

2.4 ERBE-like Monthly Regional Averages (ES-4)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is "like" the algorithm used for the Earth Radiation Budget Experiment (ERBE).

The ES-4 archival data product is created as an HDF file which contains nine HDF Vgroups corresponding to regional, nested regional, zonal, and global averages (see [Table 2.4-3](#)). There are 10,368 2.5-degree regions for the ERBE-like data; therefore, there is a maximum of 10,368 records in the 2.5-degree regional data set. The second set of data is the 2.5-degree nested to 5-degree regional data, which constitutes a maximum of 2,592 records. The third set of data is the 5-degree nested to 10-degree regional data, which constitutes up to 648 records. The fourth, fifth, and sixth sets of data are the 2.5-, 5-, and 10-degree zonally averaged data which constitute 72, 36, and 18 records, respectively. The seventh, eighth, and ninth sets of data are the 2.5-, 5-, and 10-degree globally averaged data which constitutes 1 record each. A summary of the contents of this data product can be found in [Table 2.4-1](#).

A more detailed listing of the data parameters for this product can be found in the ES-4 Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html ([Reference 3](#)).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: TOA

Time Interval Covered:

File: Month

Record: Month

Portion of Globe Covered:

File: Global

Record: Regional, Zonal, Global

Product Version:

TRMM: Edition1, Edition2

Terra: Edition1, Edition2

Aqua: Edition1, Edition2

ES-4 Metadata

The content of the ES-4 product is summarized in [Table 2.4-1](#). The metadata structures contain information which need only be recorded once per monthly product. The CERES Baseline Header Metadata and the CERES_metadata Vdata are listed in [Appendix B](#). The ES-4 Product-specific Metadata are shown in [Table 2.4-2](#).

Table 2.4-1. ES-4 Product Summary

HDF Name	Description Table	Number of Parameters	Nominal Size (MBytes)
CERES Baseline Header Metadata	See Table B-1	35	
CERES_metadata Vdata	See Table B-2	14	
ES-4 Product Specific Metadata	See Table 2.4-2	1	
ES-4 Vgroup Summary	See Table 2.4-3	9	25.482
ES-4 Data Size (MB/Month)			25.5
ES-4 Metadata Size (MB/Month)			1.5
ES-4 TOTAL SIZE (MB/Month)			27.0

Table 2.4-2. ES-4 Product Specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	ES4BinaryProductionDate	1	N/A	N/A	ASCII string

Table 2.4-3. ES-4 Vgroup Summary

Vgroup Number	Vgroup Name	Description	Number of Records	Total Size (MB)
1	2.5 Degree Regional	See Table 2.4-4	10368 (72 x 144)	19.232
2	5.0 Degree Nested Regional	See Table 2.4-5	2592 (36 x 72)	4.808
3	10.0 Degree Nested Regional	See Table 2.4-6	648 (18 x 36)	1.202
4	2.5 Degree Zonal	See Table 2.4-7	72	0.134
5	5.0 Degree Zonal	See Table 2.4-8	36	.067
6	10.0 Degree Zonal	See Table 2.4-9	18	.033
7	2.5 Degree Global	See Table 2.4-10	1	.002
8	5.0 Degree Global	See Table 2.4-11	1	.002
9	10.0 Degree Global	See Table 2.4-12	1	.002
Total Product Size (MB)				25.482

ES-4 Scientific Data Sets

The ES-4 contains science parameters written as HDF Scientific Data Sets (SDSs) which are 2- or 3-dimensional arrays of time ordered records. The ES-4 Collection Guide ([Reference 3](#)) gives a detailed description of the parameters contained on the ES-4 product.

[Table 2.4-4](#) lists the SDSs contained in the 2.5-degree Regional Vgroup.

Table 2.4-4. 2.5 Degree Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

[Table 2.4-5](#) lists the SDSs contained in the 5.0 Degree Nested Regional Vgroup.

Table 2.4-5. 5.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-12	5-13	5-14	5-15	5-16	5-17	5-18	5-19
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X

Table 2.4-5. 5.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-6 lists the SDSs contained in the 10.0 Degree Nested Regional Vgroup.

Table 2.4-6. 10.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-20	5-21	5-22	5-23	5-24	5-25	5-26	5-27
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-7 lists the SDSs contained in the 2.5-Degree Zonal Vgroup.

Table 2.4-7. 2.5-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-28	5-29	5-30	5-31	5-32	5-33	5-34	5-35
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-8 lists the SDSs contained in the 5.0-Degree Zonal Vgroup.

Table 2.4-8. 5.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-36	5-37	5-38	5-39	5-40	5-41	5-42	5-43
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X

Table 2.4-8. 5.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-9 lists the SDSs contained in the 10.0-Degree Zonal Vgroup.

Table 2.4-9. 10.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-44	5-45	5-46	5-47	5-48	5-49	5-50	5-51
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-10 lists the SDSs contained in the 2.5-Degree Global Vgroup.

Table 2.4-10. 2.5-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-52	5-53	5-54	5-55	5-56	5-57	5-58	5-59
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-11 lists the SDSs contained in the 5.0-Degree Global Vgroup.

Table 2.4-11. 5.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-60	5-61	5-62	5-63	5-64	5-65	5-66	5-67
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X

Table 2.4-11. 5.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-12 lists the SDSs contained in the 10.0-Degree Global Vgroup.

Table 2.4-12. 10.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-68	5-69	5-70	5-71	5-72	5-73	5-74	5-75
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

ES-4 Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

ES-4 Revision Record

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
2/23/04	R4V1	503	<ul style="list-style-type: none"> • Updated product versions for Aqua Edition1 to include Edition2. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All All Sec. 2.4