



Earth Polychromatic Imaging Camera (EPIC) Data Format Control Book Specification

DSCOVR CMO

4/2/2015

D. Yoder

RELEASED



**Goddard Space Flight Center
Greenbelt, Maryland**

**National Aeronautics and
Space Administration**

CHECK WITH DSCOVR DATABASE AT:
<https://dscovr-ngin.ndc.nasa.gov>
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

CM FOREWORD

This document is a Deep Space Climate Observatory (DSCOVER) Project Configuration Management (CM)-controlled document. Changes to this document require prior approval of the applicable Configuration Control Board (CCB) Chairperson or designee. Proposed changes shall be submitted to the DSCOVER CM Office (CMO), along with supportive material justifying the proposed change. Changes to this document will be made by complete revision.

Questions or comments concerning this document should be addressed to:

NASA/Goddard Space Flight Center
DSCOVER Project Office, Code 426
Attention: DSCOVER Configuration Management Office
Greenbelt, Maryland 20771

Signature Page**Prepared by:**

Electronic signature on NGIN 4/1/2015
Karin Blank Date
DSCOV Science Operations
Center Manager
NASA/GSFC, Code 586

Reviewed by:

Electronic signature on NGIN 3/26/2015
John Rauscher Date
Chief Safety and Mission
Assurance Officer (CSO)
NASA/GSFC, Code 323

Electronic signature on NGIN 3/31/2015
Gary Meadows Date
DSCOV Mission System Engineer
NASA/GSFC, Code 599

Electronic signature on NGIN 3/30/2015
Mark Bailey Date
DSCOV Lead GS Engineer
Hammers, Code 581

Electronic signature on NGIN 3/18/2015
Adam Szabo Date
DSCOV Project Scientist
NASA/GSFC, Code 672

Electronic signature on NGIN 4/1/2015
Jim Lobell Date
DSCOV Instrument Manager
GSFC/NASA, Code 505

Electronic signature on NGIN 4/1/2015
Jay Herman Date
EPIC Instrument Scientist
University of Maryland
Baltimore, Code 614

Electronic signature on NGIN 4/1/2015
Alexander Marshak Date
DSCOV Deputy Project Scientist
NASA/GSFC, Code 613

Approved by:

Signature on NGIN 4/20/2015
Robert Schweiss Date
DSCOV Ground Segment Manager
NASA/GSFC, Code 581

DSCOV PROJECT**DOCUMENT CHANGE RECORD**

Sheet: 1 of 1

REV LEVEL	DESCRIPTION OF CHANGE	APPROVED BY	DATE APPROVED
Rev-	Released per DSCOV-CCR-000525	R. Schweiss	4/2/2015

CHECK WITH DSCOV DATABASE AT:
<https://dscov-ngin.ndc.nasa.gov>
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

TABLE OF CONTENTS

	<u>Page</u>
1.0 Overview	1-2
1.1 Introduction.....	1-2
1.2 Products Overview.....	1-2
1.3 Purpose.....	1-3
1.4 Applicable Documents.....	1-3
1.5 Naming Convention for the HDF Product Files	1-4
2.0 Level 1A Product.....	2-1
2.1 Data Volumes.....	2-1
2.2 HDF Directory structure	2-1
2.3 Root attributes.....	2-3
2.4 Band Group.....	2-7
2.4.1 Image Dataset Attributes.....	2-7
2.5 Earth/Lunar Group.....	2-8
2.5.1 Geolocation Grids Attributes	2-9
3.0 Level 1B Product.....	3-1
3.1 Group structure	3-1
3.1.1 Calibrated, Geolocated Radiances	3-2
3.1.2 Dataset Attributes.....	3-3
3.2 Geolocation	3-6
3.2.1 Earth Geolocation Group	3-6
4.0 Metadata	4-1
4.1 L1A Metadata Text Format	4-6
4.2 L1B Sample Metadata (.met).....	4-7
4.3 L1B Metadata Text Format.....	4-9
4.4 Sample L1B metadata (.met) file	4-10
Appendix A. Abbreviations and Acronyms.....	A-1

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Figure 1-1. Simulated EPIC RGB image of Earth and Moon.....	1-3
Figure 2-1. Image of the L1A HDF Group Directory Tree	2-2
Figure 3-1. Image of the group directory structure for the L1B HDF product.....	3-1

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 2-1. Data Volumes of Different Data Types Contained in the L1A Products	2-1
Table 2-2. L1A Root Attributes	2-3
Table 2-3. L1A Band Group Data Contents	2-7
Table 2-4. L1A Image Attributes.....	2-8
Table 2-5. L1A Earth/Lunar Geolocation Group Data Contents	2-8
Table 2-6. Earth/Lunar geolocation group attributes.....	2-9
Table 3-1. L1B Root Group Data Contents	3-2
Table 3-2. L1B Root Group Attributes	3-3
Table 3-3. L1B Earth Geolocation Group Data Contents.....	3-6
Table 3-4. L1B Lunar Selenographic Group Data Contents.....	3-6
Table 4-1. L1B Metadata	4-1

1.0 OVERVIEW

1.1 INTRODUCTION

This document is the Data Format Control Book (DFCB) for the Deep Space Climate Observatory (DSCOVER) Earth Polychromatic Imaging Camera (EPIC) instrument science data products. It is based off the original document written for Triana. It describes the levels of data products and defines their contents. All products are written in the standard Hierarchical Data Format 5 (HDF5) using HDF-defined data models and are archived at the Atmospheric Science Data Center (ASDC). Information about HDF5 and the official documentation and software may be found at the HDF web site: (<http://www.hdfgroup.org/HDF5/>)

1.2 PRODUCTS OVERVIEW

The EPIC instrument collects multispectral data of the Earth in ten wavelengths. The center wavelength of the bands are 317.5 nanometer (nm), 325nm, 340nm, 388nm, 443nm, 551nm, 680nm, 687.75nm, 764nm, and 779.5nm. Throughout this document, the wavelength of the 10 bands will be represented by three digital values rounded to the nearest integer.

There are two products produced. The first is the calibrated level 1A products with geolocation appended. The second are the calibrated level 1B products that have been georectified to match the same grid. From the DSCOVER spacecraft's unique vantage point near the Lagrange 1 (L1) point between the Earth and the Sun, the EPIC instrument can collect data from nearly the entire sunlit surface of the Earth every hour. Unlike the products from other prior and current Earth science missions, the DSCOVER EPIC products contain data from sunrise to sunset of the Earth at a given moment in time. The Earth images will also contain an image of the Moon if it is within EPIC's field of view.

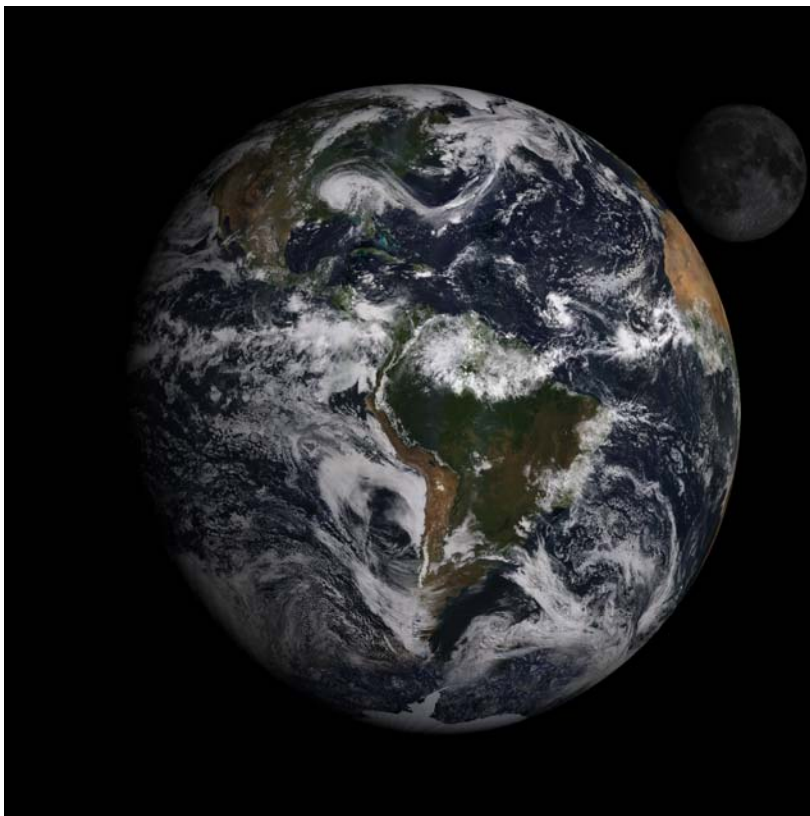


Figure 1-1. Simulated EPIC RGB image of Earth and Moon

Figure 1-1 is a simulated view of the Earth-Moon system as it might appear from the vantage point of the DSCOVR spacecraft. Unless a specified band is mentioned, all time and coordinate values referenced in association with the images are those of the reference band. This band will nominally be the image taken in the middle of the sequence.

1.3 PURPOSE

This DFCB provides the user with a detailed description of the format and contents of the DSCOVR EPIC instrument data products. It contains descriptions of the image, location, and other ancillary data and their organization into HDF data objects. This document is the specification to which serves as a guide to the end users who will require data.

1.4 APPLICABLE DOCUMENTS

NASA, *Triana Scripps-EPIC Instrument Levels 1, 2, and 3 Science Data Products Data Format Control Book (DFCB)*

HDF Group, *Mapping HDF4 to HDF5 Objects, Version 3*
<http://www.hdfgroup.org/HDF5/doc/ADGuide/H4toH5Mapping.pdf>

HDF Group, *HDF5 Homepage*

<http://www.hdfgroup.org/HDF5/>

1.5 NAMING CONVENTION FOR THE HDF PRODUCT FILES

The Product Files

All of the data collected and processed for the EPIC instrument is written to two data files, a L1A and L1B HDF file. The following file naming conventions are followed when creating the product files. All time and coordinate values in the file names are those of the reference band. Each filename is thirty-six characters long and of the form “epic_ll_yyymmddhhnn_aapbbbs_vv.h5”, where “epic_1a_201504171840_38n077w_01.h5”

ll – Indicated level of processing, either 1a or 1b

yyyy – four character year image was taken

mm – two-character month images were taken

dd – two character day images were taken

hh – hour reference band was taken

nn – minute reference band was taken

aa – latitude of centroid

p – North or South latitude

bbb – longitude of centroid

s – sign of the coordinate, whether longitude is east or west

vv – version number

h5 – indicates file type is a HDF 5 file

2.0 **LEVEL 1A PRODUCT**

Each EPIC level 1A product consists of ten images corresponding to the ten different spectral wavelengths of “bands” recorded approximately 30-60 seconds apart. The images are primarily of the full sun-lit Earth, on designated days instrument calibration activity will produce lunar and star field images instead of Earth images. Ancillary data associated with the band images includes geolocation data, Earth centroid coordinates, image collection times, and viewing geometry. Data is calibrated according to the L1A processing which includes stray light, charge-coupled device (CCD) reading, flat fielding, and other sensor-related corrections. The result is a single HDF5 file per image set, which is placed on the ASDC.

Data from all ten bands is collected at a regular cadence, resulting in approximately 13 image-sets per day. Data will be downlinked from the spacecraft at either 2048 or 1024 resolution, depending on the product and the spacecraft mode, and compressed onboard using either the Joint Photographic Experts Group (JPEG) lossless or lossy codec. After ground processing, the image data in all the final level 1A products are compressed using the lossless gzip option provided by the HDF Application Programming Interface (API).

2.1 **DATA VOLUMES**

In nominal mode, each data product contains ten bands and their matching geolocation information. A complete level 1A product will be approximately 180 megabytes (MB).

Table 2-1. Data Volumes of Different Data Types Contained in the L1A Products

Object Description	Object Dimension	Size per object (MB)	Total number of Objects	Total size of all Objects	Compression ratio	Total size in file
Image data	2048x2048	16.77	10	167.77	2.8:1	59.92
Image Attributes	28	.163	280	1.6	Not applicable (N/A)	1.6
Geolocation data	2048x2048	16.77	20	335.54	3:1	111.84
Geolocation attributes	116	.8	1160	8	N/A	8
Root attributes	61	.460	61	.46	N/A	.46

2.2 **HDF DIRECTORY STRUCTURE**

In the layout for the HDF files, data is grouped by image bands. Within the band groups, the image data and its associated geolocation data is contained. Below is a snapshot representing the layout of an EPIC L1A product:

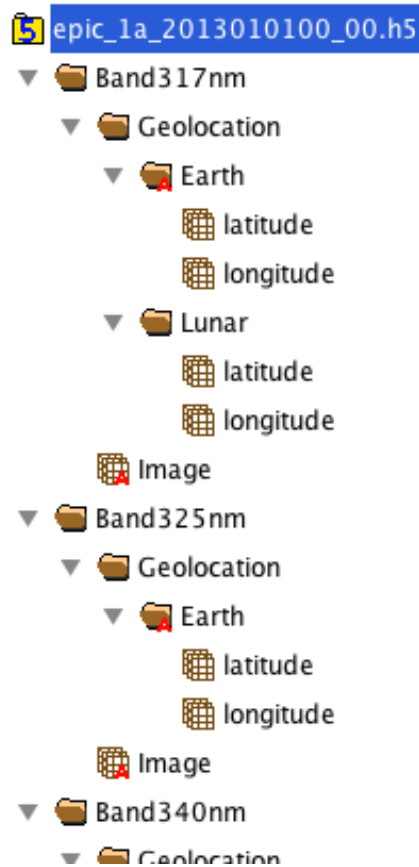


Figure 2-1. Image of the L1A HDF Group Directory Tree

/

The root group contains the band data sets and the subdirectories for geolocation information

/Band318nm

This group contains the image in the named band and geolocation grids.

/Band325nm

This group contains the image in the named band and geolocation grids.

/Band340nm

This group contains the image in the named band and geolocation grids.

/Band388nm

This group contains the image in the named band and geolocation grids.

/Band443nm

This group contains the image in the named band and geolocation grids.

/Band551nm

This group contains the image in the named band and geolocation grids.

/Band680nm

This group contains the image in the named band and geolocation grids.

/Band688nm

This group contains the image in the named band and geolocation grids.

/Band764nm

This group contains the image in the named band and geolocation grids.

/Band780nm

This group contains the image in the named band and geolocation grids.

2.3 ROOT ATTRIBUTES

Each root group directory contains a set of attributes that describes the contents of the HDF file. This includes the information about the bands present, the resolution they were taken, the resolution they were stored at, statistical information regarding data quality, and other sundries. Below is a list of the full metadata contents.

Table 2-2. L1A Root Attributes

Attribute Name	HDF Data Type	Units	Range	Description
Band_317nm_present	UInt8	Boolean	0..1	Indicates if band is present in dataset
Band_317nm_resolution	UInt16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_317nm_resolution_native	UInt16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_325nm_present	UInt8	Boolean	0..1	Indicates if band is present in dataset
Band_325nm_resolution	UInt16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_325nm_resolution_native	UInt16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_340nm_present	UInt8	Boolean	0..1	Indicates if band is present in dataset

Attribute Name	HDF Data Type	Units	Range	Description
Band_340nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_340nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_388nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_388nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_388nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_443nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_443nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_443nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_551nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_551nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_551nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_680nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_680nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_680nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_688nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset

Attribute Name	HDF Data Type	Units	Range	Description
Band_688nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_688nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_764nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_764nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_764nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Band_780nm_present	Uint8	Boolean	0..1	Indicates if band is present in dataset
Band_780nm_resolution	Uint16	Pixels	0...2048	Indicates the resolution of the data in the dataset
Band_780nm_resolution_native	Uint16	Pixels	0...2048	Indicates the resolution of the data as obtained from the spacecraft
Granule_version	String	N/A		Indicates version of calibration granule used
Percent_band_pixels_317nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_325nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_340nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_388nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_443nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_551nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_680nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_688nm	Float	Percent	0...100	Percentage of bad pixels

Attribute Name	HDF Data Type	Units	Range	Description
Percent_band_pixels_764nm	Float	Percent	0...100	Percentage of bad pixels
Percent_band_pixels_780nm	Float	Percent	0...100	Percentage of bad pixels
Begin_time	String			Beginning time of image set
Centroid_mean_latitude	Float	Degrees	-90...90	Average centroid latitude across all the images
Centroid_mean_longitude	Float	Degrees	-180...180	Average centroid longitude across all the images
Date_created	String			Date dataset was processed and created
End_time	String			End time of image set
Geospatial_lat_max	Float	Degrees	-90...90	Maximum latitude value
Geospatial_lat_min	Float	degrees	-90...90	Minimum latitude value
Geospatial_lon_max	Float	Degrees	-180...180	Maximum longitude value
Geospatial_lon_min	Float	Degrees	-180...180	Minimum longitude value
Institution	String			Creator of data
Keywords	String			Keywords attached to data
Maximum_latitude	Float	Degrees	-90...90	Maximum latitude value
Minimum_latitude	Float	degrees	-90...90	Minimum latitude value
Maximum_longitude	Float	Degrees	-180...180	Maximum longitude value
Minimum_longitude	Float	Degrees	-180...180	Minimum longitude value
Project	String			Name of project
Image_set_date	String			Date and time images were taken
Revision_number	String			Revision number of data set

Attribute Name	HDF Data Type	Units	Range	Description
Calibration_file	String			Matching calibration data used to generate this dataset
Summary	String			Description of dataset contents
Title	String			Title of dataset

2.4 BAND GROUP

Each band directory group includes a grid with calibrated radiances, and the geolocation grids for the Earth and Moon. Each image retains its natural orientation from when it was taken, and is not georeferenced to a common grid.

Table 2-3. L1A Band Group Data Contents

Name	Data type	Dimensions	Units	Description
Image	Float32	2048x2048 1024x1024	Radiances	Image taken in units of calibrated radiances
/Geolocation/Earth	Group			Gridded Earth longitude and latitude values
/Geolocation/Lunar	Group			Gridded Lunar longitude and latitude values

2.4.1 Image Dataset Attributes

Each image defined above has attributes attached to it that describe the aspects of the data sets.

Table 2-4. L1A Image Attributes

Attribute Name	Data Type	Units	Range	Description
Long_name	String	N/A	N/A	Descriptive name of dataset
Units	String	N/A	N/A	The units of data.
Valid_range	Float32	N/A	N/A	The maximum valid range of data values
FillValue	Float32	N/A	N/A	The value indicating no data or no valid data
Time	String	N/A	N/A	The data collection time in Coordinated Universal Time (UTC), form “yyyy:doy:hh:mm:ss.n”.
Exposure_length	UInt16	Ms	0...1000	The length of the time exposure in milliseconds
Mean_pixel_value	UInt16	N/A	N/A	The mean pixel value in digital counts computed from the set of all pixels in the subject image excluding marginal fill and other NULL pixels
Standard_deviation	Float32	N/A	N/A	The standard deviation value computed from the set of all pixels in the subject image excluding marginal fill and other NULL pixels
Skewness	Float32	N/A	N/A	The skewness value computed from all pixels in the subject image excluding marginal fill and other NULL pixels
Percent_bad_pixels	Float32	Percent	0...100	The percentage of pixels withing the image that are deemed bad. Marginal and other NULL pixels are excluded from computation
ImageResolution	UInt16	Pixels	1...2048	The resolution of the image as stored in the HDF file
NativeResolution	UInt16	Pixels	1...2048	The resolution of the image as taken on the spacecraft

2.5 EARTH/LUNAR GROUP

These groups contain the respective Earth and Lunar latitude and longitude values, in grids corresponding to the EPIC image.

Table 2-5. L1A Earth/Lunar Geolocation Group Data Contents

Name	Data type	Dimensions	Units	Description
Latitude	Float32	2048x2048 1024x1024	degrees	Gridded Earth latitude values

Name	Data type	Dimensions	Units	Description
Longitude	Float32	2048x2048 1024x1024	degrees	Gridded Earth longitude values

2.5.1 Geolocation Grids Attributes

Each geolocation grid defined above has attributes attached to it that describe the aspects of the data sets.

Table 2-6. Earth/Lunar geolocation group attributes

Attribute Name	HDF Data Type	Units	Description
edgeThreshold	Uint32		
DscovrEphemerisFileTime1	Float64	Julian day	DSCOV-002364 ephemeris file time in Julian days
DscovrEphemerisFileXposition1	Float64	Km	DSCOV-002364 ephemeris file x position
DscovrEphemerisFileYposition1	Float64	Km	DSCOV-002364 ephemeris file y position
DscovrEphemerisFileZposition1	Float64	Km	DSCOV-002364 ephemeris file z position
DscovrEphemerisFileXvelocity1	Float64	Km/s	DSCOV-002364 ephemeris file x velocity
DscovrEphemerisFileYvelocity1	Float64	Km/s	DSCOV-002364 ephemeris file y velocity
DscovrEphemerisFileZvelocity1	Float64	Km/s	DSCOV-002364 ephemeris file z velocity
DscovrEphemerisFileTime2	Float64	Julian day	DSCOV-002364 ephemeris file time in Julian days
DscovrEphemerisFileXposition2	Float64	Km	DSCOV-002364 ephemeris file x position
DscovrEphemerisFileYposition2	Float64	Km	DSCOV-002364 ephemeris file y position
DscovrEphemerisFileZposition2	Float64	Km	DSCOV-002364 ephemeris file z position
DscovrEphemerisFileXvelocity2	Float64	Km/s	DSCOV-002364 ephemeris file x velocity
DscovrEphemerisFileYvelocity2	Float64	Km/s	DSCOV-002364 ephemeris file y velocity
DscovrEphemerisFileZvelocity2	Float64	Km/s	DSCOV-002364 ephemeris file z velocity
LunarEphemerisFileTime1	Float64	Julian day	Lunar ephemeris file time in Julian days
LunarEphemerisFileXposition1	Float64	Km	Lunar ephemeris file x position
LunarEphemerisFileYposition1	Float64	Km	Lunar ephemeris file y position
LunarEphemerisFileZposition1	Float64	Km	Lunar ephemeris file z position

Attribute Name	HDF Data Type	Units	Description
LunarEphemerisFileXvelocity1	Float64	Km/s	Lunar ephemeris file x velocity
LunarEphemerisFileYvelocity1	Float64	Km/s	Lunar ephemeris file y velocity
LunarEphemerisFileZvelocity1	Float64	Km/s	Lunar ephemeris file z velocity
LunarEphemerisFileTime2	Float64	Julian day	Lunar ephemeris file time in Julian days
LunarEphemerisFileXposition2	Float64	Km	Lunar ephemeris file x position
LunarEphemerisFileYposition2	Float64	Km	Lunar ephemeris file y position
LunarEphemerisFileZposition2	Float64	Km	Lunar ephemeris file z position
LunarEphemerisFileXvelocity2	Float64	Km/s	Lunar ephemeris file x velocity
LunarEphemerisFileYvelocity2	Float64	Km/s	Lunar ephemeris file y velocity
LunarEphemerisFileZvelocity2	Float64	Km/s	Lunar ephemeris file z velocity
AttitudeFileQuarternion2_Q0	Float64		Attitude file quaternion q0
AttitudeFileQuarternion2_Q1	Float64		Attitude file quaternion q1
AttitudeFileQuarternion2_Q2	Float64		Attitude file quaternion q2
AttitudeFileQuarternion2_Q3	Float64		Attitude file quaternion q3
ImageSunDirection	Float64	Radians	Image sun direction
ImageEarthNorthDirection	Float64	Radians	Image Earth/North direction
CentroidRadiusDelta1	Float64	Pixels	Centroid radius delta
CentroidRadiusDelta2	Float64	Pixels	Centroid radius delta
DscovrEphemerisXposition	Float64		DSCOV-002364 ephemeris x position
DscovrEphemerisYposition	Float64		DSCOV-002364 ephemeris y position
DscovrEphemerisZposition	Float64		DSCOV-002364 ephemeris z position
LunarEphemerisXposition	Float64		Lunar ephemeris x position
LunarEphemerisYposition	Float64		Lunar ephemeris y position
LunarEphemerisZposition	Float64		Lunar ephemeris z position
AttitudeQ0	Float64		Attitude quaternion

Attribute Name	HDF Data Type	Units	Description
AttitudeQ1	Float64		Attitude quaternion
AttitudeQ2	Float64		Attitude quaternion
AttitudeQ3	Float64		Attitude quaternion
AttitudeMatrix11	Float64		
AttitudeMatrix12	Float64		
AttitudeMatrix13	Float64		
AttitudeMatrix21	Float64		
AttitudeMatrix22	Float64		
AttitudeMatrix23	Float64		
AttitudeMatrix31	Float64		
AttitudeMatrix32	Float64		
AttitudeMatrix33	Float64		
SolarAngleValue	Float64	radians	Solar angle value
GreewichHourAngle	Float64	Radians	Greenwich hour angle
ExposureDate	Float64	Julian day	Exposure date
CentroidXpixelOffset	Float32	Pixel	Centroid x pixel offset
CentroidYpixelOffset	Float32	Pixel	Centroid y pixel offset
Referencepixel1X	Uint32	Pixel	Reference pixel 1 x coordinate
Referencepixel1Y	Uint32	Pixel	Reference pixel 1 y coordinate
Referencepixel2X	Uint32	Pixel	Reference pixel 2 x coordinate
Referencepixel2Y	Uint32	Pixel	Reference pixel 2 y coordinate
ReferencePixel1Latitude	Float64	Degrees	Reference pixel 1 Latitude
ReferencePixel1Longitude	Float64	Degrees	Reference pixel 1 Longitude
ReferencePixel2Latitude	Float64	Degrees	Reference pixel 2 Latitude
ReferencePixel2Longitude	Float64	Degrees	Reference pixel 2 Longitude

Attribute Name	HDF Data Type	Units	Description
CentroidCenterLatitude	Float64	Degrees	Centroid center latitude
CentroidCenterLongitude	Float64	Degrees	Centroid center longitude
NorthLatitude	Float64	Degrees	Image north latitude
SouthLatitude	Float64	Degrees	Image south latitude
EastLongitude	Float64	Degrees	Image east longitude
WestLongitude	Float64	Degrees	Image west longitude
OrientationMatrix11	Float64		
OrientationMatrix12	Float64		
OrientationMatrix13	Float64		
OrientationMatrix21	Float64		
OrientationMatrix22	Float64		
OrientationMatrix23	Float64		
OrientationMatrix31	Float64		
OrientationMatrix32	Float64		
OrientationMatrix33	Float64		
SolarEphemerisXposition	Float64		Solar ephemeris x position
SolarEphemerisYposition	Float64		Solar ephemeris y position
SolarEphemerisZposition	Float64		Solar ephemeris z position
ScanLineAngleOffset	Float64		Scan line angle offset
ScanPixelAngleOffset	Float64		Scan pixel angle offset
TopLatitude	Float64	Degrees	Value of top most latitude
TopLongitude	Float46	Degrees	Value of top most longitude
BottomLatitude	Float64	Degrees	Value of bottom most latitude
BottomLongitude	Float64	Degrees	Value of bottom most longitude
LeftLatitude	Float64	Degrees	Value of left most latitude

Attribute Name	HDF Data Type	Units	Description
LeftLongitude	Float64	Degrees	Value of left most longitude
RightLatitude	Float64	Degrees	Value of right most latitude
RightLongitude	Float64	Degrees	Value of right most longitude
SolarEphemerisFileTime1	Float64	Julian Day	Solar ephemeris file time
SolarEphemerisFileXposition1	Float64	Km	Solar ephemeris file x position
SolarEphemerisFileYposition1	Float64	Km	Solar ephemeris file y position
SolarEphemerisFileZpostion1	Float64	Km	Solar ephemeris file z position
SolarEphemerisXveloocity1	Float64	Km/s	Solar ephemeris x velocity
SolarEphemerisYvelocity1	Float64	Km/s	Solar ephemeris y velocity
SolarEphemerisZvelocity1	Float64	Km/s	Solar ephemeris z velocity
SolarEphemerisFileTime2	Float64	Julian Day	Solar ephemeris file time
SolarEphemerisFileXposition2	Float64	Km	Solar ephemeris file x position
SolarEphemerisFileYposition2	Float64	Km	Solar ephemeris file y position
SolarEphemerisFileZpostion2	Float64	Km	Solar ephemeris file z position
SolarEphemerisFileXveloocity2	Float64	Km/s	Solar ephemeris x velocity
SolarEphemerisFileYvelocity2	Float64	Km/s	Solar ephemeris y velocity
SolarEphemerisFileZvelocity2	Float64	Km/s	Solar ephemeris z velocity

3.0 LEVEL 1B PRODUCT

The EPIC L1B contains the same 10 calibrated image bands as its corresponding L1A, however the products have been georectified to match a common grid. Ancillary data consists of image metadata, and the common grid. Below is a snapshot representing the L1B product:

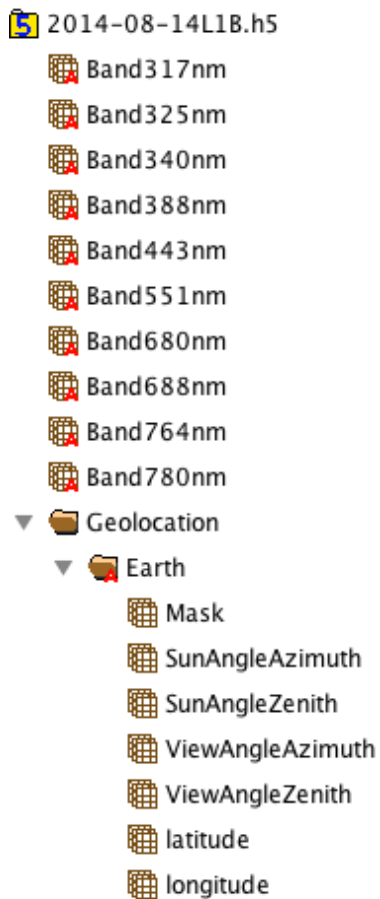


Figure 3-1. Image of the group directory structure for the L1B HDF product

3.1 GROUP STRUCTURE

The L1B root group directory contains the calibrated, georectified images produced, and has the relative geolocation information in subdirectories. The structure is as follows:

/

The root group contains the band data sets and the subdirectories for geolocation information

/Geolocation

This group contains the geolocation information for Earth and Lunar parts of the images.

/Geolocation/Grids

This group contains the geolocation information in a grid format the correlates with the image pixels

/Geolocation/Grids/Earth

This group contains the Earth latitude and longitude information, as well as solar and viewing angles.

/Geolocation/Grids/Lunar

This group contains the Selenographic coordinates in terms of latitude and longitude

3.1.1 Calibrated, Geolocated Radiances

These are the datasets containing the calibrated, geolocated radiances per band.

Table 3-1. L1B Root Group Data Contents

Band #	Name	Data type	Dimensions	Units	Description
1	Band318nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiances in the 317.5nm wavelength
2	Band325nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiances in the 325nm wavelength
3	Band340nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiance in the 340nm wavelength
4	Band388nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiances in the 388nm wavelength
5	Band443nm	Float32	2048x2048 700x700 100x100	Radiances	Calibrated radiances in the 443nm wavelength
6	Band551nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiances in the 551nm wavelength
7	Band680nm	Float32	2048x2084 1024x1024 350x350 50x50	Radiances	Calibrated radiances in the 680nm wavelength
8	Band688nm	Float32	2048x2084 1024x1024 350x350 50x50	radiances	Calibrated radiances in the 687.75nm wavelength

Band #	Name	Data type	Dimensions	Units	Description
9	Band764nm	Float32	2048x2084 1024x1024 350x350 50x50		Calibrated radiances in the 764nm wavelength
10	Band780nm	Float32	2048x2084 1024x1024 350x350 50x50		Calibrated radiances in the 799.5 wavelength

3.1.2 Dataset Attributes

Each dataset defined above has attributes attached to it that describe the aspects of the data sets. This includes aspects of the image taking, geolocation, and data statistics.

Table 3-2. L1B Root Group Attributes

Attribute Name	Data Type	Units	Range	Description
Long_name	Char8	N/A	N/A	Descriptive name of dataset
Units	Char8	N/A	N/A	The units of data.
Format	Char8	N/A	N/A	The display format in F77 notation. Default is “I5” for the level 1 bands
Cordsys	Char8	N/A	N/A	The coordinate system. Default is “cartesian”.
Minimum_value	Float32	Radiances	N/A	Minimum value range in dataset
Maximum_value	Float32	Radiances	N/A	Maximum value range in dataset
_FillValue	Uint16	N/A	N/A	The value indicating no data or no valid data
Time	Char8	N/A	N/A	The data collection time in UTC, form “yyyy:doy:hh:mm:ss.n”.
Exposure_length	Uint16	Ms	0...1000	The length of the time exposure in milliseconds
Centroid_center_latitude	Float32	Degrees	-90...90	The latitude coordinates of the image centroid in decimal degrees
Centroid_center_longitude	Float32	Degrees	-180...180	The longitude coordinates of the image centroid in decimal degrees

Attribute Name	Data Type	Units	Range	Description
Top_coord_latitude	Float32	Degrees	-90...90	The longitude, latitude coordinates of the image top-most point in decimal degrees
Top_coord_longiutde	Float32	Degrees	-180...180	The longitude, latitude coordinates of the image top-most point in decimal degrees
Right_coord_latitude	Float32	Degrees	-90...90	The longitude, latitude coordinates of the image right-most point in decimal degrees
Right_coord_longitude	Float32	Degrees	-180...180	The longitude, latitude coordinates of the image right-most point in decimal degrees
Bottom_coord_latitude	Float32	Degrees	-90...90	The longitude, latitude coordinates of the image bottom-most point in decimal degrees
Bottom_coord_longiutde	Float32	Degrees	-180...180	The longitude, latitude coordinates of the image bottom-most point in decimal degrees
Left_coord_latitude	Float32	Degrees	-90...90	The longitude, latitude coordinates of the image bottom-most point in decimal degrees
Left_coord_longitude	Float32	Degrees	-180...180	The longitude, latitude coordinates of the image bottom-most point in decimal degrees
Mean_pixel_value	Uint16	N/A	N/A	The mean pixel value in digital counts computed from the set of all pixels in the subject image excluding marginal fill and other NULL pixels
Standard_deviation	Floats32	N/A	N/A	The standard deviation value computed from the set of all pixels in the subject image excluding marginal fill and other NULL pixels

Attribute Name	Data Type	Units	Range	Description
Skewness	Float32	N/A	N/A	The skewness value computed from all pixels in the subject image excluding marginal fill and other NULL pixels
Percent_bad_pixels	Floats32	Percent	0...100	The percentage of pixels within the image that are deemed bad. Marginal other NULL pixels are excluded from computation
Left_column_offset	Uint16	Pixels	0...2047	The minimum offset in number of pixels from the first (0 th) column of the left-most edge of the valid image data
Right_column_offset	Uint16	Pixels	0...2047	The maximum offset in number of pixels from the first (0 th) column of the right-most edge of the valid image data
Top_row_offset	Uint16	Pixels	0...2047	The minimum offset in number of pixels from the first (0 th) row of the bottom-most edge of the valid image data
Centroid_column_offset	Uint16	Pixels	0...2047	The offset in number of pixels from the first column to the image centroid pixel
Centroid_row_offset	Uint16	Pixels	0...2047	The offset in number of pixels from the first 0 th) row to the image centroid pixel

3.2 GEOLOCATION

Contains the geolocation information as gridded values of latitude, longitude, sun, and view angles. These datasets correspond on a pixel-by-pixel basis to the image data.

3.2.1 Earth Geolocation Group

These grids contain values pertaining to the geolocation and solar and spacecraft view angles.

Table 3-3. L1B Earth Geolocation Group Data Contents

Field Name	Data Type	Units	Range	Description
Latitude	Float32	Degrees	-90...90	Grid of degrees latitude
Longitude	Float32	Degrees	-180...180	Grid of degrees longitude
SunAngleAzimuth	Float32	Degrees	0...180	Grid of sun azimuth angles
SunAngleZenith	Float32	Degrees	-90...90	Grid of sun Zenith angles
ViewAngleAzimuth	Float32	Degrees	0...180	Grid of spacecraft azimuth view angles
ViewAngleZenith	Float32	Degrees	-90...90	Grid of spacecraft zenith angles
Mask	UInt8	N/A	0, 1	Location of Earth pixels

3.2.1.1 Lunar Selenographic Group

These grids pertain to the moon. These values are only present when the moon is in view.

Table 3-4. L1B Lunar Selenographic Group Data Contents

Field Name	Data Type	Units	Range	Description
Latitude	Float32	Degrees	-90...90	Grid of degrees latitude
Longitude	Float32	Degrees	-180...180	Grid of degrees longitude
Mask	UInt8	N/A	0, 1	Location of Lunar pixels

4.0 METADATA

Each file has a global attribute called “metadata” attached to it. This metadata is produced for searching purposes. This is an HDF attribute. The metadata attribute contains information about the product. It is a single character string with each *name=value* parameter pair delimited by a “;” character set. The <LF> character is defined as American Standard Code for Information Interchange (ASCII) code 0A in hex.

The values in the longitude and latitude fields are the geographic coordinates of the specified pixels in the Earth or Moon image. The centroids of the images are defined as the center of the Earth or Moon disk as it appears in the image. In the case of Moon images, the values are the lunar geographic (Selenographic) coordinates of the specified pixels in the Moon image. In the case of star field products, the *Centroid_latitude* and *Centroid_longitude* fields shall contain the approximate celestial coordinates (i.e., right-ascension and declination) of the centers of the fields of view. The *Lat* and *Lon* fields are not defined for star field products and shall contain null values.

The ten *Band_xx_present* parameters are always included in the metadata whether the band is present or not. The *Percent_bad_pixels_xx* fields are included in the metadata only for those bands actually contained in the product.

Table 4-1. L1B Metadata

Field Name	Data Type	Units	Range	Description
Producer_granule_id	String	N/A	N/A	The name of the HDF file
Granule_version	String		01...99	The processing version number of the products (2 digits with leading 0)
Begin_time	String	N/A	N/A	Yyyy-mm-dd_hh:mm:ss date/time (UTC) of the first collected image
End_time	String	N/A	N/A	Yyyy0mmm-dd_hh:mm:ss date/time (UTC) of last collected image
Centroid_latitude	String	Degrees	-90...90	Latitude of the image centroid for the referenced band
Top_latitude	String	Degrees	-90...90	Latitude coordinate of the top-most point of the subject image based on the reference band
Top_longitude	String	Degrees	-180...180	Longitude coordinate of the top-most point of the subject image based on the reference band

Field Name	Data Type	Units	Range	Description
Right_latitude	String	Degrees	-90...90	Latitude coordinate of the right-most point of the subject image based on the reference band
Right_longitude	String	Degrees	-180...180	Longitude coordinate of the top-most point of the subject image based on the reference band
Bottom_latitude	String	Degrees	-90...90	Latitude coordinate of the bottom-most point of the subject based on the reference band
Left_latitude	String	Degrees	-90...90	Latitude coordinate of the left-most point of the subject image based on the reference band
Left_longitude	String	Degrees	-180...180	Left longitude coordinate of the left-most point of the subject image based on the reference band
Product_type	String	N/A	ON_HOUR, OFF_HOUR, MOON, STAR_FIELD, or SPECIAL	Indicates if the product is an on-hour or off-hour image of the Earth or an image of the Moon or space. Special products are any, which do not fit into the above categories
Reference_band	String	N/A	01...10	Indicates the band used as the reference band.
Browse_filename	String	N/A	N/A	The name of the associated external Browse file
Comment	String	N/A	N/A	A miscellaneous text comment on the product. Default value is NULL
Band_318nm_present	Char	N/A	Y or N	Indicates if band 1 is present in the product
Band_325nm_present	Char	N/A	Y or N	Indicates if band 2 is present in the product
Band_340nm_present	Char	N/A	Y or N	Indicates if band 3 is present in the product
Band_388nm_present	Char	N/A	Y or N	Indicates if band 4 is present in the product
Band_443nm_present	Char	N/A	Y or N	Indicates if band 5 is present in the product
Band_551nm_present	Char	N/A	Y or N	Indicates if band 6 is present in the product

Field Name	Data Type	Units	Range	Description
Band_680nm_present	Char	N/A	Y or N	Indicates if band 7 is present in the product
Band_688_present	Char	N/A	Y or N	Indicates if band 8 is present in the product
Band_764_present	Char	N/A	Y or N	Indicates if band 9 is present in the product
Band_780_present	Char	N/A	Y or N	Indicates if band 10 is present in the product
Percent_bad_pixels_318nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_325nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_340nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_388nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_443nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_551nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.

Field Name	Data Type	Units	Range	Description
Percent_bad_pixels_680nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_688nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_764nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Percent_bad_pixels_780nm	String	Percent	0...9	Indicates the percentage of data pixels in the subject image in the given band, which failed quality checks. "NP" indicates band not present in product.
Band_318nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_325nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_340nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_388nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_443nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_551nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.
Band_680nm_resolution	UInt16	Pixels	0...2048	Band resolution in pixels. Value is "0" if band not present.

Field Name	Data Type	Units	Range	Description
Band_688_resolution	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_764_resolution	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_780_resolution	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_318nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_325nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_340nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_388nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_443nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_551nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_680nm_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_688_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_764_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.
Band_780_resolution_native	Uint16	Pixels	0...2048	Band resolution in pixels. Value is “0” if band not present.

4.1 L1A METADATA TEXT FORMAT

Band_551nm_present=1
Band_688nm_present=1
Band_680nm_present=1
Band_764nm_present=1
Band_780nm_present=1
Band_443nm_present=1
Band_388nm_present=1
Band_340nm_present=1
Band_325nm_present=1
Band_317nm_present=1
Percent_bad_pixels_551nm=0.00
Band_551nm_resolution=2048
Band_551nm_resolution_native=1024
Percent_bad_pixels_688nm=0.00
Band_688nm_resolution=2048
Band_688nm_resolution_native=1024
Percent_bad_pixels_680nm=0.00
Band_680nm_resolution=2048
Band_680nm_resolution_native=1024
Percent_bad_pixels_764nm=0.00
Band_764nm_resolution=2048
Band_764nm_resolution_native=1024
Percent_bad_pixels_780nm=0.00
Band_780nm_resolution=2048
Band_780nm_resolution_native=1024
Percent_bad_pixels_443nm=0.00
Band_443nm_resolution=2048
Band_443nm_resolution_native=2048
Percent_bad_pixels_388nm=0.00
Band_388nm_resolution=2048
Band_388nm_resolution_native=1024
Percent_bad_pixels_340nm=0.00
Band_340nm_resolution=2048
Band_340nm_resolution_native=1024
Percent_bad_pixels_325nm=0.00
Band_325nm_resolution=2048
Band_325nm_resolution_native=1024
Percent_bad_pixels_317nm=0.00
Band_317nm_resolution=2048
Band_317nm_resolution_native=1024
title=Deep Space Climate Observatory Earth Polychromatic Imaging Camera level 1A product
summary=This dataset contains an EPIC instrument image set. Images have been calibrated and geolocation information is appended.

keywords=DSCOVER, EPIC, imagery, L1A, lagrange, 551nm, 688nm, 680nm, 764nm, 780nm,
443nm, 388nm, 340nm, 325nm, 318nm
date_created=20-Aug-2014 11:17:44
institution=NASA/GSFC
project=Deep Space Climate Observatory
image_set_date=2013/01/01 00:06:36
revision_number=0.00
calibration_file=epiccal00.h5
Granule_version=01
begin_time=todo
end_time=todo
centroid_mean_latitude=-29.00
centroid_mean_longitude=-179.30
minimum_latitude=-90.00
maximum_latitude=61.07
minimum_longitude=-180.00
maximum_longitude=180.00
geospatial_lat_min=-90.00
geospatial_lat_max=180.00
geospatial_lon_min=-90.00

4.2 L1B SAMPLE METADATA (.MET)

Band_551nm_present=0/1
Band_688nm_present=0/1
Band_680nm_present=0/1
Band_764nm_present=0/1
Band_780nm_present=0/1
Band_443nm_present=0/1
Band_388nm_present=0/1
Band_340nm_present=0/1
Band_325nm_present=0/1
Band_317nm_present=0/1
Percent_bad_pixels_551nm=XXX.XX
Band_551nm_resolution=XXXX
Band_551nm_resolution_native=XXXX
Percent_bad_pixels_688nm=XXX.XX
Band_688nm_resolution=XXXX
Band_688nm_resolution_native=XXXX
Percent_bad_pixels_680nm=XXX.XX
Band_680nm_resolution=XXXX
Band_680nm_resolution_native=XXXX
Percent_bad_pixels_764nm=XXX.XX
Band_764nm_resolution=XXXX
Band_764nm_resolution_native=XXXX

Percent_bad_pixels_780nm=XXX.XX
Band_780nm_resolution=XXXX
Band_780nm_resolution_native=XXXX
Percent_bad_pixels_443nm=XXX.XX
Band_443nm_resolution=XXXX
Band_443nm_resolution_native=XXXX
Percent_bad_pixels_388nm=XXX.XX
Band_388nm_resolution=XXXX
Band_388nm_resolution_native=XXXX
Percent_bad_pixels_340nm=XXX.XX
Band_340nm_resolution=XXXX
Band_340nm_resolution_native=XXXX
Percent_bad_pixels_325nm=XXX.XX
Band_325nm_resolution=XXXX
Band_325nm_resolution_native=XXXX
Percent_bad_pixels_317nm=XXX.XX
Band_317nm_resolution=XXXX
Band_317nm_resolution_native=XXXX
title=<string>
summary=<string>
keywords=<string>
date_created=<string>
institution=<string>
project=<string>
image_set_date=<string>
revision_number=XXX
calibration_file=<string>
Granule_version=XX
begin_time=<string>
end_time=<string>
centroid_mean_latitude=XX.XX
centroid_mean_longitude=XXX.XX
minimum_latitude=XX.XX
maximum_latitude=XX.XX
minimum_longitude=XXX.XX
maximum_longitude=XXX.XX
geospatial_lat_min=XX.XX
geospatial_lat_max=XX.XX
geospatial_lon_min=XXX.XX

4.3 L1B METADATA TEXT FORMAT

```

Band_551nm_present=0/1
Band_688nm_present=0/1
Band_680nm_present=0/1
Band_764nm_present=0/1
Band_780nm_present=0/1
Band_443nm_present=0/1
Band_388nm_present=0/1
Band_340nm_present=0/1
Band_325nm_present=0/1
Band_317nm_present=0/1
Percent_bad_pixels_551nm=XXX.XX
Band_551nm_resolution=XXXX
Band_551nm_resolution_native=XXXX
Percent_bad_pixels_688nm=XXX.XX
Band_688nm_resolution=XXXX
Band_688nm_resolution_native=XXXX
Percent_bad_pixels_680nm=XXX.XX
Band_680nm_resolution=XXXX
Band_680nm_resolution_native=XXXX
Percent_bad_pixels_443nm=XXX.XX
Band_443nm_resolution=XXXX
Band_443nm_resolution_native=XXXX
Percent_bad_pixels_764nm=XXX.XX
Band_764nm_resolution=XXXX
Band_764nm_resolution_native=XXXX
Percent_bad_pixels_780nm=XXX.XX
Band_780nm_resolution=XXXX
Band_780nm_resolution_native=XXXX
Percent_bad_pixels_388nm=XXX.XX
Band_388nm_resolution=XXXX
Band_388nm_resolution_native=XXXX
Percent_bad_pixels_340nm=XXX.XX
Band_340nm_resolution=XXXX
Band_340nm_resolution_native=XXXX
Percent_bad_pixels_325nm=XXX.XX
Band_325nm_resolution=XXXX
Band_325nm_resolution_native=XXXX
Percent_bad_pixels_317nm=XXX.XX
Band_317nm_resolution=XXXX
Band_317nm_resolution_native=XXXX
title=<String>
summary=<String>
keywords=<String>

```

date_created=<String>
institution=<String>
project=<String>
image_set_date=<String>
revision_number=XXX.XX
calibration_file=<String>
Granule_version=XX
begin_time=<String>
end_time=<String>
centroid_latitude=XXX.XX
centroid_longitude=XXX.XX
minimum_latitude=XX.XX
maximum_latitude=XX.XX
minimum_longitude=XXX.XX
maximum_longitude=XXX.XX
geospatial_lat_min=XX.XX
geospatial_lat_max=XXX.XX
geospatial_lon_min=XXX.XX
Centroid_latitude=XX.XX
Centroid_longitude=XXX.XX
Top_latitude=XX.XX
Top_longitude=XXX.XX
Bottom_latitude=XX.XX
Bottom_longitude=XXX.XX
Left_latitude=XX.XX
Left_longitude=XXX.XX
Right_latitude=XXXXX
Right_longitude=XXX.XX

4.4 SAMPLE L1B METADATA (.MET) FILE

Band_551nm_present=1
Band_688nm_present=1
Band_680nm_present=1
Band_764nm_present=1
Band_780nm_present=1
Band_443nm_present=1
Band_388nm_present=1
Band_340nm_present=1
Band_325nm_present=1
Band_317nm_present=1
Percent_bad_pixels_551nm=0.00
Band_551nm_resolution=2048
Band_551nm_resolution_native=1024
Percent_bad_pixels_688nm=0.00

Band_688nm_resolution=2048
Band_688nm_resolution_native=1024
Percent_bad_pixels_680nm=0.00
Band_680nm_resolution=2048
Band_680nm_resolution_native=1024
Percent_bad_pixels_443nm=0.00
Band_443nm_resolution=2048
Band_443nm_resolution_native=2048
Percent_bad_pixels_764nm=0.00
Band_764nm_resolution=2048
Band_764nm_resolution_native=1024
Percent_bad_pixels_780nm=0.00
Band_780nm_resolution=2048
Band_780nm_resolution_native=1024
Percent_bad_pixels_388nm=0.00
Band_388nm_resolution=2048
Band_388nm_resolution_native=1024
Percent_bad_pixels_340nm=0.00
Band_340nm_resolution=2048
Band_340nm_resolution_native=1024
Percent_bad_pixels_325nm=0.00
Band_325nm_resolution=2048
Band_325nm_resolution_native=1024
Percent_bad_pixels_317nm=0.00
Band_317nm_resolution=2048
Band_317nm_resolution_native=1024
title=Deep Space Climate Observatory Earth Polychromatic Imaging Camera level 1B product
summary=This dataset contains an EPIC instrument image set. Images have been calibrated and geolocated.
keywords=DSCOV, EPIC, imagery, L1B, lagrange, 551nm, 688nm, 680nm, 764nm, 780nm, 443nm, 388nm, 340nm, 325nm, 318nm
date_created=20-Aug-2014 10:09:03
institution=NASA/GSFC
project=Deep Space Climate Observatory
image_set_date=2013/01/01 00:06:36
revision_number=0.00
calibration_file=epiccal00.h5
Granule_version=01
begin_time=todo
end_time=todo
centroid_latitude=-29.00
centroid_longitude=-179.00
minimum_latitude=-90.00
maximum_latitude=61.07
minimum_longitude=-277.32

maximum_longitude=373.37
geospatial_lat_min=-90.00
geospatial_lat_max=373.37
geospatial_lon_min=-277.32
Centroid_latitude=-29.00
Centroid_longitude=-179.00
Top_latitude=0.00
Top_longitude=0.00
Bottom_latitude=0.00
Bottom_longitude=0.00
Left_latitude=0.00
Left_longitude=0.00
Right_latitude=0.00
Right_longitude=0.00

Appendix A. Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
ASCII	American Standard Code for Information Interchange
API	Application Programming Interface
ASDC	Atmospheric Science Data Center
CCB	Configuration Control Board
CCD	Charge Coupled Device
CCR	Configuration Change Request
CFR	Code of Federal Regulations
CM	Configuration Management
CMO	Configuration Management Office
CSO	Chief Safety and Mission Assurance Officer
DFCB	Data Format Control Book
DSCOV-R	Deep Space Climate Observatory
DSOC	DSCOV-R Science Operations Center
EPIC	Earth Polychromatic Imaging Camera
GS	Ground Segment
GSFC	Goddard Space Flight Center
GNU	GNU's Not Unix
GZIP	GNU zip
HDF	Hierarchical Data Format
ITAR	International Traffic in Arms Regulations
JPEG	Joint Photographic Experts Group
Km	Kilometer
Km/s	Kilometers per second
L1	Lagrange 1
L1A	Level 1 A
L1B	Level 1 B
Lat	Latitude
Lon	Longitude
LF	Line Feed
MB	Megabytes
ms	milliseconds
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
nm	Nanometer
NP	Not Present
Rev	Revision
RGB	Red Green Blue
SPEC	Specification
U.S.	United States
UTC	Coordinated Universal Time