



Clouds and the Earth's Radiant Energy System (CERES) Bidirectional Scans (BDS) Data Set Abstract



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Data Set Description:

This document provides a brief overview to the CERES BDS data set. For more detailed information about this product, see the [CERES BDS Collection Guide](#).

The BiDirectional Scans (BDS) product contains 24 hours of instantaneous Level-1b CERES data for a single scanner instrument. The BDS contains instantaneous radiance measurements recorded every 0.01-second for views of space, internal calibration, solar calibration and Earth. It contains all elevation scan modes which include the normal Earth scan and the short Earth scan modes and both the fixed and rotating azimuth plane scan modes.

The BDS product includes:

- Filtered broadband radiances for the total, shortwave, and window channels for each 0.01 second measurement
- Geolocation and viewing geometry for every Earth-viewing measurement
- Instrument status, engineering temperatures and voltages for each 6.6 second scan
- Sun geometry, satellite position and velocity for each scan
- All raw engineering and status data from the instrument

Additional information about the format and content of the BDS can be found in the [CERES Data Products Catalog](#). Details concerning the science parameters and how they are calculated can be found in the [CERES Algorithm Theoretical Basis Document](#) for Subsystem 1.0 and in the [BDS Collection Guide](#).

Summary of Changes:

The CERES Data Management Team and the Atmospheric Science Data Center (ASDC) at Langley use a Sampling Strategy, a Production Strategy and a Configuration Code (CCode) to track versions of CERES archival data products. In general, minor reprocessing changes are tracked by increasing the Configuration Code while major reprocessing changes result in a new Production Strategy. The Sampling Strategy identifies the satellite and instrument which acquired the data in the product.

A summary of changes made to the CERES BDS product is shown in the following tables.

Modification History of the CERES BDS NPP Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
NPP-FM5_Edition1-CV ⁽³⁾	300305	11/2014	<ul style="list-style-type: none"> Update to fix Satellite_Type variable in the IES header to properly report as NPP.
NPP-FM5_Edition1-CV ⁽³⁾	300304	07/2014	<ul style="list-style-type: none"> Updates to write out the BDS product as compressed directly from the main PGE.
NPP-FM5_Edition1-CV ⁽³⁾	300303	08/2013	<ul style="list-style-type: none"> Updates to remove bad data from the drift corrected counts. This data did not affect the radiance data; however, it caused issues with the analysis of the internal calibration data used to calculate gain updates. This issue was only seen for NPP-FM5.
NPP-FM5_Edition1-CV ⁽³⁾	300302	08/2012	<ul style="list-style-type: none"> Minor updates to support NPP-FM5 Edition1-CV Updated ancillary data files to support NPP Edition1-CV
NPP-FM5_Edition1 ⁽³⁾	100105	10/2014	<ul style="list-style-type: none"> Newly derived gain values based on analysis of in-flight internal calibration data. Update to fix Satellite_Type variable in the IES header to properly report as NPP.
NPP-FM5_CoversClosed ⁽¹⁾	300302	08/2012	<ul style="list-style-type: none"> Minor updates to support NPP-FM5 Edition1-CV Updated ancillary data files to support NPP Edition1-CV
Availability (1) Validation version only available to CERES analysts; (2) restricted to CERES Science Team; (3) public			

Modification History of the CERES BDS Aqua Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	300305	11/2014	<ul style="list-style-type: none"> Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1-CV data.
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	300304	07/2014	<ul style="list-style-type: none"> Updates to write out the BDS product as compressed directly from the main PGE.
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	300303	08/2013	<ul style="list-style-type: none"> Updates to remove bad data from the drift corrected counts. This data did not affect the radiance data; however, it caused issues with the analysis of the internal calibration data used to calculate gain updates. This issue was only seen for NPP-FM5.
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	300302	07/2012	<ul style="list-style-type: none"> Minor updates to support NPP-FM5 Edition1-CV Updated ancillary data files to support NPP Edition1-CV
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-NoSW ⁽³⁾	300301	10/2011	<ul style="list-style-type: none"> New C++ version of software on the new production system.
Aqua-FM3_Edition4 ⁽³⁾ Aqua-FM4_Ed4-CV-NoSW ⁽³⁾	400405	10/2014	<ul style="list-style-type: none"> Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1 data.
Aqua-FM3_Edition4 ⁽³⁾ Aqua-FM4_Ed4-CV-NoSW ⁽³⁾	400404	09/2014	<ul style="list-style-type: none"> Updates to fix reading the gains for the last month of the record. Issue with Window radiances at the beginning of the day being set to zero fixed.

Modification History of the CERES BDS Aqua Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Aqua-FM3_Edition4 ⁽³⁾ Aqua-FM4_Edition4 ⁽³⁾ (thru 3/30/2005) Aqua-FM4_Ed4-CV-NoSW ⁽³⁾ (after 3/30/2005)	400403	04/2014	<ul style="list-style-type: none"> • Gains based on in-flight internal calibration data. • No daily interpolation of gain values, one gain for each channel used for all days in the month.
Aqua-FM3_Edition3 ⁽³⁾ Aqua-FM4_Ed3-NoSW ⁽³⁾	300305	11/2014	<ul style="list-style-type: none"> • Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1 data.
Aqua-FM3_Edition3 ⁽³⁾ Aqua-FM4_Ed3-NoSW ⁽³⁾	300304	06/2014	<ul style="list-style-type: none"> • Updates to fix reading the gains for the last month of the record for Edition4. • Issue with Window radiances at the beginning of the day being set to zero fixed for Edition4.
Aqua-FM3_Edition3 ⁽³⁾ Aqua-FM4_Ed3-NoSW ⁽³⁾	300303	08/2013	<ul style="list-style-type: none"> • Minor update to the C++ version of the software to fix the incorrect time initialization. The incorrect time caused the Second Time Constant algorithm to calculate the adjustment incorrectly.
Aqua-FM3_Edition3 ⁽³⁾ Aqua-FM4_Ed3-NoSW ⁽³⁾	300300	01/2011	<ul style="list-style-type: none"> • Software moved to new production system.
Aqua-FM3_Edition3 ⁽³⁾ Aqua-FM4_Edition3 ⁽³⁾ (06/2002 through 03/29/2005) Aqua-FM4_Ed3-NoSW ⁽³⁾ (after 03/30/2005)	032040	09/2010	<ul style="list-style-type: none"> • Updated instrument gains based on internal calibration results.
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	033038	09/2008	<ul style="list-style-type: none"> • Change all scripts to Perl. • Update to support multiple platforms. • Fix error caused by a possible bit flip in Level-0 data signaling a DAC update. • Recompilation of code with new Toolkit to fix a problem reading ephemeris/attitude data. • Fix problem encountered due to the addition of a leap second on Dec. 31, 2005.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Ed2-NoSW ⁽³⁾	032040	09/2008	<ul style="list-style-type: none"> • Change all scripts to Perl. • Update to support multiple platforms. • Update code to handle Edition2 and Edition3 processing. • Recompilation of code with new Toolkit to fix a problem reading ephemeris/attitude data. • Fix problem encountered due to the addition of a leap second on Dec. 31, 2005.
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	033034	01/2007	<ul style="list-style-type: none"> • Changes to scripts to get the Aqua-FM4_Ed1-CV-NoSW3 correct ephemeris and Attitude data files. • OS upgrade
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Ed2-NoSW ⁽³⁾	031036	01/2007	<ul style="list-style-type: none"> • OS upgrade
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Ed2-NoSW3 ⁽³⁾	031035	04/2006	<ul style="list-style-type: none"> • Add ability to set start/stop time in script to process data after the addition of the leap second on Dec. 31, 2005.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Ed2-NoSW ⁽³⁾	031034	01/2006	<ul style="list-style-type: none"> • Fix script to correctly select ephemeris/attitude data files.

Modification History of the CERES BDS Aqua Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Aqua-FM3_Edition1-CV ⁽³⁾ Aqua-FM4_Ed1-CV-NoSW ⁽³⁾	033033	03/2006	<ul style="list-style-type: none"> • An update was made to the scripts to select the correct ephemeris and attitude data files. • Update to add Solar and Lunar Angles to the BDS. New SDSs: Solar Elevation Angles, Lunar Elevation Angles, Solar Azimuth Angles, Lunar Azimuth Angles. • New fields in the Satellite-Celestial Vdata: Earth-Moon Distance, Solar Beta Angle, Solar Eta Angle, Lunar Beta Angle, Lunar Eta Angle, Lunar Longitude at record start, Lunar Colatitude at record start. • Update to check when Solar Heating affects radiance counts, when this occurs the radiances are set to the CERES Fill- Value. • Tighten Std. Dev. thresholds for the spaceclamp, to catch bit- flips that may occur in the data.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	031033	11/2005	<ul style="list-style-type: none"> • Update to read new SDSs and new fields in the Satellite-Celestial Vdata in Edition1-CV BDSs. Edition2 after November 2005 will include these new SDSs and Vdata fields.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	032031	08/2005	<ul style="list-style-type: none"> • Updates to code to allow processing of Total and WN channel data in FM4 after the SW channel anomaly, which began on 03/30/2005. This update does not affect FM3 science data.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	030032	04/2005	<ul style="list-style-type: none"> • Updated to use same samples for spaceclamp determination as those used in Edition1. • Update Solar Eclipse tolerance angle from 0.75 to 0.65 to avoid footprints being mistakenly flagged as being in a Solar Eclipse condition.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	031030	03/2005	<ul style="list-style-type: none"> • Radiance values set to fill-value when any channels raw data equal exactly zero. • Update to check the 16-bit raw radiance value against the fill- value before moving to a 64-bit value for calculations. • Update to properly handle the patch being uploaded for the WN Bridge Balance. • Fix error causing a BAD spaceclamp flag being overwritten with GOOD and causing an erroneous spaceclamp to be calculated and used in radiance count conversion.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	029030	09/2004	<ul style="list-style-type: none"> • Update to set geolocation values to CERES fill-value when a bit-flip is encountered in the elevation counts.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	030028	09/2004	<ul style="list-style-type: none"> • Update to set geolocation values to CERES fill-value when a bit-flip is encountered in the elevation counts.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	028029	06/2004	<ul style="list-style-type: none"> • Update to fix Double Drift Correction initialization.
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	028028	05/2004	<ul style="list-style-type: none"> • Update made to default spaceclamp region. Minor Changes expected in: <ul style="list-style-type: none"> ○ CERES SW Filtered Radiance Upwards ○ CERES WN Filtered Radiance Upwards ○ CERES TOT Filtered Radiance Upwards
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	029027	05/2004	<ul style="list-style-type: none"> • Update Double Drift Correction Algorithm. Changes expected in: <ul style="list-style-type: none"> ○ CERES SW Filtered Radiance Upwards ○ CERES WN Filtered Radiance Upwards ○ CERES TOT Filtered Radiance Upwards

Modification History of the CERES BDS Aqua Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Aqua-FM3_Edition2 ⁽³⁾ Aqua-FM4_Edition2 ⁽³⁾	028027	03/2004	<ul style="list-style-type: none"> • New SDSs containing double drift corrected counts added. • New algorithm added to correct SW interference with the WN channel radiances. • Double Drift correction added to radiance conversion to correct drift introduced by the Second Time Constant correction.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	027025	03/2004	<ul style="list-style-type: none"> • New SDSs containing double drift corrected counts added. • New algorithm added to correct SW interference with the WN channel radiances. • Double Drift correction added to radiance conversion to correct drift introduced by the Second Time Constant correction.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	027027	09/2003	<ul style="list-style-type: none"> • No Science Impact.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	027026	08/2003	<ul style="list-style-type: none"> • Corrected erroneous Second Time Constant equation.
Aqua-FM3_Edition1 ⁽³⁾ Aqua-FM4_Edition1 ⁽³⁾	026025	01/2003	<ul style="list-style-type: none"> • Release of Aqua Edition1, updated ground to flight gains.
Availability: (1) Validation version only available to CERES analysts; (2) restricted to CERES Science Team; (3) public			

Modification History for: [NPP](#) | [Aqua](#) | [Terra](#) | [TRMM](#)

Modification History of the CERES BDS Terra Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	300305	11/2014	<ul style="list-style-type: none"> • Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1-CV data.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	300304	07/2014	<ul style="list-style-type: none"> • Updates to write out the BDS product as compressed directly from the main PGE.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	300303	08/2013	<ul style="list-style-type: none"> • Updates to remove bad data from the drift corrected counts. This data did not affect the radiance data; however, it caused issues with the analysis of the internal calibration data used to calculate gain updates. This issue was only seen for NPP-FM5
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	300302	07/2012	<ul style="list-style-type: none"> • Minor updates to support NPP-FM5 Edition1-CV • Updated ancillary data files to support NPP Edition1-CV
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	300301	10/2011	<ul style="list-style-type: none"> • New C++ version of software on the new production system.
Terra-FM1_Edition4 ⁽³⁾ Terra-FM2_Edition4 ⁽³⁾	400405	10/2014	<ul style="list-style-type: none"> • Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1 data.
Terra-FM1_Edition4 ⁽³⁾ Terra-FM2_Edition4 ⁽³⁾	400404	09/2014	<ul style="list-style-type: none"> • Updates to fix reading the gains for the last month of the record. • Issue with Window radiances at the beginning of the day being set to zero fixed.
Terra-FM1_Edition4 ⁽³⁾ Terra-FM2_Edition4 ⁽³⁾	400403	02/2014	<ul style="list-style-type: none"> • Newly derived gains based on in-flight internal calibration data. SW gain values • No daily interpolation of gain values, one gain for each channel used for all days in the month.

Modification History of the CERES BDS Terra Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Terra-FM1_Edition3 ⁽³⁾ Terra-FM2_Edition3 ⁽³⁾	300305	11/2014	<ul style="list-style-type: none"> Update to fix Satellite_Type variable in the IES header to properly report NPP for NPP Edition1 data.
Terra-FM1_Edition3 ⁽³⁾ Terra-FM2_Edition3 ⁽³⁾	300304	06/2014	<ul style="list-style-type: none"> Updates to fix reading the gains for the last month of the record for Edition4. Issue with Window radiances at the beginning of the day being set to zero fixed for Edition4.
Terra-FM1_Edition3 ⁽³⁾ Terra-FM2_Edition3 ⁽³⁾	300303	08/2013	<ul style="list-style-type: none"> Minor update to the C++ version of the software to fix the incorrect time initialization. The incorrect time caused the Second Time Constant algorithm to calculate the adjustment incorrectly.
Terra-FM1_Edition3 ⁽³⁾ Terra-FM2_Edition3 ⁽³⁾	300300	01/2011	<ul style="list-style-type: none"> Software moved to new production system.
Terra-FM1_Edition3 ⁽³⁾ Terra-FM2_Edition3 ⁽³⁾	032040	11/2009	<ul style="list-style-type: none"> Updated instrument gains based on internal calibration results.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	033038	09/2008	<ul style="list-style-type: none"> Change all scripts to Perl. Update to support multiple platforms. Fix error caused by a possible bit flip in Level-0 data signaling a DAC update. Recompilation of code with new Toolkit to fix a problem reading ephemeris/attitude data. Fix problem encountered due to the addition of a leap second on Dec. 31, 2005.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	032040	09/2008	<ul style="list-style-type: none"> Change all scripts to Perl. Update to support multiple platforms. Update code to handle Edition2 and Edition3 processing. Recompilation of code with new Toolkit to fix a problem reading ephemeris/attitude data. Fix problem encountered due to the addition of a leap second on Dec. 31, 2005.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	033034	01/2007	<ul style="list-style-type: none"> Changes to scripts to get the correct ephemeris and Attitude data files. OS upgrade
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	031036	01/2007	<ul style="list-style-type: none"> OS upgrade
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	031035	04/2006	<ul style="list-style-type: none"> Add ability to set start/stop time in script to process data after the addition of the leap second on Dec. 31, 2005.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	031034	01/2006	<ul style="list-style-type: none"> Fix script to correctly select ephemeris/attitude data files.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	033033	03/2006	<ul style="list-style-type: none"> An update was made to the scripts to select the correct ephemeris and attitude data files.
Terra-FM1_Edition1-CV ⁽³⁾ Terra-FM2_Edition1-CV ⁽³⁾	033032	01/2006	<ul style="list-style-type: none"> Update to add Solar and Lunar Angles to the BDS. New SDSs: Solar Elevation Angles, Lunar Elevation Angles, Solar Azimuth Angles, Lunar Azimuth Angles. New fields in the Satellite-Celestial Vdata: Earth-Moon Distance, Solar Beta Angle, Solar Eta Angle, Lunar Beta Angle, Lunar Eta Angle, Lunar Longitude at record start, Lunar Colatitude at record start. Update to check when Solar Heating affects radiance counts, when this occurs the radiances are set to the CERES Fill- Value. Tighten Std. Dev. thresholds for the spaceclamp, to catch bit- flips that may occur in the data.

Modification History of the CERES BDS Terra Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	031033	01/2006	<ul style="list-style-type: none"> Update to read new SDSs and new fields in the Satellite-Celestial Vdata in Edition1-CV BDSs. Edition2 after 11/2005 will include these new SDSs and Vdata fields.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	032031	08/2005	<ul style="list-style-type: none"> Updates do not affect the Terra science data. Updates to code to allow processing of Total and WN channel data in FM4 after the SW channel anomaly, which began on March 30, 2005.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	030032	03/2005	<ul style="list-style-type: none"> Updated to use same samples for spaceclamp determination as those used in Edition1. Update Solar Eclipse tolerance angle from 0.75 to 0.65 to avoid footprints being mistakenly flagged as being in a Solar Eclipse condition.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	031030	03/2005	<ul style="list-style-type: none"> Radiance values set to fill-value when any channels raw data equal exactly zero. Update to check the 16-bit raw radiance value against the fill- value before moving to a 64-bit value for calculations. Update to properly handle the patch being uploaded for the WN Bridge Balance. Fix error causing a BAD spaceclamp flag being overwritten with GOOD and causing an erroneous spaceclamp to be calculated and used in radiance count conversion.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	029030	09/2004	<ul style="list-style-type: none"> Update to set geolocation values to CERES fill-value when a bit-flip is encountered in the elevation counts.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	030028	09/2004	<ul style="list-style-type: none"> Update to set geolocation values to CERES fill-value when a bit-flip is encountered in the elevation counts.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	028029	06/2004	<ul style="list-style-type: none"> Update to fix Double Drift Correction initialization.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	028028	05/2004	<ul style="list-style-type: none"> Update made to default spaceclamp region. Minor Changes expected in: <ul style="list-style-type: none"> CERES SW Filtered Radiance Upwards CERES WN Filtered Radiance Upwards CERES TOT Filtered Radiance Upwards
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	029027	05/2004	<ul style="list-style-type: none"> Update Double Drift Correction Algorithm. Changes expected in: <ul style="list-style-type: none"> CERES SW Filtered Radiance Upwards CERES WN Filtered Radiance Upwards CERES TOT Filtered Radiance Upwards
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	028027	04/2004	<ul style="list-style-type: none"> New SDSs containing double drift corrected counts added. New algorithm added to correct SW interference with the WN channel radiances. Double Drift correction added to radiance conversion to correct drift introduced by the Second Time Constant correction.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	027025	03/2004	<ul style="list-style-type: none"> New SDSs containing double drift corrected counts added.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	027027	09/2003	<ul style="list-style-type: none"> No Science Impact.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	026024	08/2003	<ul style="list-style-type: none"> Corrected erroneous Second Time Constant equation.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	025023	01/2003	<ul style="list-style-type: none"> No Science Impact.

Modification History of the CERES BDS Terra Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	026025	01/2003	<ul style="list-style-type: none"> No Science Impact.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	025022	12/2003	<ul style="list-style-type: none"> No Science Impact.
Terra-FM1_Edition2 ⁽³⁾ Terra-FM2_Edition2 ⁽³⁾	024023	09/2002	<ul style="list-style-type: none"> Release of Terra Edition2. Update to correct drift found in instrument gains over time.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	024021	07/2002	<ul style="list-style-type: none"> No Science Impact.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	022017	02/2002	<ul style="list-style-type: none"> No Science Impact.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	021016	09/2001	<ul style="list-style-type: none"> Add 3-channel intercomparison to check for bit hits. Provide the capability to process slow azimuth scan rate data. Correct error to properly identify Bridge Balance resets.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	018013	04/2001	<ul style="list-style-type: none"> Updated the scan profile tables to include the new profile with no internal calibration. The previous version did not properly handle this scan profile causing scan dependent offsets of 0.0 to be used instead of the correct values.
Terra-FM1_Edition1 ⁽³⁾ Terra-FM2_Edition1 ⁽³⁾	017012	11/2000	<ul style="list-style-type: none"> Updated Terra count conversion offsets to use the ground determined values since no deep-space calibration has yet been performed. Updated Edit Limits for Terra radiance conversion from wide open to values determined by examining the inflight data. QA flags are now written to BDS as sample level and scan level. Previous flags were written for each sample, even when flags were scan level values. Terra Second Time Constant coefficients were modified based on inflight data analysis.
Terra-FM1_Alpha Terra-FM2_Alpha	014010	04/2000 04/2000	<ul style="list-style-type: none"> Eliminated spaceclamp values with the moon in the field of view. Corrected extraneous data writes when processing multi-day Level 0 files. Potentially fewer records depending on processing conditions. Implemented instrument specific thresholds for the spaceclamp algorithm. Potential changes in spaceclamp values for some records. Added meaningful SDS dimension names as HDF attributes.
Availability: (1) Validation version only available to CERES analysts; (2) restricted to CERES Science Team; (3) public			

Modification History of the CERES BDS TRMM Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
TRMM-PFM_Edition1-CV ⁽³⁾ TRMM-PFM_Ed1-CV- TransOps ⁽³⁾	033033	03/2006	<ul style="list-style-type: none"> Update to add Solar and Lunar Angles to the BDS. New SDSs: Solar Elevation Angles, Lunar Elevation Angles, Solar Azimuth Angles, Lunar Azimuth Angles. New fields in the Satellite-Celestial Vdata: Earth-Moon Distance, Solar Beta Angle, Solar Eta Angle, Lunar Beta Angle, Lunar Eta Angle, Lunar Longitude at record start, Lunar Colatitude at record start. Update to check when Solar Heating affects radiance counts, when this occurs the radiances are set to the CERES Fill- Value. Tighten Std. Dev. thresholds for the spaceclamp, to catch bit- flips that may occur in the data. New SDSs containing Double Drift corrected counts for all 3 channels added to the BDS. Double Drift Correction added to radiance count conversion to correct drift introduced by the Second Time Constant correction.
TRMM-PFM_Edition1 ⁽³⁾ TRMM-PFM_Transient-Ops2 ⁽³⁾ TRMM-PFM_FailingSensor ⁽³⁾	021016	09/2001	<ul style="list-style-type: none"> Add 3-channel intercomparison to check for bit hits. Provide the capability to process slow azimuth scan rate data. Correct error to properly identify Bridge Balance resets.
TRMM-PFM_Edition1 ⁽³⁾	016011	08/2000	<ul style="list-style-type: none"> Crosstalk replacement set to ON for TRMM: radiance values set to fill- value when crosstalk is found. New SDSs added: Time- Ordered Analog Parameters, Drift Corrected Counts (per channel). The BDS is now written with HDF compression. Smaller file for user.
TRMM-PFM_Edition1 ⁽³⁾	015011	07/2000	<ul style="list-style-type: none"> Add check for crosstalk between detector channels. Fixed sign error in the Second Time Constant algorithm.
TRMM-PFM_Transient_Ops2 ⁽³⁾ TRMM-PFM_Edition1 ⁽³⁾	014010	11/1999 02/2000	<ul style="list-style-type: none"> Eliminated spaceclamp values with the moon in the field of view. Corrected extraneous data writes when processing multi-day Level 0 files. Potentially fewer records depending on processing conditions. Implemented instrument specific thresholds for the spaceclamp algorithm. Potential changes in spaceclamp values for some records. Added meaningful SDS dimension names as HDF attributes.
TRMM-PFM_Edition1 ⁽³⁾	011004	04/1999	<ul style="list-style-type: none"> Updated 2nd time constant and spaceclamp algorithms. Included valid radiances in the solar calibration product, BDSS. Updated Terra offsets and coefficients for FM1 and FM2.
TRMM-PFM_Edition1 ⁽³⁾	009001	10/1998	<ul style="list-style-type: none"> Changed Window channel width value to 3.7 from 3.6µm.

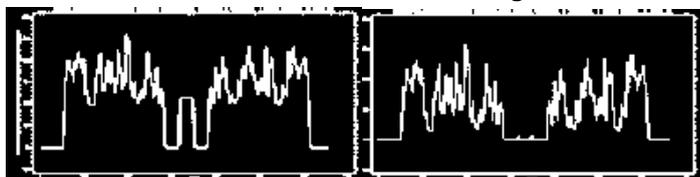
Modification History of the CERES BDS TRMM Archival Product

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on the ES-9 Product
TRMM-PFM_Edition1 ⁽³⁾	008000	08/1998	<ul style="list-style-type: none"> • Corrected along-track data flagging algorithm.
TRMM-PFM_Edition1 ⁽³⁾	007000	07/1998	<ul style="list-style-type: none"> • No science impact.
TRMM-PFM_Edition1 ⁽³⁾	006000	07/1998	<ul style="list-style-type: none"> • Changed TRMM offset files to include Deep Space Calibration offsets for each elevation position. • Corrected Second Time Constant Algorithm. • Changed geolocation from geocentric coordinates at top of atmosphere to geodetic coordinates at Earth surface. • Added viewing angles in geocentric coordinates. • Changed Window channel units to W/m²/sr/μm. • Changed parameter names for geodetic coordinates.
TRMM-PFM_ValidationR1 ⁽²⁾	000019	02/1998	<ul style="list-style-type: none"> • Corrected for Digital-to- Analog Converter updates during rapid thermal changes at sunrise/sunset. • Used updated count conversion coefficients for each channel.
TRMM-PFM_AtLaunch ⁽¹⁾	0016	12/1997	<ul style="list-style-type: none"> • Began generating BDS.
Availability: (1) Validation version only available to CERES analysts; (2) restricted to CERES Science Team; (3) public			

Examples of Data:

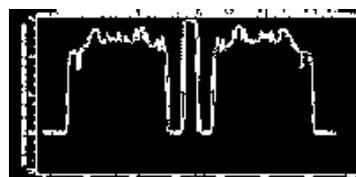
Examples of the January 1998 data contained in the BDS are shown below. Select thumbnail to view larger image.

Individual Radiances for a 6.6 second scan (660 samples) taken during cross-track scan mode



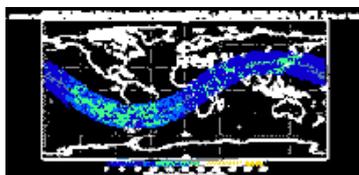
Total Channel

Shortwave Channel

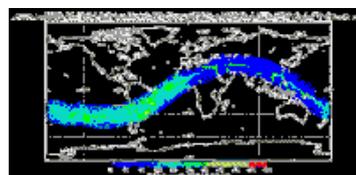


Window

An orbital swath of scans located on the Earth



Cross-track Scan Mode



Rotating

Azimuth Plane Scan Mode

See the [CERES Instrument Home Page](#) for additional information about instrument operations and daily statistics of engineering measurements.

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"These data were obtained from the NASA Langley Research Center Atmospheric Science Data Center."

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Reference:

The CERES Team has gone to considerable trouble to remove major errors and to verify the quality and accuracy of these data. Please provide a reference to the following paper when you publish scientific results with the CERES data:

Wielicki, B. A., B. R. Barkstrom, E. F. Harrison, R. B. Lee III, G. L. Smith, and J. E. Cooper, "Clouds and the Earth's Radiant Energy System (CERES): An Earth Observing System Experiment," *Bull. Amer. Meteor. Soc.*, **77**, 853-868, 1996.

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