the ASTER TIR subsystem was designed to record (200 to 370 degrees Kelvin). The result is a table of observed radiances as a function of temperature. This table was used to construct a second table, which lists temperature as a function of radiance. This second table is stored as a lookup table, to be used to generate this product.

Applications

Brightness temperature has been used to observe volcanic ash clouds, detect ice leads in the Arctic, and to identify anthropogenic and natural fires, to name a few examples. The ASTER brightness temperature will be used as an alternate to radiance in the temperature/emissivity separation algorithm to report relative cloud-top temperature because there will be no routinely available applicable atmospheric correction to enable a calculation of exact cloud-top temperature. ASTER brightness temperatures can be acquired during the day or night and over all surface types (land, water, cloud, etc.).

Constraints

The algorithm is constrained only by the fact that it requires unsaturated input radiance values. The algorithm should work on TIR data acquired during the day or night and over land, clouds, water, or anything else not hotter than about 120 degrees C or colder than about –100 degrees C.

Surface Reflectance

Product ID: AST07 **Lead Invest:** Kurt Thome
Product Level: 2 **Production Mode:** on-request
Absolute Accuracy: 0.01 for reflectance <0.15, 7% for reflectance >0.15
Relative Accuracy: 0.005
Horizontal Resolution: 15, 30 m **Units:** none
Product Size (MB): 215

Product Description

The Level 2 surface reflectance data set (AST07) contains surface reflectance for each of the nine VNIR and SWIR bands at 15-m and 30-m resolutions, respectively. The results are obtained by applying an atmospheric correction to radiances reported by the ASTER sensor. The atmospheric correction removes effects due to changes in satellite-sun geometry and atmospheric conditions. The atmospheric correction algorithm is applied to clear-sky pixels only and the results are reported as a number between 0 and 1.

Algorithm Description

The atmospheric correction algorithm used to retrieve the surface reflectance relies on a look-up table (LUT) approach. The LUT contains forward radiative transfer calculations from a Gauss-Seidel iteration code to compute at-satellite radiance for a set of assumed surface reflectance values and a variety of atmospheric conditions. The atmospheric correction is applied by using a set of input atmospheric conditions relating to the ASTER scene of interest to select a portion of the LUT. The output of the LUT search is a set of surface reflectance/at-sensor radiance pairs. Using linear interpolation on these pairs, a radiance reported by ASTER is converted to a surface reflectance. The atmospheric conditions are defined by the aerosol size distribution (or equivalently the aerosol type), the aerosol amount, surface pressure, and the sun-satellite geometry, The aerosol information is obtained from outside sources, for example MISR, MODIS, or climatological means. The scattering phase functions of the aerosol particles in the atmosphere are assumed to scatter as mie particles using the aerosol size distribution information supplied by MISR or MODIS. The results from this method will be in reflectance units (values between 0 and 1) with an accuracy dependent upon the accuracy of input atmospheric conditions and the surface slope. The model is expected to lose accuracy in terrain with high relief due to the assumption of horizontal homogeneity made in the radiative transfer code. Also because of this assumption, the model will give less accurate results in regions where the atmosphere or surface are not horizontally homogeneous on the scale of several pixels.

Applications

Accurate atmospheric correction removes effects of changes in satellite-sun geometry and atmospheric conditions and improves surface type classification and estimates of the Earth's

radiation budget, and use of ASTER data for applications such as agricultural management requires atmospheric correction.

Constraints

This description applies to the atmospheric correction method used for the solar-reflective bands only for clear-sky pixels. This algorithm requires a digital elevation model providing slope and elevation for accurate modeling of surface reflectance. The model requires total and component optical depths as input. The algorithm is computed only for daytime image data for the VNIR - SWIR bands. The algorithm begins to break down at large view angles (not applicable for ASTER) and large solar zenith angles (>75 degrees). The algorithm's accuracy also degrades somewhat in regions around the backscatter direction due to strong surface BRDF effects. Uncertainty in the results also increases in regions of atmospheric heterogeneity.

Surface Radiance – VNIR, SWIR

Product ID: AST09 **Lead Invest:** Kurt Thome

Product Level: 2 **Production Mode:** on-request
Absolute Accuracy: 8% for reflectance >0.1; 15% for reflectance <0.1
Relative Accuracy: 1%
Horizontal Resolution: 15, 30 m **Units:** $W\ m^{-2}\ sr^{-1}\ \mu m^{-1}$
Product Size (MB): 215

Product Description

The Level 2 surface radiance data set (AST09) contains surface radiance for each of the nine VNIR and SWIR bands at 15-m and 30-m resolutions, respectively. The results are obtained by applying an atmospheric correction to radiances reported by the ASTER sensor. The atmospheric correction removes effects due to changes in satellite-sun geometry and atmospheric conditions. The atmospheric correction algorithm is applied to clear-sky pixels only and the results are reported as a number between 0 and 1.

Algorithm Description

The atmospheric correction algorithm used to retrieve the surface radiance relies on a look-up table (LUT) approach. The LUT contains forward radiative transfer calculations from a Gauss-Seidel iteration code to compute at-satellite radiance for a set of assumed surface reflectance values and a variety of atmospheric conditions. The atmospheric correction is applied by using a set of input atmospheric conditions relating to the ASTER scene of interest to select a portion of the LUT. The output of the LUT search is a set of surface radiance/at-sensor radiance pairs. Using linear interpolation on these pairs, a radiance reported by ASTER is converted to a surface radiance. The atmospheric conditions are defined by the aerosol size distribution (or equivalently the aerosol type), the aerosol amount, surface pressure, and the sun-satellite geometry, The aerosol information is obtained from outside sources, for example MISR, MODIS, or climatological means. The scattering phase functions of the aerosol particles in the atmosphere are assumed to scatter as mie particles using the aerosol size distribution information supplied by MISR or MODIS. The accuracy of the results from this method are dependent upon the accuracy of input atmospheric conditions and the surface slope. The model is expected to lose accuracy in terrain with high relief due to the assumption of horizontal homogeneity made in the radiative transfer code. Also because of this assumption, the model will give less accurate results in regions where the atmosphere or surface are not horizontally homogeneous on the scale of several pixels.

Applications

Accurate atmospheric correction removes effects of changes in satellite-sun geometry and atmospheric conditions and improves surface type classification and estimates of the Earth's radiation budget, and use of ASTER data for applications such as agricultural management requires atmospheric correction.

Constraints

This description applies to the atmospheric correction method used for the solar-reflective bands only for clear-sky pixels. This algorithm requires a digital elevation model providing slope and elevation for accurate modeling of surface reflectance. The model requires total and component optical depths as input. The algorithm is computed only for daytime image data for the VNIR - SWIR bands. The algorithm begins to break down at large view angles (not applicable for ASTER) and large solar zenith angles (>75 degrees). The algorithm's accuracy also degrades somewhat in regions around the backscatter direction due to strong surface BRDF effects. Uncertainty in the results also increases in regions of atmospheric heterogeneity

Surface Radiance – TIR

Product ID: AST09
Lead Invest: Frank Palluconi
Product Level: 2
Production Mode: on-request
Absolute Accuracy: 2%
Relative Accuracy: 1%
Horizontal Resolution: 90 m
Units: W m^{-2} sr^{-1} μm^{-1}
Product Size (MB): 13

Product Description

This product provides surface leaving radiance, in W m^{-2} sr^{-1} μm^{-1}, for the five ASTER TIR channels at 90 m spatial resolution. In addition, the down welling sky irradiance in W m^{-2} μm^{-1} for the five ASTER TIR channels is also provided. Atmospheric correction has been applied and the surface leaving radiance is valid for the clear sky portion of scenes. This radiance includes both surface emitted and surface reflected components. The surface radiance is only of known accuracy for cloud-free pixels since insufficient information is available about cloud properties for a valid correction of cloudy pixels.

Accurate atmospheric correction is intended to remove the effect of the atmosphere providing the opportunity to use these radiances in the determination of surface spectral emissivity and surface kinetic temperature. This atmospheric correction, along with similar corrections for other Terra instruments, marks the first implementation of operational atmospheric correction in environmental satellites. This parameter is generated only upon request, and the data can be collected during either the daytime or nighttime.

Algorithm Description

The radiance measured by the ASTER instrument includes emission, absorption, and scattering by the constituents of the earth's atmosphere. The purpose of atmospheric correction is to remove these effects providing estimates of the radiation emitted and reflected at the surface. Atmospheric correction is necessary to isolate those features of the observation that are intrinsic to the surface from those caused by the atmosphere.

The approach involves two fundamental elements: 1) the use of a radiation transfer model capable of estimating the magnitude of atmosphere emission, absorption, and scattering, and 2) the acquisition of all the necessary atmospheric parameters (i.e. temperature, water vapor, ozone, aerosols) at the time and location of the measurement to be corrected. MODTRAN is the chosen radiation transfer model.

Applications

Surface leaving radiance is closely associated with the thermal properties of the surface itself nearly independent of the overlying atmosphere. If the spectral emissivity of the surface is known, the surface kinetic temperature can be directly obtained given the information provided with this product. Surface kinetic temperature can be used in a number of applications ranging

from derivations of sensible heat flux to estimates of plant stress. Several methods of separating surface leaving radiance into estimates of spectral emissivity and surface kinetic temperature exist including the algorithm used for this process by ASTER. Spectral emissivity can be used to estimate surface composition, which has wide application in geology, environmental assessment and urban planning.

Constraints

The surface leaving radiance is only of known accuracy for cloud-free pixels. As this data product does not correct for the presence of water or ice clouds it is of uncertain value when such clouds are present, however, a cloud mask is included in the quality assurance "QA plane" portion of the product, allowing the user to avoid cloudy pixels. In addition, the cloud identity products from MODIS and MISR may be used if the spatial resolution of these products is acceptable. This product is used within the ASTER operational data product production framework as an input to the generation of surface spectral emissivity for the five ASTER TIR channels and the derivation of surface kinetic temperature.

Surface Emissivity

Product ID: AST05
Product Level: 2
Absolute Accuracy: 0.05-0.1
Horizontal Resolution: 90 m
Product Size (MB): 9

Lead Invest: Gillespie/Rokugawa
Production Mode: on-request
Relative Accuracy: 0.005
Units: none

Product Description

The Level-2 land surface emissivity product contains surface emissivity at 90-m resolution generated only over the land from ASTER's five thermal infrared channels. Surface emissivity is required to derive land surface temperature (AST08) data, also at a resolution of 90 meters. The emissivity product is critical for deriving accurate land surface temperatures. It is therefore important in studies of surface energy and water balance. The emissivity product is also useful for mapping geologic and land-cover features.

Current sensors provide only limited information useful for deriving surface emissivity and researchers are required to use emissivity surrogates such as land-cover type or vegetation index in making rough estimates of emissivity and hence land surface temperatures. The five thermal infrared channels of the ASTER instrument enable direct surface emissivity estimates. Mapping of thermal features from optical sensors such as Landsat and AVHRR has been used for many developmental studies. These instruments, however, lack the spectral coverage, resolution and radiometric accuracy that will be provided by the ASTER instrument.

Algorithm Description

Read in the land-leaving radiance and down-welling sky irradiance vectors for each pixel. Estimate the emissivity spectrum using the Normalized Emissivity Method and iteratively compensate for reflected skylight. Normalize the emissivity spectrum using the average emissivity for each pixel. Calculate the min-max difference (MMD) of the normalized spectrum and estimate the minimum emissivity using a regression that relates the MMD and the minimum emissivity. Scale the normalized emissivities using the minimum emissivity. Compensate for reflected skylight using the refined emissivities. Use the emissivity value to calculate a temperature using Planck's Law.

Applications

Emissivity is useful in identifying surface composition. Many minerals -- especially silicate minerals that make up the bulk of the Earth’s surface -- have distinctive thermal infrared emissivity spectra, but ambiguous or non-distinctive VNIR spectra. Quartz, feldspars, amphiboles, and pyroxenes all are in this category. Carbonate rocks also have distinctive spectra, although the diagnostic features are unresolved by ASTER. Because other minerals -- especially iron-bearing and hydrated minerals -- have distinctive VNIR and SWIR spectra, surface composition mapping is best undertaken with the full range of ASTER bands, not just the

TIR bands alone.

Rock and soil emissivities also contrast with vegetation, snow and water. Therefore, emissivity data are useful for mapping forest clearings and snow coverage.

Atmospheric gases such as SO_2, emitted from volcanoes, absorb ground-emitted thermal radiation selectively. Therefore, emissivity maps are useful in recognizing the presence of volcanic emissions, although special processing is required to quantify them. The same comments apply to industrial pollution.

Constraints

Currently there are no constraints, and the algorithm should work with TIR data acquired during the day or night. The algorithm will return incorrect values for clouds, however, because the atmospheric corrections will have been inaccurate due to a lack of knowledge of cloud height. Therefore, if a pixel is classified as "cloud" on the basis of its spectral and temperature characteristics a notation to that effect will be made in the QA plane. Because clouds radiate to the ground, pixels not covered by clouds but in their vicinity will also have inaccurate emissivties and spectra, and therefore these pixels are also noted in the QA plane. For cold surfaces viewed through a warm or humid atmosphere correction for reflected skylight can be inaccurate, leading to inaccurate emissivity estimates.

Surface Kinetic Temperature

Product ID: AST08
Product Level: 2
Absolute Accuracy: 1-4 K
Horizontal Resolution: 90 m
Product Size (MB): 3

Lead Invest: Gillespie/Rokugawa
Production Mode: on-request
Relative Accuracy: 0.3 K
Units: degrees K

Product Description

The Level-2 land surface kinetic temperature product contains surface temperatures at 90-m resolution generated only over the land from ASTER's five thermal infrared channels. Land surface temperatures are determined from Planck's Law, using the emissivities from AST05 to scale the measured radiances after correction for atmospheric effects. Surface temperatures are important in studies of surface energy and water balance. They are also useful in studies of volcanism and thermal pollution.

Current sensors provide only limited information useful for deriving surface emissivity, and therefore land surface temperature estimates can be inaccurate. The five thermal infrared channels of the ASTER instrument enable direct surface emissivity estimates, and accurate temperature estimation.

Algorithm Description

See AST05, Surface Emissivity.

Applications

The derived land surface temperature has applications in studies of surface energy and water balance. Temperature data will be used in the monitoring and analysis of volcanic processes, day and night temperature data will be used to estimate thermal inertia, and thermal data will be used for high-resolution mapping of fires as a complement to MODIS global fire data. Thermal data are especially useful in fire studies because they can “see through” smoke to the burning terrain below.

Constraints

See AST05, Surface Emissivity. For cold surfaces viewed through a warm or humid atmosphere correction for reflected skylight can be inaccurate, leading to inaccurate emissivity estimates. The error increases as the emissivity decreases. Therefore, even if some emissivities are erroneous, surface temperatures may be accurate, provided some of the emissivities are near unity.

Digital Elevation Model (DEM)

Product ID: AST14
Product Level: 2
Absolute Accuracy: >= 7 m
Horizontal Resolution: 30 m
Product Size (MB): 35

Lead Invest: Mike Abrams/Roy Welch
Production Mode: on-request
Relative Accuracy: >= 10 m
Units: m

Product Description

This data set contains topographic information derived from the along-track, 15 m ASTER optical stereo data acquired in near infrared bands 3N and 3B. It can be created as a Relative DEM (no ground control) or an Absolute DEM (with ground control, which must be supplied by the user). These high spatial resolution DEMs (up to 7 m absolute horizontal and vertical accuracy with appropriate ground control, and up to 10 m relative accuracy without ground control) can be used to derive absolute slope and slope aspect good to 5 degrees over horizontal distances of more than 100 m. ASTER DEMs should meet 1:50,000 to 1:250,000 map accuracy standards.

This is an on-request product which will be generated by the Land Processes DAAC at EROS Data Center at a rate of one 60 km X 60 km stereo pair/day. Based on simulations of instrument operations, mission planning, cloud cover and illumination, an ASTER digital stereo data set with a base/height ratio of 0.6 should be acquired for all of the Earth's land surface below 82 degrees latitude by the end of the 6 year mission. ASTER stereo pairs also can be processed to DEMs by users operating their own software.

Generation of elevation models from stereo photographic data, now a routine adjunct to standard surveying methods, has been developed over the past 60 years based on the principles of photogrammetry. Extensions of these principles to the generation of DEMs from optical, digital stereo satellite data has been implemented over the past two decades. Examples of these satellite stereo systems include SPOT, JERS-1 OPS, and MOMS. Currently, there are large areas of the globe for which no consistent, high-resolution, widely available elevation models exist. ASTER DEMs will help provide much needed coverage over many of these areas.

Algorithm Description

An autocorrelation approach using commercial software at the Land DAAC will produce DEMs from Level 1A or 1B digital stereo pairs.

Applications

Topographic data as well as derived slope and slope aspect are basic to all aspects of land surface research including; cartography, climate modeling, biogeochemistry, biogeography, geophysics, geology, geomorphology and soil science. Digital elevation data are also required for

atmospheric and radiometric correction of most satellite observations of the land surface. Digital elevation data are also used for practical engineering applications such as studies of drainage and runoff, and site suitability studies for urban development, waste containment, and recreation.

Constraints

This product will be produced using off the shelf commercial software. Absolute accuracy depends on availability of investigator-provided ground control point

SECTION 4: Product Definitions--Common Information

Many metadata attributes are common to all ASTER products. This section describes each of these shared metadata attributes. They are organized according to the hdf component to which they belong.

Note: You won't find the QA_Alert_table component in a product if that table is empty, i.e. if no alerts were generated.

formatted_product_summary

Item	Units	Comments
ASTEROBSERVATIONMODE	none	Observation modes for each sensorgroup (VNIR1, VNIR2, SWIR or TIR)
POINTINGINFO	none	Pointing Angle for the corresponding sensor
GAIN	none	Band number and Gain setting.
QAPERCENTMISSINGDATA	none	Granule level % missing data. This attribute can be repeated for individual parameters within a granule.
QAPERCENTOUTOFBOUNDSDATA	none	Granule level % out of bounds data. This attribute can be repeated for individual parameters within a granule.
QAPERCENTINTERPOLATEDDATA	none	Granule level % interpolated data. This attribute can be repeated for individual parameters within a granule.
AUTOMATICQUALITYFLAG	none	Automatic Quality Flag: Good, Bad or Suspect
SCENECLOUDCOVERAGE	none	Cloud coverage (in %) of the whole scene
QUADRANTCLOUDCOVERAGE	none	Cloud coverage (in %) for each of the 4 quarters of the scene (upper left, upper right, lower left, lower right
INSTRUMENTSHORTNAME	none	The unique identifier of an instrument. (ASTER)
SPATIALRESOLUTION	none	The nominal spatial resolutions of VNIR, SWIR and TIR. (res. of VNIR, res. of SWIR, res. of TIR)
ASTEROPERATIONMODE	none	One of three operation modes: OBSERVATION, CALIBRATION or TEST
WESTBOUNDINGCOORDINATE	none	Pointing Angle for the corresponding sensor Band number and Gain setting Western-most coordinate of the limit of coverage expressed in longitude.
NORTHBOUNDINGCOORDINATE	none	Northern-most limit of coverage expressed in geodetic latitude.
EASTBOUNDINGCOORDINATE	none	Eastern-most coordinate of the limit of coverage expressed in longitude.
SOUTHBOUNDINGCOORDINATE	none	Southern-most limit of coverage expressed in geodetic latitude.
UPPERLEFT	degrees	The coordinates of the upper-left corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
UPPERRIGHT	degrees	The coordinates of the upper-right corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees

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Item	Units	Comments
LOWERLEFT	degrees	The coordinates of the lower-left corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
LOWERRIGHT	degrees	The coordinates of the lower-right corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
SCENECENTER	none	Longitude and latitude of the scene center (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
TIMEOFDAY	GMT	The hour (and optionally minute, or minute and second) of the day. This attribute is used to specify a single point in time covered by a data collection, granule, or event.
CALENDARDATE	none	The year (and optionally month, or month and day). This attribute is used to specify a single date covered by a data collection, granule, or event.
GEOMETRICDBVERSION	none	The version information of the geometric correction data (Version, Issuancedate,
RADIOMETRICDBVERSION	none	The version information of the radiometric correction data (Version, Issuancedate,
COARSEDEMVERSION	none	The version information of the coarse DEM database (Version, Issuancedate, comments)
SIZEMBECSDATAGRANULE	none	The size attribute will indicate the volume of data contained in the granule.
REPROCESSINGACTUAL	none	Granule level, stating what reprocessing has been performed on this granule.
PGEVERSION	none	Version of PGE, updated whenever code or any static is input in the Delivered Algorithm Package.
PROCESSLEVELID	none	This attribute reflects the classification of the science data processing level, which defines in general terms the characteristics of the output of the processing performed.
RECEIVINGCENTER	none	"EDOS", fixed value
PROCESSINGCENTER	none	Name of the facility where the granule was processed.
SOURCEDATAPRODUCT	none	Information about the input data used to generate the L1B product
SCENEORIENTATIONANGLE	degrees	The angle of the clockwise rotation from Y-axis of the map projected coordinates at ascending, within the range [-90.0, 90.0]
MAPPROJECTIONNAME	none	The name of the systematic representation of all or part of the surface of the Earth on a plane or developable surface.
SOLARDIRECTION	none	The sun direction as seen from the scene center.(az, el)

formatted_product_summary

Item	Units	Comments
ASTERSCENEID	none	The scene identifier defined by path, row and view
QAALERTSUMMARY	none	Summary info for all alerts fired by running the PGE with this granule.
BANDSCALEFACTORS	none	Array of scale factors with which to multiply the DN values in the data swath to calculate the science paramter value.

productmetadata.0

Item	Units	Comments
SensorName	none	VNIR, SWIR or TIR
PointingAngle	degrees	Pointing Angle for the corresponding sensor
SettingTimeofPointing	GMT	Date and time that the pointing was performed.
Gain	none	Band number and Gain setting
ASTERObservationMode	none	Observation modes for each sensorgroup (VNIR1, VNIR2, SWIR or TIR)
IDofASTERGDSDataGranule	none	Unique identifier for location of a data granule held in ASTER GDS.
ReceivingCenter	none	EDOS, fixed value
ProcessingCenter	none	Name of the facility where the granule was processed.
GenerationDateandTime	GMT	Date and time that the granule was created.
GeometricDBVersion	none	The version information of the geometric correction data (Version, Issuancedate,
RadiometricDBVersion	none	The version information of the radiometric correction data (Version, Issuancedate,
CoarseDEMVersion	none	The version information of the coarse DEM database (Version, Issuancedate, comments)
SceneCloudCoverage	none	Cloud coverage (in %) of the whole scene
QuadrantCloudCoverage	none	Cloud coverage (in %) for each of the 4 quarters of the scene (upper left, upper right, lower left, lower right)
SourceDataProduct	none	Information about the input data used to generate the L1B product
ASTEROperationMode	none	One of three operation modes: OBSERVATION, CALIBRATION or TEST
ProcessedBands	none	Observation modes for each sensorgroup (VNIR1, VNIR2, SWIR or TIR) A string indicating which bands were processed, Processed bands are indicted by a band number. 'XX' is used to mark bands which were NOT processed. Example '01023N3BXXXXXXXXXXXXXXXXXXXXX'
ASTERSceneID	none	The scene identifier defined by path, row and view
OrbitNumber	none	The orbit number of the satellite, when data is acquired.(path, row, view)
RecurrentCycleNumber	none	The satellite recurrent cyclenumber and the revolution number in the cycle (cycle,

productmetadata.0

Item	Units	Comments
FlyingDirection	none	The satellite flight direction when observation is done. `AS': ascending direction. `DE': descending direction
SolarDirection	degrees	The sun direction as seen from the scene center.(az, el)
SpatialResolution	m	The nominal spatial resolutions of VNIR, SWIR and TIR. (res. of VNIR, res. of SWIR, res. of TIR)
UpperLeft	degrees	The coordinates of the upper-left corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
UpperRight	degrees	The coordinates of the upper-right corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
LowerLeft	degrees	The coordinates of the lower-left corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
LowerRight	degrees	The coordinates of the lower-right corner of the scene. (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
SceneCenter	degrees	Longitude and latitude of the scene center (lat, long) where, lat: geodetic latitude long: geodetic longitude in degrees
SceneOrientationAngle	degrees	The angle of the clockwise rotation from Y-axis of the map projected coordinates at ascending, within the range [-90.0, 90.0]
BandScaleFactors	none	Array of scale factors with which to multiply the DN values in the data swath to calculate the science paramter value.

coremetadata.0

Item	Units	Comments
AutomaticQualityFlagExplanation	none	More detail explaining Automatic Quality Flag
AutomaticQualityFlag	none	Automatic Quality Flag: Good, Bad or Suspect
OperationalQualityFlagExplanation	none	more detail explaining setting of Operational Quality Flag
OperationalQualityFlag	none	passed, failed, "being investigated"
ParameterName	none	The measured science parameter expressed in the data granule
GRingPointLongitude	degrees	The longitude (decimal degrees) of a point of the G-ring.
GRingPointLatitude	degrees	The geodetic latitude (decimal degrees) of a point of the G-ring.
GRingPointSequenceNo	none	Value denotes the numerical sequence position of a G-Ring point.
ExclusionGRingFlag	none	Flag which determines if the coordinates represent the Outer or Exclusion G-Ring.
FutureReviewDate	none	Date of next planned QA peer review.
ScienceReviewDate	none	Date of last QA peer review.
QAPercentMissingData	none	Granule level % missing data. This attribute can be repeated for individual parameters within a granule.
QAPercentCloudCover	none	This attribute is used to characterize the cloud cover amount of a granule.
QAPercentOutofBoundsData	none	Granule level % out of bounds data. This attribute can be repeated for individual parameters within a granule.
QAPercentInterpolatedData	none	Granule level % interpolated data. This attribute can be repeated for individual parameters within a granule.
AdditionalAttributeName	none	Name of a Product Specific Attribute
ParameterValue	none	Value of a Product Specific Attribute
LocalGranuleID	none	Unique identifier for locally produced granule that ECS ingests and is required to capture.
ShortName	none	This is the official reference name used in identifying the contents of the data collection.
VersionID	none	Version identifier of the data collection.
SizeMBECSDataGranule	none	The size attribute will indicate the volume of data contained in the granule.

coremetadata.0

Item	Units	Comments
DayNightFlag	none	This attribute is used to identify if a granule was collected during the day, night (between sunset and sunrise) or both.
InputPointer	none	The measured science parameter expressed in the data granule. Data model logical reference to Input Granule(s).
PlatformShortName	none	The unique platform name. (Terra)
InstrumentShortName	none	The unique identifier of an instrument. (ASTER)
WestBoundingCoordinate	none	Western-most coordinate of the limit of coverage expressed in longitude.
NorthBoundingCoordinate	none	Northern-most limit of coverage expressed in geodetic latitude.
EastBoundingCoordinate	none	Eastern-most coordinate of the limit of coverage expressed in longitude.
SouthBoundingCoordinate	none	Southern-most limit of coverage expressed in geodetic latitude.
TimeofDay	none	The hour (and optionally minute, or minute and second) of the day. This attribute is used to specify a single point in time covered by a data collection, granule, or event.
CalendarDate	none	The year (and optionally month, or month and day). This attribute is used to specify a single date covered by a data collection, granule, or event.
ReprocessingActual	none	Granule level, stating what reprocessing has been performed on this granule.
PGEVersion	none	Version of PGE, updated whenever code or any static is input in the Delivered Algorithm Package.
ProcessLevelID	none	This attribute reflects the classification of the science data processing level, which defines in general terms the characteristics of the output of the processing performed.
MapProjectionName	none	The name of the systematic representation of all or part of the surface of the Earth on a plane or developable surface.

QA_alert_table

Item	Units	Comments
QAStatNumTempOOR	none	The number of pixels with a possible but out-of-range temperature
QAStatNumAddlBadPixels	none	The additional number of bad pixels added by L2 processing.
QAStatNumPixAllBndsOOR	none	The number of pixels where all bands exceed their critical values
QAStatLUTExtrpReqd	none	The atmospheric correction required extrapolation of the LUT
QAStatPctFailPixels	none	The % of pixels for which the algorithm fails
QAStatPctBadPixels	none	The % of pixels that are bad in the output product
QAStatPctHiUncertPixels	none	The % of pixels with high uncertainty values
QAAlertNumTempImposs	none	Summary Statistic QAStatNumTempImposs exceeded threshold value and triggered this
QAAlertNumTempOOR	none	Summary Statistic QAStatNumTempOOR exceeded threshold value and triggered this alert
QAAlertOffDiagElemOOR	none	Any off-diagonal input correlation matrix element is greater than or equal to one
QAAlertEigenvalOOR	none	Any of the three eigenvalues is less than a threshold value
QAAlertOffDiagInpLTLim	none	An off-diagonal input correlation matrix element is less than a threshold value
QAAlertNumAddlBadPixels	none	Summary Statistic QAStatNumAddlBadPixels exceeded threshold value and triggered this alert
QAAlertNumPixAllBndsOOR	none	Summary Statistic QAStatNumPixAllBndsOOR exceeded threshold value and triggered this alert
QAAlertLUTExtrpReqd	none	The atmospheric correction required extrapolation of the LUT
QAAlertPctFailPixels	none	Summary Statistic QAStatPctFailPixels exceeded threshold value and triggered this alert
QAAlertPctBadPixels	none	Summary Statistic QAStatPctBadPixels exceeded threshold value and triggered this alert
QAAlertPctHiUncertPixels	none	Summary Statistic QAStatPctHiUncertPixels exceeded threshold value and triggered this
QACritAlertsCnt	none	Here are the Alert-related Product Specific Attributes (PSA) Number of Critical Alerts triggered
QANonCritAlertsCnt	none	Number of Non-Critical Alerts triggered
QASummaryOfAlerts	none	Summary information for all alerts triggered during the processing of this granule.

level_1_carryover

Item	Units	Comments
PROCESSINGCENTER	none	Name of the facility where the granule was processed.
GENERATIONDATEANDTIME	GMT	Date and time that the granule was created.
SOURCEDATAPRODUCT	none	Information about the input data used to generate the L1B product
PROCESSEDBANDS	none	A string indicating which bands were processed, Processed bands are indicted by a band number. 'XX' is used to mark bands which were NOT processed. Example '01023N3BXXXXXXXXXXXXXXXXXXXXX' indicates ALL VNIR bands and none of the SWIR or TIR bands
IDOFASTERGDSDATAGRANULE	none	Unique identifier for location of a data granule held in ASTER GDS.
CORINTEL1	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA1	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD1	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD1	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS1	none	Parameters used in GCTP Map projection
UTMZONECODE1	none	Zone code for UTM projection
CORINTEL2	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA2	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD2	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD2	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS2	none	Parameters used in GCTP Map projection
UTMZONECODE2	none	Zone code for UTM projection
CORINTEL3N	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'

level_1_carryover

Item	Units	Comments
CORPARA3N	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD3N	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD3N	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS3N	none	Parameters used in GCTP Map projection
UTMZONECODE3N	none	Zone code for UTM projection
CORINTEL3B	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA3B	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD3B	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD3B	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS3B	none	Parameters used in GCTP Map projection
UTMZONECODE3B	none	Zone code for UTM projection
CORINTEL4	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA4	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD4	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD4	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS4	none	Parameters used in GCTP Map projection
UTMZONECODE4	none	Zone code for UTM projection
CORINTEL5	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA5	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'

level_1_carryover

Item	Units	Comments
RESMETHOD5	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD5	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS5	none	Parameters used in GCTP Map projection
UTMZONECODE5	none	Zone code for UTM projection
CORINTEL6	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA6	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD6	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD6	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS6	none	Parameters used in GCTP Map projection
UTMZONECODE6	none	Zone code for UTM projection
CORINTEL7	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA7	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD7	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD7	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS7	none	Parameters used in GCTP Map projection
UTMZONECODE7	none	Zone code for UTM projection
CORINTEL8	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA8	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD8	none	Resampling Method:'BL' or 'NN' or 'CC'

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Item	Units	Comments
MPMETHOD8	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS8	none	Parameters used in GCTP Map projection
UTMZONECODE8	none	Zone code for UTM projection
CORINTEL9	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA9	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD9	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD9	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS9	none	Parameters used in GCTP Map projection
UTMZONECODE9	none	Zone code for UTM projection
CORINTEL10	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA10	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD10	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD10	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS10	none	Parameters used in GCTP Map projection
UTMZONECODE10	none	Zone code for UTM projection
CORINTEL11	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA11	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD11	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD11	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'

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Item	Units	Comments
PROJECTIONPARAMETERS11	none	Parameters used in GCTP Map projection
UTMZONECODE11	none	Zone code for UTM projection
CORINTEL12	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA12	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD12	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD12	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS12	none	Parameters used in GCTP Map projection
UTMZONECODE12	none	Zone code for UTM projection
CORINTEL13	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA13	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD13	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD13	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS13	none	Parameters used in GCTP Map projection
UTMZONECODE13	none	Zone code for UTM projection
CORINTEL14	none	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
CORPARA14	none	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
RESMETHOD14	none	Resampling Method:'BL' or 'NN' or 'CC'
MPMETHOD14	none	Map Projection Method:'UTM', 'PS', 'LAMCC', 'SOM' or 'EQRECT'
PROJECTIONPARAMETERS14	none	Parameters used in GCTP Map projection

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Item	Units	Comments
UTMZONECODE14	none	Zone code for UTM projection
SCENECLOUDCOVERAGE	none	The percentage of cloud coverage for the whole scene.
QUADRANTCLOUDCOVERAGE	none	The percentage for 4 quarters of a scene.(qcul, qcur, qcll, qclr) where,qcul: upper left qcur: upper rightqcll: lower left qclr: lower right
NUMBEROFBADPIXELS1	none	The actual bad pixel lists are in the badpixelinfo attribute The number of bad pixels in the L1B band 1 image
NUMBEROFBADPIXELS2	none	The number of bad pixels in the L1B band 2 image
NUMBEROFBADPIXELS3N	none	The number of bad pixels in the L1B band 3n image
NUMBEROFBADPIXELS3B	none	The number of bad pixels in the L1B band 3b image
NUMBEROFBADPIXELS4	none	The number of bad pixels in the L1B band 4 image
NUMBEROFBADPIXELS5	none	The number of bad pixels in the L1B band 5 image
NUMBEROFBADPIXELS6	none	The number of bad pixels in the L1B band 6 image
NUMBEROFBADPIXELS7	none	The number of bad pixels in the L1B band 7 image
NUMBEROFBADPIXELS8	none	The number of bad pixels in the L1B band 8 image
NUMBEROFBADPIXELS9	none	The number of bad pixels in the L1B band 9 image
NUMBEROFBADPIXELS10	none	The number of bad pixels in the L1B band 10 image
NUMBEROFBADPIXELS11	none	The number of bad pixels in the L1B band 11 image
NUMBEROFBADPIXELS12	none	The number of bad pixels in the L1B band 12 image
NUMBEROFBADPIXELS13	none	The number of bad pixels in the L1B band 13 image
NUMBEROFBADPIXELS14	none	The number of bad pixels in the L1B band 14 image
PROCESSINGFLAG4	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS4	none	The number of measurements
MEASUREMENTPOINTNUMBER4	none	The number of measurement points.

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Item	Units	Comments
AVERAGEOFFSET4	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET4	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD4	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG5	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS5	none	The number of measurements
MEASUREMENTPOINTNUMBER5	none	The number of measurement points.
AVERAGEOFFSET5	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET5	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD5	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG6	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS6	none	The number of measurements
MEASUREMENTPOINTNUMBER6	none	The number of measurement points.
AVERAGEOFFSET6	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET6	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD6	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold

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Item	Units	Comments
PROCESSINGFLAG7	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS7	none	The number of measurements
MEASUREMENTPOINTNUMBER7	none	The number of measurement points.
AVERAGEOFFSET7	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET7	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD7	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG8	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS8	none	The number of measurements
MEASUREMENTPOINTNUMBER8	none	The number of measurement points.
AVERAGEOFFSET8	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET8	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD8	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG9	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS9	none	The number of measurements
MEASUREMENTPOINTNUMBER9	none	The number of measurement points.
AVERAGEOFFSET9	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.

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Item	Units	Comments
STANDARDDEVIATIONOFFSET9	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD9	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PCTIMAGEMATCH4	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF4	none	The Average Correlation Coefficient.
CTHLD4	none	The Correlation Threshold value.
PCTIMAGEMATCH5	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF5	none	The Average Correlation Coefficient.
CTHLD5	none	The Correlation Threshold value.
PCTIMAGEMATCH6	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF6	none	The Average Correlation Coefficient.
CTHLD6	none	The Correlation Threshold value.
PCTIMAGEMATCH7	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF7	none	The Average Correlation Coefficient.
CTHLD7	none	The Correlation Threshold value.
PCTIMAGEMATCH8	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF8	none	The Average Correlation Coefficient.
CTHLD8	none	The Correlation Threshold value.
PCTIMAGEMATCH9	none	The percentage of image matching used in the SWIR parallax correction processing.
AVGCORRELCOEF9	none	The Average Correlation Coefficient.
CTHLD9	none	The Correlation Threshold value.

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Item	Units	Comments
PROCESSINGFLAG10	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS10	none	The number of measurements
MEASUREMENTPOINTNUMBER10	none	The number of measurement points.
AVERAGEOFFSET10	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET10	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD10	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG11	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS11	none	The number of measurements
MEASUREMENTPOINTNUMBER11	none	The number of measurement points.
AVERAGEOFFSET11	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET11	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD11	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG12	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS12	none	The number of measurements
MEASUREMENTPOINTNUMBER12	none	The number of measurement points.
AVERAGEOFFSET12	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.

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Item	Units	Comments
STANDARDDEVIATIONOFFSET12	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD12	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG13	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS13	none	The number of measurements
MEASUREMENTPOINTNUMBER13	none	The number of measurement points.
AVERAGEOFFSET13	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET13	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD13	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold
PROCESSINGFLAG14	none	Processing flag: 0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
NUMBEROFMEASUREMENTS14	none	The number of measurements
MEASUREMENTPOINTNUMBER14	none	The number of measurement points.
AVERAGEOFFSET14	none	Average offset value (LAOset, PAOset) where LAOset: average offset in along track direction. PAOset: average offset in cross track direction.
STANDARDDEVIATIONOFFSET14	none	Standard deviation offset value.(LSDOset, PSDOset) where,LSDOset: SD offset in alongtrack direction.PSDOset: SD offset in cross track direction.
THRESHOLD14	none	Threshold value. (CThld, LOThld, POThld,VOThld) where CThld: Correction threshold, LOThld: offset threshold in along track direction, POThld: offset threshold in cross track direction, VOThld: Vector offset threshold

badpixelinformation

Item	Units	Comments
BadPixelSegments1	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments2	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments3N	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments3B	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments4	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments5	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments6	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments7	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments8	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments9	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments10	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments11	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments12	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments13	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
BadPixelSegments14	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel)
NumberofElement1	none	The number of elements of the list of bad pixels for band 1
NumberofElement2	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 2
NumberofElement3N	none	The number of elements of the list of bad pixels for band 3n
NumberofElement3B	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 3b
NumberofElement4	none	The number of elements of the list of bad pixels for band 4
NumberofElement5	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 5

badpixelinformation

Item	Units	Comments
NumberofElement6	none	The number of elements of the list of bad pixels for band 6
NumberofElement7	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 7
NumberofElement8	none	The number of elements of the list of bad pixels for band 8
NumberofElement9	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 9
NumberofElement10	none	The number of elements of the list of bad pixels for band 10
NumberofElement11	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 11
NumberofElement12	none	The number of elements of the list of bad pixels for band 12
NumberofElement13	none	Location information for each bad pixel element. (Line, First_Bad_Pixel, Last_Bad_Pixel) The number of elements of the list of bad pixels for band 13
NumberofElement14	none	The number of elements of the list of bad pixels for band 14

SECTION 5: Product Definitions--Product-Specific Information

This section describes the metadata that is specific to each product.

Decorrelation stretch

Item	Type	Units	Comments
Data Plane 1	d	none	Stretched image numbers for first input band
Data Plane 2	d	none	Stretched image numbers for second input band
Data Plane 3	d	none	Stretched image numbers for third input band
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
STAT_PIXEL_FREQUENCY	m	none	frequency of pixels (e.g., every 3rd) used to generate statistics.
RTI_START_LINE	m	none	starting line selected for input, default 1
RTI_STOP_LINE	m	none	ending line selected for input, default last line in dataset
RTI_START_PIXEL	m	none	starting pixel selected for input, default 1
RTI_STOP_PIXEL	m	none	ending pixel selected for input, default last pixel in dataset
RTI_START_LAT	m	degrees	starting latitude selected for input, default is whole dataset
RTI_STOP_LAT	m	degrees	ending latitude selected for input, default is whole dataset
RTI_START_LONG	m	degrees	starting longitude selected for input, default is whole dataset
RTI_STOP_LONG	m	degrees	ending longitude selected for input, default is whole dataset
BLUE_BAND	m	none	1st input band
GREEN_BAND	m	none	2nd input band
RED_BAND	m	none	3rd input band
RTI_FIRST_STAT_LINE	m	none	number of 1st line to use for stats
RTI_LAST_STAT_LINE	m	none	number of last line to use for stats
RTI_FIRST_STAT_PIXEL	m	none	number of 1st pixel to use for stats
RTI_LAST_STAT_PIXEL	m	none	number of last pixel to use for stats
RTI_CORR_COVAR_PICK	m	none	"correlation" or "covariance" matrix
RTI_OUTPUT_STDDEV	m	none	scale factor by which all outputs multiplied; standard dev. of outputs

Decorrelation stretch

Item	Type	Units	Comments
RTI_OUTPUT_MEAN	m	none	desired mean of outputs
NUM_STAT_LINES	m	none	number of lines processed in generating statistics.
NUM_STAT_PIXELS	m	none	number of pixels used to generate statistics.
CLOUD_STAT_PIXELS	m	none	number of cloud pixels rejected in gathering stats
BAD_STAT_PIXELS	m	none	number of bad pixels rejected in gathering stats
LINES_PROCESSED	m	none	number of lines processed in stretching image.
GOOD_PIXELS	m	none	number of pixels used in stretching image
CLOUD_PIXELS	m	none	number of cloud pixels rejected in stretching image
BAD_PIXELS	m	none	number of bad pixels rejected in stretching image
BAND_MEANS	m	W/m^2/sr/um	list: estimated means of 3 bands used
BAND_STDDEVS	m	W/m^2/sr/um	list: estimated standard deviations of 3 bands used
COVARIANCE_MATRIX	m	none	list: the 9 elements of the matrix
CORRELATION_MATRIX	m	none	list: the 9 elements of the matrix,
EIGEN_VALUES	m	none	Characteristic values of the correlation/covariance matrix; used to determine the decorrelation stretch factors (see ATBD for details)
EIGEN_VECTORS	m	none	list: the 9 elements of the 3 eigenvectors
TRANSFORM_MATRIX	m	none	list: the 9 elements of the matrix
OFFSET_VECTOR	m	none	subtracted from each output vector
MESSAGES	m	none	processing status messages

Brightness temperature

Item	Type	Units	Comments
Brightness Temperature Band 10	d	degrees C	Brightness Temperature for band 10, hundredths of degrees Celsius (ie, scaled by 100x)
Brightness Temperature Band 11	d	degrees C	Brightness Temperature for band 11, hundredths of degrees Celsius (ie, scaled by 100x)
Brightness Temperature Band 12	d	degrees C	Brightness Temperature for band 12, hundredths of degrees Celsius (ie, scaled by 100x)
Brightness Temperature Band 13	d	degrees C	Brightness Temperature for band 13, hundredths of degrees Celsius (ie, scaled by 100x)
Brightness Temperature Band 14	d	degrees C	Brightness Temperature for band 14, hundredths of degrees Celsius (ie, scaled by 100x)
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
RTI_START_LINE	m	none	starting line selected for input, default 1"
RTI_STOP_LINE	m	none	ending line selected for input, default last line in dataset"
RTI_START_PIXEL	m	none	starting pixel selected for input, default 1"
RTI_STOP_PIXEL	m	none	ending pixel selected for input, default last pixel in dataset"
RTI_START_LAT	m	degrees	starting latitude selected for input, default is whole dataset"
RTI_STOP_LAT	m	degrees	ending latitude selected for input, default is whole dataset"
RTI_START_LONG	m	degrees	starting longitude selected for input, default is whole dataset"
RTI_STOP_LONG	m	degrees	ending longitude selected for input, default is whole dataset"
CLOUD_PIXELS	m	none	number of cloud pixels
PIXELS_SET_MAX	m	none	number of pixels which produced a super-max value on lookup, max reported
PIXELS_SET_MIN	m	none	number of pixels which produced a sub-min value on lookup, min reported
BT_HISTOGRAM1	m	none	histogram of data plane 1 with 1 hundredth degree resolution
BT_HISTOGRAM2	m	none	histogram of data plane 2 with 1 hundredth degree resolution
BT_HISTOGRAM3	m	none	histogram of data plane 3 with 1 hundredth degree resolution
BT_HISTOGRAM4	m	none	histogram of data plane 4 with 1 hundredth degree resolution
BT_HISTOGRAM5	m	none	histogram of data plane 5 with 1 hundredth degree resolution

Surface Reflectance and Surface Radiance (VNIR, SWIR)

Item	Type	Units	Comments
Surface Radiance Band 1	d	W/m^2/sr/um	surface radiance for band 1
Surface Radiance Band 2	d	W/m^2/sr/um	surface radiance for band 2
Surface Radiance Band 3n	d	W/m^2/sr/um	surface radiance for band 3n
Surface Radiance Band 3b	d	W/m^2/sr/um	surface radiance for band 3b
Surface Radiance Band 4	d	W/m^2/sr/um	surface radiance for band 4
Surface Radiance Band 5	d	W/m^2/sr/um	surface radiance for band 5
Surface Radiance Band 6	d	W/m^2/sr/um	surface radiance for band 6
Surface Radiance Band 7	d	W/m^2/sr/um	surface radiance for band 7
Surface Radiance Band 8	d	W/m^2/sr/um	surface radiance for band 8
Surface Radiance Band 9	d	W/m^2/sr/um	surface radiance for band 9
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
QA Data Plane 2	d	none	This data plane is 8 bits per pixel for VNIR, and 16 for SWIR. It contains uncertainty information for each channel. see ASTER Higher-Level Data Product Quality Assessment Plan for details.
RTI_START_LINE	m	none	run time input - starting line selected for input, default 1
RTI_STOP_LINE	m	none	run time input - ending line selected for input, default last line in dataset
RTI_START_PIXEL	m	none	run time input - starting pixel selected for input, default 1
RTI_STOP_PIXEL	m	none	run time input - ending pixel selected for input, default last pixel in dataset
RTI_STOP_LAT	m	degrees	run time input - ending latitude selected for input, default is whole dataset
RTI_START_LONG	m	degrees	run time input - starting longitude selected for input, default is whole dataset
RTI_STOP_LONG	m	degrees	run time input - ending longitude selected for input, default is whole dataset
RTI_AEROSOL_OD_SRC	m	none	run time input - requested source: aerosol optical depth
RTI_MOLECULAR_OD_SRC	m	none	run time input - requested source: molecular optical depth

Surface Reflectance and Surface Radiance (VNIR, SWIR)

Item	Type	Units	Comments
RTI_JUNGE_SRC	m	none	run time input - requested source: junge parameter
RTI_SSA_SRC	m	none	run time input - requested source: aerosol single scatter albedo
RTI_LUT_VERS	m	none	run time input - which version of look up table to use
RTI_MODTRAN_VERS	m	none	run time input - which version of modtran to use
RTI_M_O3_SRC	m	none	run time input - requested source: columnar ozone profile
RTI_M_O2_SRC	m	none	run time input - requested source: columnar oxygen profile
RTI_M_CO2_SRC	m	none	run time input - requested source: columnar carbon dioxide profile
RTI_M_H2O_SRC	m	none	run time input - requested source: columnar water vapor profile
RTI_M_TEMP_SRC	m	none	run time input - requested source: temperature profile
RTI_M_PRES_SRC	m	none	run time input - requested source: pressure profile
RTI_DEM_SRC	m	none	run time input - requested source: digital elevation model
MASK_USED	m	none	whether or not mask was used
AEROSOL_OD_SRC	m	none	source used for this product: aerosol optical depth
AEROSOL_OD_RES	m	m	resolution of source: aerosol optical depth
AEROSOL_OD_MEAN	m	none	mean for entire scene: aerosol optical depth
AEROSOL_OD_STDEV	m	none	standard deviation (of samples in scene): aerosol optical depth
AEROSOL_OD_UNCERT	m	none	uncertainty estimate for each sample: aerosol optical depth
JUNGE_SRC	m	none	source used for this product: junge parameter (size distribution)
JUNGE_RES	m	m	resolution of source: junge parameter
JUNGE_MEAN	m	none	mean for entire scene: junge parameter
JUNGE_STDEV	m	none	standard deviation (of samples in scene): junge parameter
JUNGE_UNCERT	m	none	uncertainty estimate for each sample: junge parameter

Surface Reflectance and Surface Radiance (VNIR, SWIR)

Item	Type	Units	Comments
MOLECULAR_OD_SRC	m	none	source used for this product: molecular optical depth
MOLECULAR_OD_RES	m	m	resolution of source: molecular optical depth
MOLECULAR_OD_MEAN	m	none	mean for entire scene: molecular optical depth
MOLECULAR_OD_STDEV	m	none	standard deviation (of samples in scene): molecular optical depth
MOLECULAR_OD_UNCERT	m	none	uncertainty estimate for each sample: molecular optical depth
AEROSOL_SSA_SRC	m	none	source used for this product: aerosol single scatter albedo
AEROSOL_SSA_RES	m	m	resolution of source: aerosol single scatter albedo
AEROSOL_SSA_MEAN	m	none	mean for entire scene: aerosol single scatter albedo
AEROSOL_SSA_STDEV	m	none	standard deviation: aerosol single scatter albedo
AEROSOL_SSA_UNCERT	m	none	uncertainty estimate for each sample: aerosol single scatter albedo
MODTRAN_O3_SRC	m	none	source used for this product: columnar ozone profile
MODTRAN_O3_RES	m	m	x-y resolution of source: columnar ozone profile
MODTRAN_O3_LEVELS	m	none	list of altitude levels in profile: columnar ozone profile
MODTRAN_O3_UNCERT	m	none	uncertainty estimate for each sample: columnar ozone profile
MODTRAN_O2_SRC	m	none	source used for this product: columnar oxygen profile
MODTRAN_O2_RES	m	none	x-y resolution of source: columnar oxygen profile
MODTRAN_O2_LEVELS	m	none	list of altitude levels in profile: columnar oxygen profile
MODTRAN_O2_UNCERT	m	none	uncertainty estimate for each sample: columnar oxygen profile
MODTRAN_CO2_SRC	m	none	source used for this product: columnar carbon dioxide profile
MODTRAN_CO2_RES	m	none	x-y resolution of source: columnar carbon dioxide profile
MODTRAN_CO2_LEVELS	m	none	list of altitude levels in profile: columnar carbon dioxide profile
MODTRAN_CO2_UNCERT	m	none	uncertainty estimate for each sample: columnar carbon dioxide profile

Surface Reflectance and Surface Radiance (VNIR, SWIR)

Item	Type	Units	Comments
MODTRAN_H2O_SRC	m	none	source used for this product: columnar water vapor profile
MODTRAN_H2O_RES	m	m	x-y resolution of source: columnar water vapor profile
MODTRAN_H2O_LEVELS	m	none	list of altitude levels in profile: columnar water vapor profile
MODTRAN_H2O_UNCERT	m	none	uncertainty estimate for each sample: columnar water vapor profile
MODTRAN_TEMP_SRC	m	none	source used for this product: temperature profile
MODTRAN_TEMP_RES	m	m	x-y resolution of source: temperature profile
MODTRAN_TEMP_LEVELS	m	none	list of altitude levels in profile: temperature profile
MODTRAN_TEMP_UNCERT	m	none	uncertainty estimate for each sample: temperature profile
MODTRAN_PRES_SRC	m	none	source used for this product: pressure profile
MODTRAN_PRES_RES	m	m	x-y resolution of source: pressure profile
MODTRAN_PRES_LEVELS	m	none	list of altitude levels in profile: pressure profile
MODTRAN_PRES_UNCERT	m	none	uncertainty estimate for each sample: pressure profile
DEM_SRC	m	none	source of dem
DEM_RES	m	m	resolution of dem
DEM_MIN_ELEVATION	m	m	minimum elevation (for entire scene)
DEM_MAX_ELEVATION	m	m	maximum elevation in scene
DEM_ELEVATION_UNCERT	m	m	uncertainty of dem (pixel avg.)
DEM_MIN_SLOPE	m	degrees	minimum elevation (for entire scene)
DEM_MAX_SLOPE	m	degrees	maximum elevation in scene
DEM_SLOPE_UNCERT	m	degrees	uncertainty of dem (pixel avg.)

Surface Radiance (TIR)

Item	Type	Units	Comments
Surface Radiance Band 10	d	W/m^2/sr/um	surface radiance for band 10
Surface Radiance Band 11	d	W/m^2/sr/um	surface radiance for band 11
Surface Radiance Band 12	d	W/m^2/sr/um	surface radiance for band 12
Surface Radiance Band 13	d	W/m^2/sr/um	surface radiance for band 13
Surface Radiance Band 14	d	W/m^2/sr/um	surface radiance for band 14
Sky Irradiance Band 10	d	W/m^2/um	sky irradiance for band 10
Sky Irradiance Band 11	d	W/m^2/um	sky irradiance for band 11
Sky Irradiance Band 12	d	W/m^2/um	sky irradiance for band 12
Sky Irradiance Band 13	d	W/m^2/um	sky irradiance for band 13
Sky Irradiance Band 14	d	W/m^2/um	sky irradiance for band 14
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
QA Data Plane 2	d	none	Contains uncertainty information for each channel, and also whether the pixel is good/not good for each channel. see ASTER Higher-Level Data Product Quality Assessment Plan for details.
RTI_START_LINE	m	none	run time input - starting line selected for input, default 1
RTI_STOP_LINE	m	none	run time input - ending line selected for input, default last line in dataset
RTI_START_PIXEL	m	none	run time input - starting pixel selected for input, default 1
RTI_STOP_PIXEL	m	none	run time input - ending pixel selected for input, default last pixel in dataset
RTI_START_LAT	m	degrees	run time input - starting latitude selected for input, default is whole dataset
RTI_STOP_LAT	m	degrees	run time input - ending latitude selected for input, default is whole dataset
RTI_START_LONG	m	degrees	run time input - starting longitude selected for input, default is whole dataset run time input - starting longitude
RTI_STOP_LONG	m	degrees	run time input - ending longitude selected for input, default is whole dataset
RTI_AER_SRC	m	none	run time input - requested source modtran aerosol parameters

Surface Radiance (TIR)

Item	Type	Units	Comments
RTI_MODTRAN_VERS	m	none	run time input - which version of modtran to use
RTI_M_O3_SRC	m	none	run time input - requested source columnar ozone profile
RTI_M_CO2_SRC	m	none	run time input - requested source columnar carbon dioxide profile
RTI_M_H2O_SRC	m	none	run time input - requested source columnar water vapor profile
RTI_M_TEMP_SRC	m	none	run time input - requested source temperature profile
RTI_M_PRES_SRC	m	none	run time input - requested source pressure profile
RTI_DEM_SRC	m	none	run time input - requested source digital elevation model
MASK_USED	m	none	whether or not mask was used
AEROSOL_OD_SRC	m	none	source used for this product aerosol optical depth
AEROSOL_OD_RES	m	m	resolution of source aerosol optical depth
AEROSOL_OD_MEAN	m	none	mean for entire scene aerosol optical depth
AEROSOL_OD_STDEV	m	none	standard deviation (of samples in scene) aerosol optical depth
AEROSOL_OD_UNCERT	m	none	uncertainty estimate for each sample aerosol optical depth
MODTRAN_ALT_LEVELS	m	none	list of altitude levels for profile data
MODTRAN_O3_SRC	m	none	source used for this product columnar ozone profile
MODTRAN_O3_RES	m	m	x-y resolution of source columnar ozone profile
MODTRAN_O3_UNCERT	m	none	uncertainty estimate for each sample columnar ozone profile
MODTRAN_H2O_SRC	m	none	source used for this product columnar water vapor profile
MODTRAN_H2O_RES	m	m	x-y resolution of source columnar water vapor profile
MODTRAN_H2O_UNCERT	m	none	uncertainty estimate for each sample columnar water vapor profile
MODTRAN_TEMP_SRC	m	none	source used for this product temperature profile
MODTRAN_TEMP_RES	m	m	x-y resolution of source temperature profile

Surface Radiance (TIR)

Item	Type	Units	Comments
MODTRAN_TEMP_UNCERT	m	none	uncertainty estimate for each sample temperature profile
MODTRAN_PRES_SRC	m	none	source used for this product pressure profile
MODTRAN_PRES_RES	m	m	x-y resolution of source pressure profile
MODTRAN_PRES_UNCERT	m	none	uncertainty estimate for each sample pressure profile
DEM_SRC	m	none	source of dem
DEM_RES	m	m	resolution of dem
DEM_MIN	m	m	minimum elevation (for entire scene)
DEM_MAX	m	m	maximum elevation in scene
DEM_UNCERT	m	none	uncertainty of dem (pixel avg.)

Surface Emissivity

Item	Type	Units	Comments
Emissivity for Band 10	d	none	Emissivities for band 10
Emissivity for Band 11	d	none	Emissivities for band 11
Emissivity for Band 12	d	none	Emissivities for band 12
Emissivity for Band 13	d	none	Emissivities for band 13
Emissivity for Band 14	d	none	Emissivities for band 14
Normalizing Band	d	none	Band whose temperature was used to generated normalized emissivities.
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
QA Data Plane 2	d	none	Contains the error status for each band, as well E_MAX, number of iterations, and the ratio of Sky Irradiance to Land-Leaving Radiance. see ASTER Higher-Level Data Product Quality Assessment Plan for details.
MIN_FORMULA	m	none	formula for minimum emissivity as a function of the standard deviation of emissivity
C1_RADIATION_CONSTANT	m	W*m^2	value: 3.74151 * 10^16
C2_RADIATION_CONSTANT	m	m*degK	value: .0143879
NUM_PIXELS_SET_MIN	m	none	nums of pixels set to the minimum emissivity value, 1 for each plane 1-5
NUM_PIXELS_SET_MAX	m	none	nums of pixels set to the maximum emissivity value, 1 for each plane 1-5
MAX_ITERATIONS	m	none	max iterations of main loop (comp. emiss, correct for sky) done
FIRST_DIFF_TOLERANCE	m	none	first difference in sequence of radiances, used to decide to stop main loop
SECOND_DIFF_TOLERANCE	m	none	threshold in 2nd difference in sequence of radiances, used to
FIRST_DELTA_SAMPLES	m	none	number of points in sequence from which to compute first deltas
VARIANCE_THRESHOLD	m	none	triggers computation of max. emissivity to use in computing normalized emissivities
FIRST_DERIV_THRESHOLD	m	none	used to determine whether to use computed max. emissivity value
CALCED_VARIANCE_THRESHOL	m	none	on minimum variance calculated by function generated to express max. emissivity vs. variance curve

Surface Emissivity

Item	Type	Units	Comments
INITIAL_PARABALOID	m	none	Fit 2nd-order polynomial to emis. estimate vs. e-spectum variance (see ATBD for details)
IRRAD_CORRECTION_E_MAX	m	none	to evaluate in generating max. emissivity when correcting for sky irradiance,
DATA_PLANES_DESCRIPTION	m	none	description of emissivity planes 1-5
LAST_PLANE_DESCRIPTION	m	none	description of high temperature band plane
BAND10_EMIS_HIST	m	none	histogram of emmisivities in channel 10, binned at .001
BAND11_EMIS_HIST	m	none	histogram of emmisivities in channel 11, binned at .001
BAND12_EMIS_HIST	m	none	histogram of emmisivities in channel 12, binned at .001
BAND13_EMIS_HIST	m	none	histogram of emmisivities in channel 13, binned at .001
BAND14_EMIS_HIST	m	none	histogram of emmisivities in channel 14, binned at .001
E_MAX_INTERVALS	m	none	Maximum emissivity intervals
NO_OF_ITERATIONS_INTERVALS	m	none	Number of iteration intervals
IRRADIANCE_RATIO_INTERVALS	m	none	irradiance ratio intervals

Surface Kinetic Temperature

Item	Type	Units	Comments
Temperature	d	tenths of degs	Temperatures
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
QA Data Plane 2	d	none	Contains the Accuracy and Precision for each pixel, as well as the band used for calculating the reported temperature. Also contains E_MAX, Number of Iterations, and ratio of Sky Irradiance to Land Leaving radiance. See QA Plan for details.
MIN_FORMULA	m	none	formula for minimum emissivity as a
C1_RADIATION_CONSTANT	m	W*m^2	function of the standard deviation of emissivity ratios. value: 3.74151 * 10^16
C2_RADIATION_CONSTANT	m	m*degK	value: .0143879
NUM_PIXELS_SET_MIN	m	none	nums of pixels set to the minimum emissivity value, 1 for each plane 1-5
NUM_PIXELS_SET_MAX	m	none	nums of pixels set to the maximum emissivity value, 1 for each plane 1-5
MAX_ITERATIONS	m	none	max iterations of main loop (comp. emiss, correct for sky) done
FIRST_DIFF_TOLERANCE	m	none	first difference in sequence of radiances, used to decide to stop main loop
SECOND_DIFF_TOLERANCE	m	none	threshold in 2nd difference in sequence of radiances, used to
FIRST_DELTA_SAMPLES	m	none	number of points in sequence from which to compute first deltas
VARIANCE_THRESHOLD	m	none	triggers computation of max. emissivity to use in computing normalized emissivities
FIRST_DERIV_THRESHOLD	m	none	used to determine whether to use computed max. emissivity value
CALCED_VARIANCE_THRESHOL	m	none	on minimum variance calculated by function generated to express max. emissivity vs. variance curve
INITIAL_PARABALOID	m	none	Fit 2nd-order polynomial to emis. estimate vs. e-spectum variance (see ATBD for details)
IRRAD_CORRECTION_E_MAX	m	none	when correcting for sky irradiance, this value always used to calculate normalized emissivities
PLANE1_DESCRIPTION	m	none	description of temperature data plane (plane 1)
LAST_PLANE_DESCRIPTION	m	none	description of high temperature band plane
BAND10_EMIS_HIST	m	none	histogram of emissivities in channel 10, binned at .001

Surface Kinetic Temperature

Item	Type	Units	Comments
BAND11_EMIS_HIST	m	none	histogram of emissivities in channel 11, binned at .001
BAND12_EMIS_HIST	m	none	histogram of emissivities in channel 12, binned at .001
BAND13_EMIS_HIST	m	none	histogram of emissivities in channel 13, binned at .001
BAND14_EMIS_HIST	m	none	histogram of emissivities in channel 14, binned at .001
TEMPERATURE_HIST	m	none	histogram of plane 1, binned at tenths of deg k
E_MAX_INTERVALS	m	none	Maximum emissivity intervals
NO_OF_ITERATIONS_INTERVALS	m	none	Number of iteration intervals
IRRADIANCE_RATIO_INTERVALS	m	none	irradiance ratio intervals
TEMP_ACCURACY_INTERVALS	m	none	Temperature accuracy intervals
TEMP_PRECISION_INTERVALS	m	none	Temperature precision intervals

Digital Elevation Model (DEM)

Item	Type	Units	Comments
DEM	d	m	The Digital Elevation Model.
QA Data Plane 1	d	none	Contains good, bad, suspect, and cloud information for each pixel; see ASTER Higher-Level Data Product Quality Assessment Plan for details
QA Data Plane 2	d	none	Contains the correlation coefficient between 3N and 3B. see ASTER Higher-Level Data Product Quality Assessment Plan for details.
DEMType	m	none	Flag indicating whether the DEM is relative or absolute.
QualityRating	m	none	Operator specified quality rating (VeryGood, Excellent, Good, Fair, Poor)
DEMCorrelationSuccessPercent	m	percent	The percentage of successful pixels (as opposed to failed pixels) from the DEM extraction process.
DEMCorrelationMethod	m	none	Type of correlation method used in extracting the DEM….the DEM extraction always uses mean normalized correlation so value is always "M"
DEMElevationMin	m	m	The minimum elevation in the scene.
DEMElevationMax	m	m	The maximum elevation in the scene
EditFilterType	m	none	Type of filter applied by the user during 2D DEM editing. ("N" for noise removal;"E" for erode holes;"S" for smoothing;"M" for median)
CellSpacing	m	m	The distance between DEM postings.
OrderID	m	none	ECS-Assigned order ID for DEM request.
GCPNumberProvided	m	none	The number of GCPs that were provided
GCPProviderComments	m	none	Any comments on the GCPs by the provider
GCPSourceAccuracyXYZ	m	m	The accuracy of the GCP in X, Y, and Z directions
GCPSourceType	m	none	Flag indicating source of GCP (GPS, Map, Photogrammetry, or Survey)
GCPDatum	m	none	Horizontal datum of the GCPs (NAD83 for scenes lying in the Continental US and Canada; WGS84 for all other areas)
GCPID	m	none	An individual GCP's identifier.
FeatureType	m	none	The type of feature associated with the GCP, such as road intersection.
GCPPositionLat	m	see comment	Latititude of the GCP (Lat/Lon using degrees/minutes/seconds, or UTM)

Digital Elevation Model (DEM)

Item	Type	Units	Comments
GCPPositionLon	m	see comment	Longitude of the GCP (Lat/Lon using degrees/minutes/seconds, or UTM)
GCPPositionElev	m	m	Elevation of the GCP
GCPXLocation3N	m	none	Identifies the sample number in the 3N image of the pixel associated with the GCP
GCPYLocation3N	m	none	Identifies the line number in the 3N image of the pixel associated with the GCP
GCPXLocation3B	m	none	Identifies the sample number in the 3B image of the pixel associated with the GCP
GCPYLocation3B	m	none	Identifies the line number in the 3B image of the pixel associated with the GCP

APPENDIX A: Contents of "formatted_product_summary"

Instrument and Spacecraft

- Instrument Short Name
- Spatial Resolution (by telescope)
- ASTER Observation Mode (which telescopes are on)
- Pointing Angles (by telesope, including time of pointing)
- Gain (by band)

Spatial

- Scene Four Corners
  - Upper Left
  - Upper Right
  - Lower Left
  - Lower Right
- Scene Center

Temporal

- Time of Day (of acquisition)
- Calendar Date (of acquisition)

Quality

- QA Percent Missing Data
- QA Percent Out of Bounds Data
- QA Percent Interpolated Data
- Automatic QA Flag
- Scene Cloud Coverage
- Quadrant Cloud Coverage
  - Upper left
  - Upper right
  - Lower left
  - Lower right
- QA Alert Table

Calibration

- Geometric DB Version
- Radiometric DB Version
- Coarse DEM Version (used for SWIR parallax correction)

Processing

- PGE Version (version of software used)
- Receiving Center
- Processing Center
- Source Data Product (the associated Level 1 product)

Scene

Scene Orientation Angle (rotation of scene axis relative to North)
Map Projection
Solar Direction
    Azimith
    Elevation
Band Scale Factors

Product-Specific (varies by product)

Level 1 Carryover

A copy of the metadata from the associated Level 1 product--except for bad pixel information which is provided separately (next item)

Level 1 Bad Pixel Information

Number of Bad Pixels (by band)
List of Bad Pixels (by band)

APPENDIX B: Metadata Cross Reference Table

If you know the name of a metadata attribute, but don't know which hdf attribute contains it, use this table to find out. (Please ignore case--sometimes an item is represented in all upper case, sometimes in mixed or lower case.)

Attribute Name	Location
AdditionalAttributeName	coremetadata.0
ASTEROBSERVATIONMODE	formatted_product_summary
ASTERObservationMode	productmetadata.0
ASTEROPERATIONMODE	formatted_product_summary
ASTEROperationMode	productmetadata.0
ASTERSCENEID	formatted_product_summary
ASTERSceneID	productmetadata.0
AUTOMATICQUALITYFLAG	formatted_product_summary
AutomaticQualityFlag	coremetadata.0
AutomaticQualityFlagExplanation	coremetadata.0
AVERAGEOFFSET10	level_1_carryover
AVERAGEOFFSET11	level_1_carryover
AVERAGEOFFSET12	level_1_carryover
AVERAGEOFFSET13	level_1_carryover
AVERAGEOFFSET14	level_1_carryover
AVERAGEOFFSET4	level_1_carryover
AVERAGEOFFSET5	level_1_carryover
AVERAGEOFFSET6	level_1_carryover
AVERAGEOFFSET7	level_1_carryover
AVERAGEOFFSET8	level_1_carryover
AVERAGEOFFSET9	level_1_carryover
AVGCORRELCOEF4	level_1_carryover
AVGCORRELCOEF5	level_1_carryover
AVGCORRELCOEF6	level_1_carryover
AVGCORRELCOEF7	level_1_carryover
AVGCORRELCOEF8	level_1_carryover
AVGCORRELCOEF9	level_1_carryover
BadPixelSegments1	badpixelinformation
BadPixelSegments10	badpixelinformation
BadPixelSegments11	badpixelinformation
BadPixelSegments12	badpixelinformation
BadPixelSegments13	badpixelinformation
BadPixelSegments14	badpixelinformation
BadPixelSegments2	badpixelinformation
BadPixelSegments3B	badpixelinformation
BadPixelSegments3N	badpixelinformation
BadPixelSegments4	badpixelinformation
BadPixelSegments5	badpixelinformation

Attribute Name	Location
BadPixelSegments6	badpixelinformation
BadPixelSegments7	badpixelinformation
BadPixelSegments8	badpixelinformation
BadPixelSegments9	badpixelinformation
BandScaleFactors	productmetadata.0
BANDSCALEFACTORS	formatted_product_summary
CALENDARDATE	formatted_product_summary
CalendarDate	coremetadata.0
COARSEDEMVERSION	formatted_product_summary
CoarseDEMVersion	productmetadata.0
CORINTEL1	level_1_carryover
CORINTEL10	level_1_carryover
CORINTEL11	level_1_carryover
CORINTEL12	level_1_carryover
CORINTEL13	level_1_carryover
CORINTEL14	level_1_carryover
CORINTEL2	level_1_carryover
CORINTEL3B	level_1_carryover
CORINTEL3N	level_1_carryover
CORINTEL4	level_1_carryover
CORINTEL5	level_1_carryover
CORINTEL6	level_1_carryover
CORINTEL7	level_1_carryover
CORINTEL8	level_1_carryover
CORINTEL9	level_1_carryover
CORPARA1	level_1_carryover
CORPARA10	level_1_carryover
CORPARA11	level_1_carryover
CORPARA12	level_1_carryover
CORPARA13	level_1_carryover
CORPARA14	level_1_carryover
CORPARA2	level_1_carryover
CORPARA3B	level_1_carryover
CORPARA3N	level_1_carryover
CORPARA4	level_1_carryover
CORPARA5	level_1_carryover
CORPARA6	level_1_carryover
CORPARA7	level_1_carryover

Attribute Name	Location
CORPARA8	level_1_carryover
CORPARA9	level_1_carryover
CTHLD4	level_1_carryover
CTHLD5	level_1_carryover
CTHLD6	level_1_carryover
CTHLD7	level_1_carryover
CTHLD8	level_1_carryover
CTHLD9	level_1_carryover
DayNightFlag	coremetadata.0
EASTBOUNDINGCOORDINATE	formatted_product_summary
EastBoundingCoordinate	coremetadata.0
ExclusionGRingFlag	coremetadata.0
FlyingDirection	productmetadata.0
FutureReviewDate	coremetadata.0
GAIN	formatted_product_summary
Gain	productmetadata.0
GenerationDateandTime	productmetadata.0
GENERATIONDATEANDTIME	level_1_carryover
GEOMETRICDBVERSION	formatted_product_summary
GeometricDBVersion	productmetadata.0
GRingPointLatitude	coremetadata.0
GRingPointLongitude	coremetadata.0
GRingPointSequenceNo	coremetadata.0
IDOFASTERGDSDATAGRANULE	level_1_carryover
IDofASTERGDSDataGranule	productmetadata.0
InputPointer	coremetadata.0
INSTRUMENTSHORTNAME	formatted_product_summary
InstrumentShortName	coremetadata.0
LocalGranuleID	coremetadata.0
LOWERLEFT	formatted_product_summary
LowerLeft	productmetadata.0
LowerRight	productmetadata.0
LOWERRIGHT	formatted_product_summary
MAPPROJECTIONNAME	formatted_product_summary
MapProjectionName	coremetadata.0
MEASUREMENTPOINTNUMBER10	level_1_carryover
MEASUREMENTPOINTNUMBER11	level_1_carryover
MEASUREMENTPOINTNUMBER12	level_1_carryover

Attribute Name	Location
MEASUREMENTPOINTNUMBER13	level_1_carryover
MEASUREMENTPOINTNUMBER14	level_1_carryover
MEASUREMENTPOINTNUMBER4	level_1_carryover
MEASUREMENTPOINTNUMBER5	level_1_carryover
MEASUREMENTPOINTNUMBER6	level_1_carryover
MEASUREMENTPOINTNUMBER7	level_1_carryover
MEASUREMENTPOINTNUMBER8	level_1_carryover
MEASUREMENTPOINTNUMBER9	level_1_carryover
MPMETHOD1	level_1_carryover
MPMETHOD10	level_1_carryover
MPMETHOD11	level_1_carryover
MPMETHOD12	level_1_carryover
MPMETHOD13	level_1_carryover
MPMETHOD14	level_1_carryover
MPMETHOD2	level_1_carryover
MPMETHOD3B	level_1_carryover
MPMETHOD3N	level_1_carryover
MPMETHOD4	level_1_carryover
MPMETHOD5	level_1_carryover
MPMETHOD6	level_1_carryover
MPMETHOD7	level_1_carryover
MPMETHOD8	level_1_carryover
MPMETHOD9	level_1_carryover
NORTHBOUNDINGCOORDINATE	formatted_product_summary
NorthBoundingCoordinate	coremetadata.0
NUMBEROFBADPIXELS1	level_1_carryover
NUMBEROFBADPIXELS10	level_1_carryover
NUMBEROFBADPIXELS11	level_1_carryover
NUMBEROFBADPIXELS12	level_1_carryover
NUMBEROFBADPIXELS13	level_1_carryover
NUMBEROFBADPIXELS14	level_1_carryover
NUMBEROFBADPIXELS2	level_1_carryover
NUMBEROFBADPIXELS3B	level_1_carryover
NUMBEROFBADPIXELS3N	level_1_carryover
NUMBEROFBADPIXELS4	level_1_carryover
NUMBEROFBADPIXELS5	level_1_carryover
NUMBEROFBADPIXELS6	level_1_carryover
NUMBEROFBADPIXELS7	level_1_carryover

Attribute Name	Location
NUMBEROFBADPIXELS8	level_1_carryover
NUMBEROFBADPIXELS9	level_1_carryover
NumberofElement1	badpixelinformation
NumberofElement10	badpixelinformation
NumberofElement11	badpixelinformation
NumberofElement12	badpixelinformation
NumberofElement13	badpixelinformation
NumberofElement14	badpixelinformation
NumberofElement2	badpixelinformation
NumberofElement3B	badpixelinformation
NumberofElement3N	badpixelinformation
NumberofElement4	badpixelinformation
NumberofElement5	badpixelinformation
NumberofElement6	badpixelinformation
NumberofElement7	badpixelinformation
NumberofElement8	badpixelinformation
NumberofElement9	badpixelinformation
NUMBEROFMEASUREMENTS10	level_1_carryover
NUMBEROFMEASUREMENTS11	level_1_carryover
NUMBEROFMEASUREMENTS12	level_1_carryover
NUMBEROFMEASUREMENTS13	level_1_carryover
NUMBEROFMEASUREMENTS14	level_1_carryover
NUMBEROFMEASUREMENTS4	level_1_carryover
NUMBEROFMEASUREMENTS5	level_1_carryover
NUMBEROFMEASUREMENTS6	level_1_carryover
NUMBEROFMEASUREMENTS7	level_1_carryover
NUMBEROFMEASUREMENTS8	level_1_carryover
NUMBEROFMEASUREMENTS9	level_1_carryover
OperationalQualityFlag	coremetadata.0
OperationalQualityFlagExplanation	coremetadata.0
OrbitNumber	productmetadata.0
ParameterName	coremetadata.0
ParameterValue	coremetadata.0
PCTIMAGEMATCH4	level_1_carryover
PCTIMAGEMATCH5	level_1_carryover
PCTIMAGEMATCH6	level_1_carryover
PCTIMAGEMATCH7	level_1_carryover
PCTIMAGEMATCH8	level_1_carryover

Attribute Name	Location
PCTIMAGEMATCH9	level_1_carryover
PGEVersion	coremetadata.0
PGEVERSION	formatted_product_summary
PlatformShortName	coremetadata.0
PointingAngle	productmetadata.0
POINTINGINFO	formatted_product_summary
PROCESSEDBANDS	level_1_carryover
ProcessedBands	productmetadata.0
ProcessingCenter	productmetadata.0
PROCESSINGCENTER	formatted_product_summary
PROCESSINGCENTER	level_1_carryover
PROCESSINGFLAG10	level_1_carryover
PROCESSINGFLAG11	level_1_carryover
PROCESSINGFLAG12	level_1_carryover
PROCESSINGFLAG13	level_1_carryover
PROCESSINGFLAG14	level_1_carryover
PROCESSINGFLAG4	level_1_carryover
PROCESSINGFLAG5	level_1_carryover
PROCESSINGFLAG6	level_1_carryover
PROCESSINGFLAG7	level_1_carryover
PROCESSINGFLAG8	level_1_carryover
PROCESSINGFLAG9	level_1_carryover
PROCESSLEVELID	formatted_product_summary
ProcessLevelID	coremetadata.0
PROJECTIONPARAMETERS1	level_1_carryover
PROJECTIONPARAMETERS10	level_1_carryover
PROJECTIONPARAMETERS11	level_1_carryover
PROJECTIONPARAMETERS12	level_1_carryover
PROJECTIONPARAMETERS13	level_1_carryover
PROJECTIONPARAMETERS14	level_1_carryover
PROJECTIONPARAMETERS2	level_1_carryover
PROJECTIONPARAMETERS3B	level_1_carryover
PROJECTIONPARAMETERS3N	level_1_carryover
PROJECTIONPARAMETERS4	level_1_carryover
PROJECTIONPARAMETERS5	level_1_carryover
PROJECTIONPARAMETERS6	level_1_carryover
PROJECTIONPARAMETERS7	level_1_carryover
PROJECTIONPARAMETERS8	level_1_carryover

Attribute Name	Location
PROJECTIONPARAMETERS9	level_1_carryover
QAAlertEigenvalOOR	QA_alert_table
QAAlertLUTExtrpReqd	QA_alert_table
QAAlertNumAddlBadPixels	QA_alert_table
QAAlertNumPixAllBndsOOR	QA_alert_table
QAAlertNumTempImposs	QA_alert_table
QAAlertNumTempOOR	QA_alert_table
QAAlertOffDiagElemOOR	QA_alert_table
QAAlertOffDiagInpLTLim	QA_alert_table
QAAlertPctBadPixels	QA_alert_table
QAAlertPctFailPixels	QA_alert_table
QAAlertPctHiUncertPixels	QA_alert_table
QAALERTSUMMARY	formatted_product_summary
QACritAlertsCnt	QA_alert_table
QANonCritAlertsCnt	QA_alert_table
QAPercentCloudCover	coremetadata.0
QAPERCENTINTERPOLATEDDATA	formatted_product_summary
QAPercentInterpolatedData	coremetadata.0
QAPercentMissingData	coremetadata.0
QAPERCENTMISSINGDATA	formatted_product_summary
QAPERCENTOUTOFBOUNDSDATA	formatted_product_summary
QAPercentOutofBoundsData	coremetadata.0
QAStatLUTExtrpReqd	QA_alert_table
QAStatNumAddlBadPixels	QA_alert_table
QAStatNumPixAllBndsOOR	QA_alert_table
QAStatNumTempOOR	QA_alert_table
QAStatPctBadPixels	QA_alert_table
QAStatPctFailPixels	QA_alert_table
QAStatPctHiUncertPixels	QA_alert_table
QASummaryOfAlerts	QA_alert_table
QuadrantCloudCoverage	productmetadata.0
QUADRANTCLOUDCOVERAGE	formatted_product_summary
QUADRANTCLOUDCOVERAGE	level_1_carryover
RadiometricDBVersion	productmetadata.0
RADIOMETRICDBVERSION	formatted_product_summary
RECEIVINGCENTER	formatted_product_summary
ReceivingCenter	productmetadata.0
RecurrentCycleNumber	productmetadata.0

Attribute Name	Location
ReprocessingActual	coremetadata.0
REPROCESSINGACTUAL	formatted_product_summary
RESMETHOD1	level_1_carryover
RESMETHOD10	level_1_carryover
RESMETHOD11	level_1_carryover
RESMETHOD12	level_1_carryover
RESMETHOD13	level_1_carryover
RESMETHOD14	level_1_carryover
RESMETHOD2	level_1_carryover
RESMETHOD3B	level_1_carryover
RESMETHOD3N	level_1_carryover
RESMETHOD4	level_1_carryover
RESMETHOD5	level_1_carryover
RESMETHOD6	level_1_carryover
RESMETHOD7	level_1_carryover
RESMETHOD8	level_1_carryover
RESMETHOD9	level_1_carryover
SceneCenter	productmetadata.0
SCENECENTER	formatted_product_summary
SceneCloudCoverage	productmetadata.0
SCENECLOUDCOVERAGE	level_1_carryover
SCENECLOUDCOVERAGE	formatted_product_summary
SceneOrientationAngle	productmetadata.0
SCENEORIENTATIONANGLE	formatted_product_summary
ScienceReviewDate	coremetadata.0
SensorName	productmetadata.0
SettingTimeofPointing	productmetadata.0
ShortName	coremetadata.0
SizeMBECSDataGranule	coremetadata.0
SIZEMBECSDATAGRANULE	formatted_product_summary
SolarDirection	productmetadata.0
SOLARDIRECTION	formatted_product_summary
SourceDataProduct	productmetadata.0
SOURCEDATAPRODUCT	formatted_product_summary
SOURCEDATAPRODUCT	level_1_carryover
SouthBoundingCoordinate	coremetadata.0
SOUTHBOUNDINGCOORDINATE	formatted_product_summary
SpatialResolution	productmetadata.0

Attribute Name	Location
SPATIALRESOLUTION	formatted_product_summary
STANDARDDEVIATIONOFFSET10	level_1_carryover
STANDARDDEVIATIONOFFSET11	level_1_carryover
STANDARDDEVIATIONOFFSET12	level_1_carryover
STANDARDDEVIATIONOFFSET13	level_1_carryover
STANDARDDEVIATIONOFFSET14	level_1_carryover
STANDARDDEVIATIONOFFSET4	level_1_carryover
STANDARDDEVIATIONOFFSET5	level_1_carryover
STANDARDDEVIATIONOFFSET6	level_1_carryover
STANDARDDEVIATIONOFFSET7	level_1_carryover
STANDARDDEVIATIONOFFSET8	level_1_carryover
STANDARDDEVIATIONOFFSET9	level_1_carryover
THRESHOLD10	level_1_carryover
THRESHOLD11	level_1_carryover
THRESHOLD12	level_1_carryover
THRESHOLD13	level_1_carryover
THRESHOLD14	level_1_carryover
THRESHOLD4	level_1_carryover
THRESHOLD5	level_1_carryover
THRESHOLD6	level_1_carryover
THRESHOLD7	level_1_carryover
THRESHOLD8	level_1_carryover
THRESHOLD9	level_1_carryover
TIMEOFDAY	formatted_product_summary
TimeofDay	coremetadata.0
UPPERLEFT	formatted_product_summary
UpperLeft	productmetadata.0
UPPERRIGHT	formatted_product_summary
UpperRight	productmetadata.0
UTMZONECODE1	level_1_carryover
UTMZONECODE10	level_1_carryover
UTMZONECODE11	level_1_carryover
UTMZONECODE12	level_1_carryover
UTMZONECODE13	level_1_carryover
UTMZONECODE14	level_1_carryover
UTMZONECODE2	level_1_carryover
UTMZONECODE3B	level_1_carryover
UTMZONECODE3N	level_1_carryover

Attribute Name	Location
UTMZONECODE4	level_1_carryover
UTMZONECODE5	level_1_carryover
UTMZONECODE6	level_1_carryover
UTMZONECODE7	level_1_carryover
UTMZONECODE8	level_1_carryover
UTMZONECODE9	level_1_carryover
VersionID	coremetadata.0
WESTBOUNDINGCOORDINATE	formatted_product_summary
WestBoundingCoordinate	coremetadata.0