CERES_ISCCP-D2like_Ed3A

Data Quality Summary (11/14/2013)

Investigation: **CERES**
Data Product: **ISCCP-D2like**

Data Set: **Day_Terra (Instruments: CERES-FM1 or -FM2)**
Nit_Terra (Instruments: CERES-FM1 or -FM2)
Day_Aqua (Instruments: CERES-FM3 or -FM4)
Nit_Aqua (Instruments: CERES-FM3 or -FM4)
GEO_DAY
Mrg_GEO-MODIS-DAY (Terra, Aqua, and GEO)

Data Set Version: **Edition3A**

Subsetting Tool Availability: http://ceres.larc.nasa.gov/order_data.php

The purpose of this document is to inform users of the accuracy of this data product as determined by the CERES Science Team. The document summarizes key validation results, provides cautions where users might easily misinterpret the data, provides links to further information about the data product, algorithms, and accuracy, and gives information about planned data improvements.

This document is a high-level summary and represents the minimum information needed by scientific users of this data product. It is strongly suggested that authors, researchers, and reviewers of research papers re-check this document for the latest status before publication of any scientific papers using this data product.

NOTE: To navigate the document, use the Adobe Reader bookmarks view option. Select "View" "Navigation Panels" "Bookmarks".

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1.0 Nature of the CERES ISCCP-D2like Products

The CERES-ISCCP-D2like Edition3A product provides the CERES MODIS-derived and geostationary (GEO)-derived cloud property retrievals where the cloud properties have been stratified by optical depth and cloud pressure levels similar to the ISCCP D2 product (Rossow and Schiffer 1991). The cloud properties are gridded onto 1°x1° regions and averaged over monthly and monthly 3-hourly time scales. The CERES MODIS cloud properties are not the official NASA Goddard MODIS MOD06 or MYD06 cloud retrievals, but are based on the CERES cloud working group retrievals (Minnis et al. 2011) that are also available in the CERES SSF level-2 and SSF1deg Edition 3A products. The GEO cloud properties are retrieved from a two-channel algorithm using only the geostationary satellites' visible and IR bands (Minnis et al. 1996) and are the same GEO cloud properties found in the SYN1deg Edition 3A products.

The CERES ISCCP-D2like product essentially reformats the CERES-MODIS and GEO cloud properties in the same manner as the NASA GISS ISCCP-D2 cloud property products are distributed. This allows the user to to employ the CERES-generated cloud properties in all ISCCP-D2 applications, such as GCM validation and other climate modeling studies. The CERES project will shortly provide a CERES-MODIS simulator that can be applied to model output in order to produce quantities that can be directly compared to the CERES MODIS and GEO cloud retrievals found in the ISCCP-D2like products. A flux-by-cloud-type product is also being developed that will provide the associated TOA SW and LW fluxes as a function of cloud type. This new instantaneous gridded 1°-regional product will allow modelers to compare their simulated fluxes using the MODIS cloud properties along the Terra/Aqua ground tracks with the corresponding CERES-observed fluxes.

The CERES ISCCP-D2like products are organized into four categories depending on cloud retrieval source and are described in Table 1-1. The MODIS cloud properties are separated into day and night products, since the nighttime MODIS cloud retrievals come from the IR channels only and are not of the same quality as the daytime retrievals. The GEO cloud properties are daytime-only when GEO optical depths are available. The Mrg product, also daytime-only, combines the Terra-MODIS (10:30 AM local equator crossing time (LECT)), Aqua-MODIS (1:30 PM LECT), and GEO cloud properties. The GEO cloud properties in the Mrg product have been normalized to MODIS and are therefore consistent with MODIS to complete the diurnal cycle. The 9 or 42 cloud types are defined according to optical depth and cloud top pressure and are identical to the ISCCP definition (see Figure 1-1). Only the MODIS products are available in the 42 cloud type format. Table 1-2 lists the parameters available by product and cloud type.

Table 1-1. Description of the four ISCCP-D2like products. SSSS indicates the satellite (Terra, Aqua), and # identifies the CERES instrument (FM1, FM2, FM3, FM4).

ISCCP-D2like Product Filename	Description
ISCCP-D2like-Day_SSSS-FM#-MODIS	Daytime (SZA<82°) MODIS-only SSF-based clouds. One monthly file per satellite.
ISCCP-D2like-Nit_SSSS-FM#-MODIS	Nighttime (SZA≥82°) MODIS-only SSF-based clouds. One monthly file per satellite.
ISCCP-D2like-GEO_DAY	Daytime 5-satellite GEO-only 3-hourly 8-km resolution cloud retrievals. 60°N to 60°S spatial domain. One file per month.
ISCCP-D2like-Mrg_GEO-MODIS-DAY	Daytime combined Terra and Aqua MODIS and GEO cloud properties. MODIS takes precedence over GEO. GEO cloud properties normalized to MODIS for consistency. One file per month.

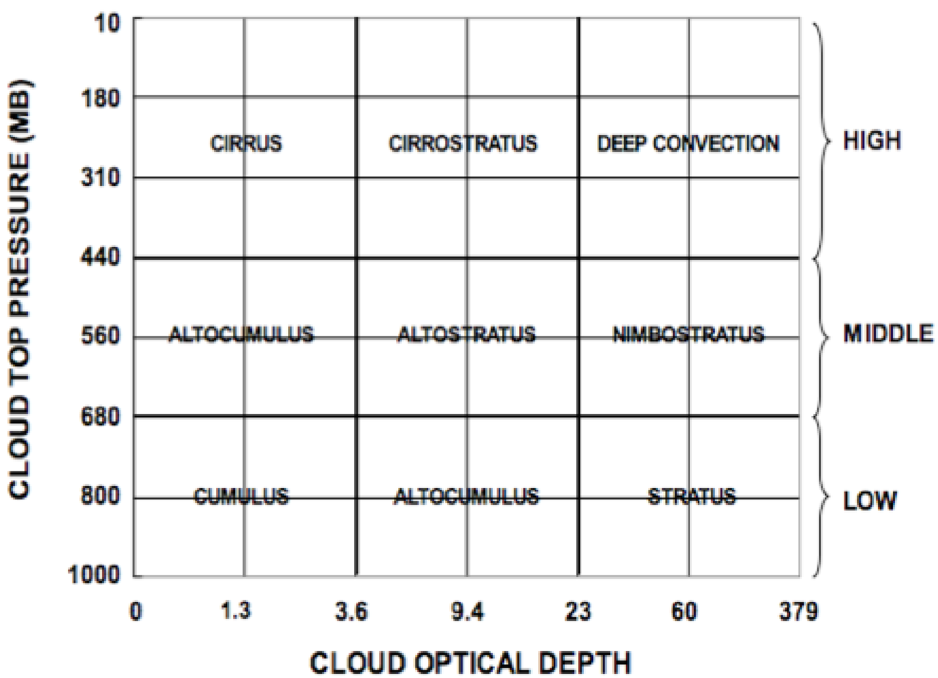

Figure 1-1. The stratification of the 9 (thick lines, large blocks) and 42 (thin lines, small blocks) cloud types as a function of cloud top pressure and cloud optical depth. The cloud type names are given for the 9 cloud types.

Table 1-2. List of cloud properties available as a function of ISCCP-D2like product. The 42 cloud type format is not available for either the GEO or Mrg products.

	9 cloud types			**42 cloud types**		
Cloud Property	**Day/Nit**	**GEO**	**Mrg**	**Day/Nit**	**GEO**	**Mrg**
Total Cloud Fraction	X	X	X	X		
Liquid Cloud Fraction	X	X	X	X		
Ice Cloud Fraction	X	X	X	X		
Effective Temperature	X	X	X			
Effective Pressure	X	X	X			
Optical Depth	X	X	X			
LWP (Liquid Water Path) IWP (Ice Water Path)	X	X	X			
Particle Size	X					
IR Emissivity	X					

The monthly 3-hourly GMT time blocks are averaged from the same 3-hourly time block over all days of the month. The monthly mean is derived from the average of the sampled monthly 3-hourly time blocks. Usually over tropical and midlatitude regions, the monthly 3-hourly cloud parameter for Day or Nit equals the monthly mean, since there is only one daytime or nighttime satellite overpass per day (Figure 1-2). For the GEO and Mrg products, usually four daytime 3-hourly blocks are used to compute the monthly mean. Unlike the SYN1deg or SSF1deg products, no temporal interpolation is used to fill in the temporal coverage gaps; the CERES ISCCP-D2like product monthly means are averaged only from measurements. All temporally averaged cloud properties have been weighted by their corresponding cloud fraction.

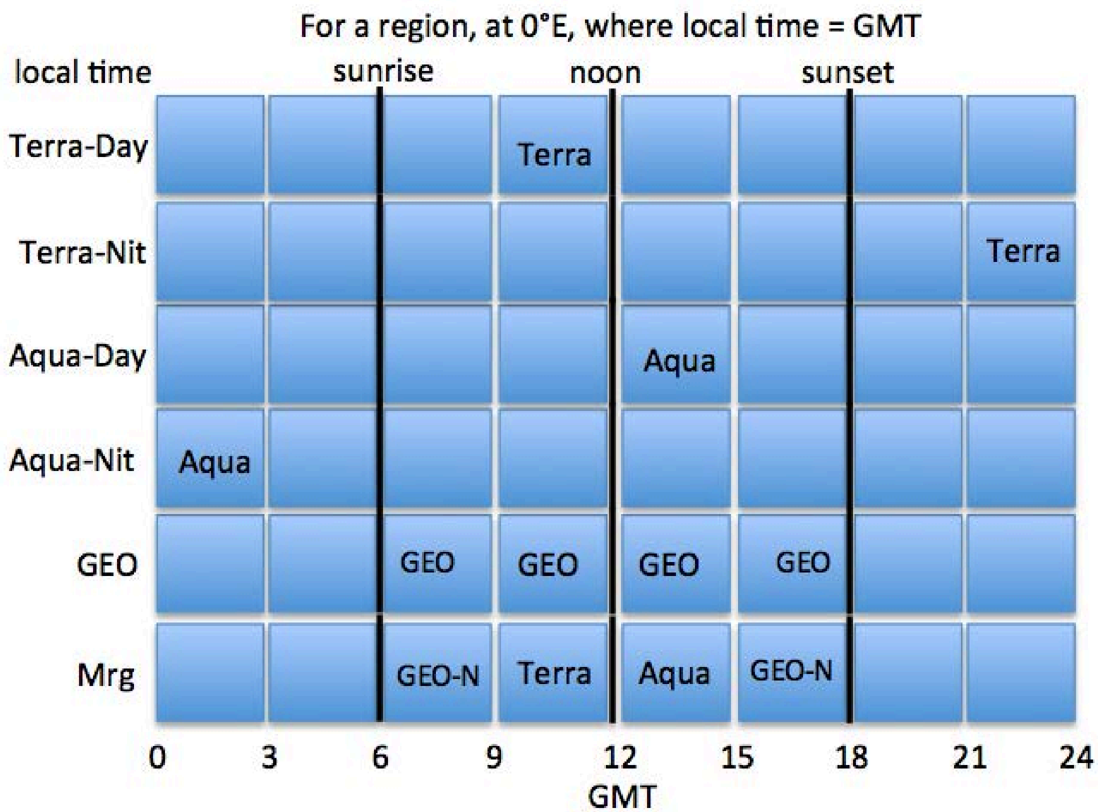

Figure 1-2. A hypothetical monthly 3-hourly GMT example for a 1°-region located at 0° longitude and the equator, where GMT and local time are identical, displaying when the Terra-MODIS, Aqua-MODIS and GEO measurements are observed as a function of the ISCCP-D2like product labeled on the left. GEO-N indicates that the GEO cloud properties were normalized with Terra and Aqua-MODIS time blocks.

The pixel-level MODIS cloud properties are averaged within a CERES 20-km footprint and stratified into two possible cloud layers (Geier et al. 2003 Fig. 4-10). Each of the CERES sub-footprint layers for a satellite overpass within a 1° region are assigned to a cloud type. If there are multiple sub-footprint layers for a single cloud type within a 1° region, the sub-footprint cloud properties are averaged. The quality of the MODIS cloud properties are given in the SSF level-2 Data Quality Summary.

The daytime 3-hourly GEO cloud properties are retrieved from a two-channel algorithm using only the visible and IR bands (Minnis et al. 1996). The GEO visible and IR radiances are first inter-calibrated monthly with coincident collocated and co-angled MODIS radiances to remove any GEO calibration drifts (Doelling et al. 2013). The GEO cloud mask is based on clear-sky thresholds derived from the GEOS-4 predicted clear-sky surface temperatures (Bloom et al. 2005) and the monthly CERES MODIS-based clear-sky albedo maps. The GEO retrieval algorithm assumes a liquid and ice particle size of 10µm radii and 60µm diameter, respectively, to estimate the LWP/IWP. A threshold of 253°K is used to discriminate between liquid and ice phases. The GEO cloud properties are initially stratified by four cloud pressure layers separated at 700, 500 and 300mb, the same layers provided by the SSF1deg and SYN1deg products. A gamma distribution, which is computed using the log and linear optical depth, provides an optical depth distribution for each layer in order to stratify each pressure layer by optical depth (Kato et al. 2005). The integration of the PDF within the optical depth range for the given bin determines the optical depth for the bin (Figure 1-3).

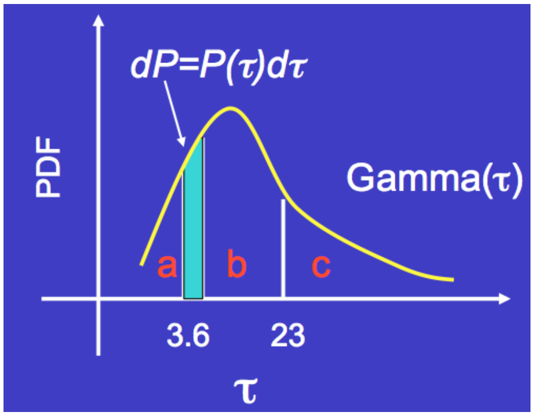

Figure 1-3. An illustration of the integration of the optical depth distribution for 3 optical depth bins (labeled a, b, and c) based on the gamma distribution (yellow line) computed from the linear and log optical depth for a given GEO cloud layer.

The Mrg product combines the daytime Terra-MODIS (10:30 AM LECT), Aqua-MODIS (1:30 PM LECT), and GEO cloud properties to provide the most diurnally complete daytime ISCCP-D2like product. The Mrg product assumes that the MODIS multi-visible and IR channel retrievals are superior to the two-channel GEO retrieval. First, the GEO cloud properties are normalized with coincident (denoted here as within 1.5 hours and within a 1° region) MODIS cloud properties. The coincident MODIS and GEO total cloud property measurement pairs over a 5°x5° lat/lon domain are linearly regressed monthly. In order to obtain the cloud property adjustment factor ratio for a given regional observation, the linear regression coefficients are applied to the total cloud property value divided by the total unadjusted GEO cloud property value. The adjustment factor ratio is then applied to all of the observed sampled cloud type property values for that observation. GEO cloud properties are not normalized over snow or glint areas. Second, the MODIS-normalized GEO 3-hourly cloud properties are assigned to the appropriate 1° regional 3-hourly daily GMT time blocks. Then the Terra and Aqua-MODIS cloud properties are assigned to a 3-hourly time block and take precedence over the coincident GEO retrievals. This is similar to the method outlined in Doelling et al. (2013) to normalize the GEO-derived broadband fluxes to CERES. The ISCCP-D2like-GEO product does not normalize the cloud properties to MODIS.

We urge users to visit the CERES Data subsetting/visualization/ordering tool, which provides a vastly improved user interface and a wider range of data formats (e.g., ASCII, netCDF) than is currently available with the ASDC ordering tool, which is limited to HDF.
http://ceres.larc.nasa.gov

2.0 Cautions and Helpful Hints

The CERES Science Team notes several CAUTIONS and HELPFUL HINTS regarding the use of CERES_ISCCP-D2like_Ed3A:

- A full list of parameters on the CERES ISCCP-D2like is contained in the Data Product Catalog (PDF):
  - ISCCP-D2like-Day/Nit-MODIS
  - ISCCP-D2like-GEO
  - ISCCP-D2like-Mrg
- Processing is performed on a nested grid. This grid uses 1° equal-angle regions between 45°N and 45°S and maintains area consistency at higher latitudes. The product contains a complete 360x180 1°x1° grid created by replication.
- The ISCCP-D2like Day/Nit MODIS products usually only have cloud properties for one monthly 3-hourly GMT bin, which is determined by the local equator crossing time of the either the Terra (10:30AM) or Aqua (1:30PM) satellites over tropical and mid-latitude domains (Figure 1-2). Over the poles, up to 14 overpasses per day per satellite are observed.
- The ISCCP-D2like MODIS cloud property difference between day and night may be a result of the retrieval algorithm. The MODIS daytime cloud properties are retrieved from both visible and IR MODIS bands, whereas at night only the IR bands are used. It is very difficult to obtain accurate optical depths for thick clouds using only IR channels. Cloud properties, such as optical depth, that rely on visible bands show significant differences between day and night as shown in Table 2-1. The nighttime optical depth, LWP, and IWP are underestimated when compared with the more reliable daytime retrievals. It is also possible that some of the differences are caused by diurnal cloud property variations.

Table 2-1. The Aqua-MODIS 10-year mean cloud properties from July 2002 to June 2012 for nonpolar (±60° latitude) and polar (>60° latitude) regions.

Aqua Ed2 10-year Means	Day		Night	
	nonpolar	polar	nonpolar	polar
Cloud Fraction (%)	60.0	71.8	58.5	63.8
Effective Temperature (K°)	261.9	249.6	253.8	244.5
Optical Depth	4.7	3.7	3.5	4.1
LWP (g/cm^2)	77.6	81.7	60.7	60.1
IWP (g/cm^2)	237.3	99.5	67.4	98.1
Liquid particle radii (μm)	13.3	11.8	13.7	11.7
Ice particle radii (μm)	24.3	25.4	43.3	32.5

- No zonal or global averages are provided with this product. No daily or 3-hourly temporal resolutions are provided.
- When averaging cloud properties, weight by the associated cloud fraction. Combining liquid and ice water paths and particle sizes should be avoided.

- Two optical depth averages are provided. The “log optical depth” logarithmically averages the individual pixel-level optical depths spatially and logarithmically weights the daily 1°-regional means to estimate the monthly optical depth. The logarithm of the optical depth is proportional to radiance. These are left in the log form in the data product; to convert to optical depth take the natural exponent. This log optical depth should be used for most applications, especially when comparing to other datasets. The “linear optical depth” averages the pixel-level optical depths linearly. When used in tandem with the “log optical depth,” the optical depth distribution can be estimated (Kato et al. 2005).
- CERES ISCCP-D2like products are only available for the CERES instrument which was in cross-track mode for a given month. There are two CERES instruments on both the Terra and Aqua satellites; each instrument can be operated in either the cross-track or Rotating Azimuth Plane Scan (RAPS) mode. The crosstrack mode provides a uniform spatial distribution of the CERES instrument footprints. All CERES Terra/Aqua Edition 3A instrument radiances are calibrated to be on the same radiometric scale. For Terra, the FM1 instrument spends the most time in crosstrack mode. For Aqua, FM4 was the prime crosstrack instrument prior to March 2005. When the SW channel failed at the end of March 2005, FM3 was permanently placed in crosstrack mode. Please see this month-to-month summary of the CERES operational scan modes on Terra and Aqua.
- Users should be aware that some of the key inputs used to produce ISCCP-D2like Ed3A cloud properties changed at various times during the data record. Such changes, if large enough, may introduce spurious, unphysical jumps in the record. In the past, these changes were reflected in each CERES data product’s version through a letter change (e.g., SRBAVG Edition2A, Edition2B, etc.). However, this proved cumbersome and confusing to many users. Therefore, for the ISCCP-D2like Edition3A, letter changes will only reflect a reprocessing of the data record (e.g., due to a code bug). Changes to inputs will instead be documented in this Data Quality Summary. Figure 2-1 provides a timeline of all input source changes used to produce the SSF1deg and SYN1deg data products. Users are advised to use Figure 2-1 as a reference in their analysis of ISCCP-D2like products. The introduction of a new GEO satellite may cause an unphysical jump. Also the MTSAT-1R visible radiance response was nonlinear when compared with MODIS. The MTSAT-1R-based clear-sky radiance may be overestimated near bright clouds causing spurious cloud retrievals (Doelling et al. 2013).

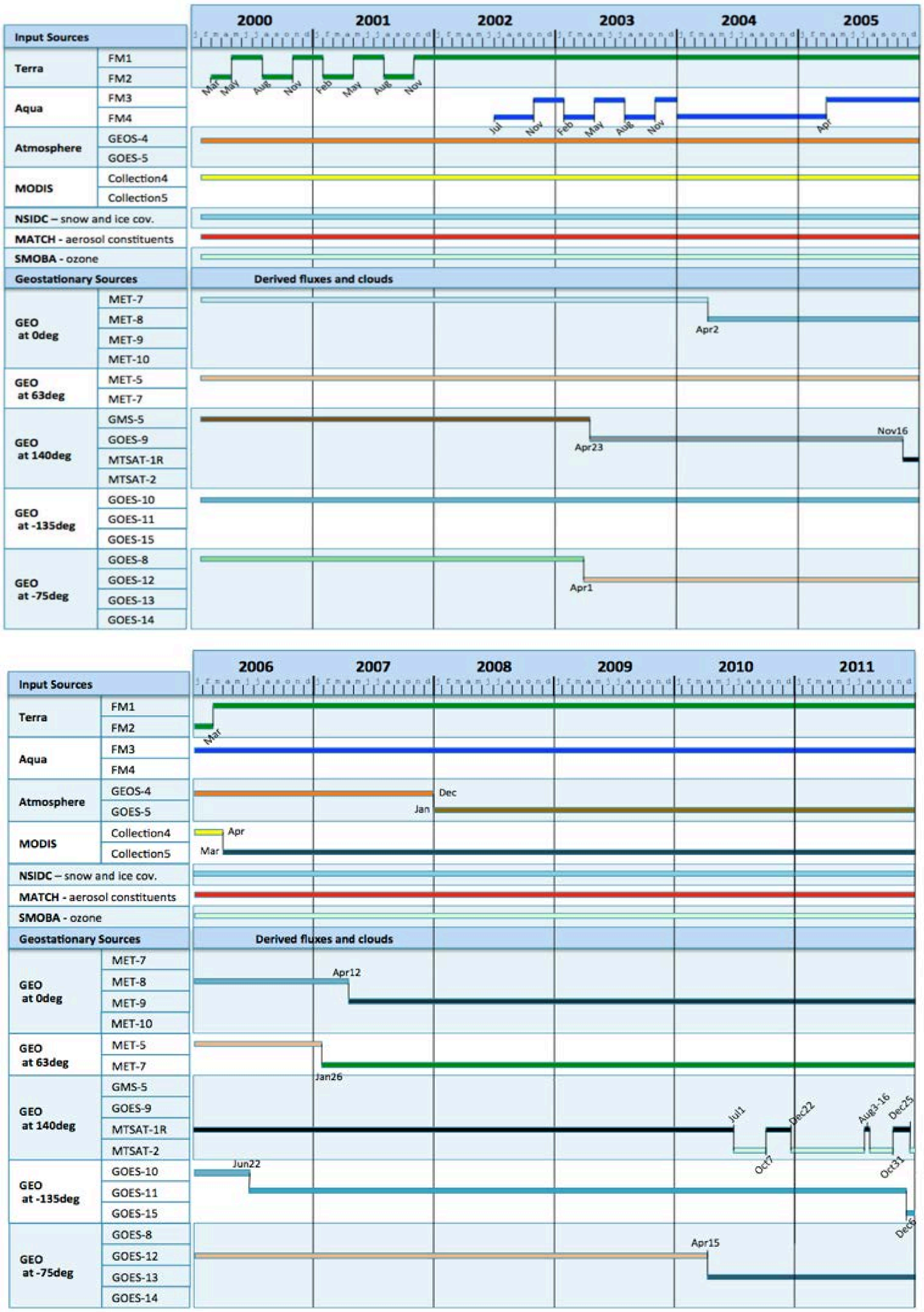

Figure 2-1. CERES input datasets used to produce CERES_ISCCP-D2like products. The most up-to-date chart is located here.

3.0 Version History

3.1 Changes Between Edition3A and Edition2A

Due to a bug in the code, Edition2A did not include optical depth observations less than one *for the ISCCP-D2like-Mrg product only*. This bug has been corrected in Edition3A. No other changes were implemented.

The Edition 2A and Edition 3A Terra-MODIS, Aqua-MODIS, and GEO cloud retrievals are identical. The CERES project introduced Edition3 products to incorporate CERES instrument calibration improvements (Thomas et al. 2010).

3.2 Edition2A

Edition2A is the first publicly available version of the CERES ISCCP-D2like product.

4.0 Accuracy and Validation

4.1 Edition 3A

The primary goal of the ISCCP-D2like products is to provide an ISCCP-D2-like format dataset for the CERES MODIS and GEO cloud properties that are found in other CERES level-2 and level-3 products. The MODIS cloud property accuracy and validation can be found in the CERES Terra Edition3A SSF level2 Data Quality Summary and are documented in Minnis et al. (2011). The GEO-derived broadband fluxes are summarized in the Data Quality Summaries of SYN1deg-lite Ed2.6 and SYN1deg Ed3A and in Doelling et al. (2013). The latter reference also evaluates the GEO cloud properties.

4.1.1 GEO-to-MODIS Cloud Property Normalization

To validate the GEO-to-MODIS cloud property normalization, we compare the 15-minute coincident GEO minus Aqua-MODIS total cloud property differences before and after normalization. The normalization was performed utilizing both Terra and Aqua overpasses and using measurements coincident within 1.5 hours of the 3-hourly GEO measurements. It is assumed that the normalization coefficients derived during the Aqua and Terra overpasses are representative of all daytime hours. If the normalization algorithm were perfect, there would be no GEO minus Aqua-MODIS cloud property biases. Normalization is needed because GEO cloud properties are more difficult to retrieve over ocean sun glint and snow and desert surfaces, since the bright surface albedo reduces the visible contrast between clear and cloudy conditions. In addition, thin clouds are difficult to identify over desert regions using simple GEO IR and visible thresholds.

Figure 4-1 displays the regional difference before and after normalization for December 2002. Data gaps positioned between 5°S and 15°S latitude and 110°-120°E, 50°-60°E, 30°-20°W, 105°-95°W, and 155°-145°W longitude are where the GEO image is in sunglint conditions. During sunglint conditions the GEO cloud properties are not retrieved. However, for regions near sunglint the GEO cloud properties may still be suspect as observed in the 105°-95°W longitude location of the cloud amount difference plot in Figure 4-1. After normalization these regions show remarkable consistency with Aqua-MODIS. The data gap over the Tibetan plateau region is more than likely a GEO cloud retrieval failure over bright snow conditions. After normalization the GEO minus Aqua-MODIS cloud property differences over the Sahara, Saudi Arabia, Namibia, Australia, Mexico and Atacama deserts have been substantially reduced. Also, the cloud property discontinuities at the GEO domain boundaries (see Table 4-1) are evident in the plots before normalization and have been nearly removed after normalization. For example, at 105°W, the boundary between GOES-10 and GOES-8, and at 101°E, the boundary between Meteosat-5 and GMS-5, discontinuities in the Figure 4-1 cloud amount before normalization are observed. After normalization, the discontinuities are removed. Table 4-2 shows the mean bias and regional RMS for December 2002 between 40°N and 40°S. The normalization has reduced the regional RMS difference by 40% for cloud fraction and 54% for cloud effective temperature.

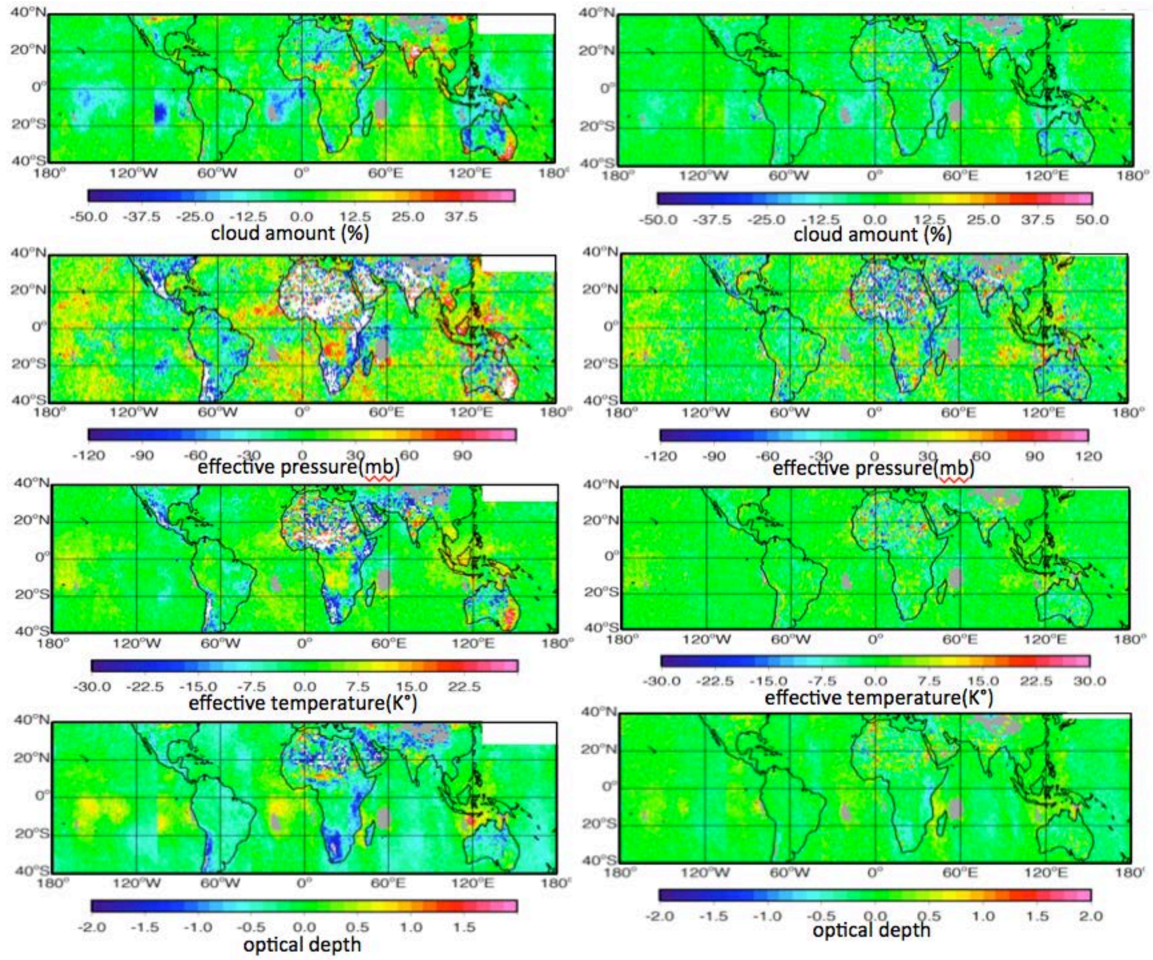

Figure 4-1. Monthly mean regional bias in total cloud properties (left) before and (right) after normalization for December 2002. The bias is defined as the difference between GEO and MODIS 15-minute coincident measurements (GEO – MODIS).

Table 4-1. The GEO domain boundaries during December 2002.

Satellite	Western Boundary	Sub-satellite Longitude	Eastern Boundary
GOES-10	178°W	135°W	105°W
GOES-8	105°W	75°W	37°W
Meteosat-7	37°W	0.0°E	32°E
Meteosat-5	32°E	63°E	101°E
GMS-5	101°E	140°E	178°W

Table 4-2. Monthly mean bias and regional RMS of daytime total cloud properties for December 2002 between 40°N and 40°S, before and after normalization. Measurements are coincident within 15 minutes; bias is GEO – MODIS.

Dec 2002, 40°N to 40°S	Before Normalization		After Normalization	
	Bias	RMS	Bias	RMS
Cloud Fraction (%)	-0.5	9.8	-1.5	5.9
Effective Pressure (mb)	3.3	56.7	-0.9	32.8
Effective Temperature (K°)	-0.2	6.7	0.2	3.1
Optical Depth	-0.16	0.42	-0.01	0.20

4.1.2 ISCCP-D2like-GEO Minus Mrg Cloud Property Differences

The ISCCP-D2like-Mrg product is an improvement over the ISCCP-D2like-GEO since it incorporates both the superior MODIS cloud properties when available and the GEO cloud properties normalized with MODIS during time periods when MODIS cloud properties are nonexistent. The ISCCP-D2like-Mrg product offers daytime diurnally complete cloud properties that are consistent with the MODIS retrievals. To illustrate the improvement in the ISCCP-D2like-Mrg over the ISCCP-D2like-GEO products, Figure 4-2 shows the mean Mrg total cloud properties for December 2002 (left) and the GEO minus Mrg difference (right). Large positive cloud amount differences indicate where GEO amounts are greater than the associated Mrg, such as over the northern Asian snow fields. The normalization removes the GEO domain boundary artifacts. For example, the sharp discontinuity at 101°E is the boundary between Meteosat-5 and GMS-5, which is evident in the cloud amount difference plot in Figure 4-2, but not apparent in the Mrg cloud amount plot. The optical depth difference discontinuities along 32°E, the boundary between Meteosat-7 and Meteosat-5, and along 37°W, the boundary between Meteosat-7 and GOES-8, are not manifested in the Mrg cloud optical depth plot. The negative GEO minus Mrg cloud temperature (pressure) differences over the Australian, Namibian, Saudi Arabian, Atacama and Mexican deserts indicate that the GEO-derived cloud temperatures (pressures) were underestimated and are now consistent with MODIS.

Since the normalization is performed using total cloud properties, it is uncertain if a uniform application of the normalization coefficients is appropriate for all cloud types. It must be remembered that the normalization was based on the cloud types that were dominant for the region.

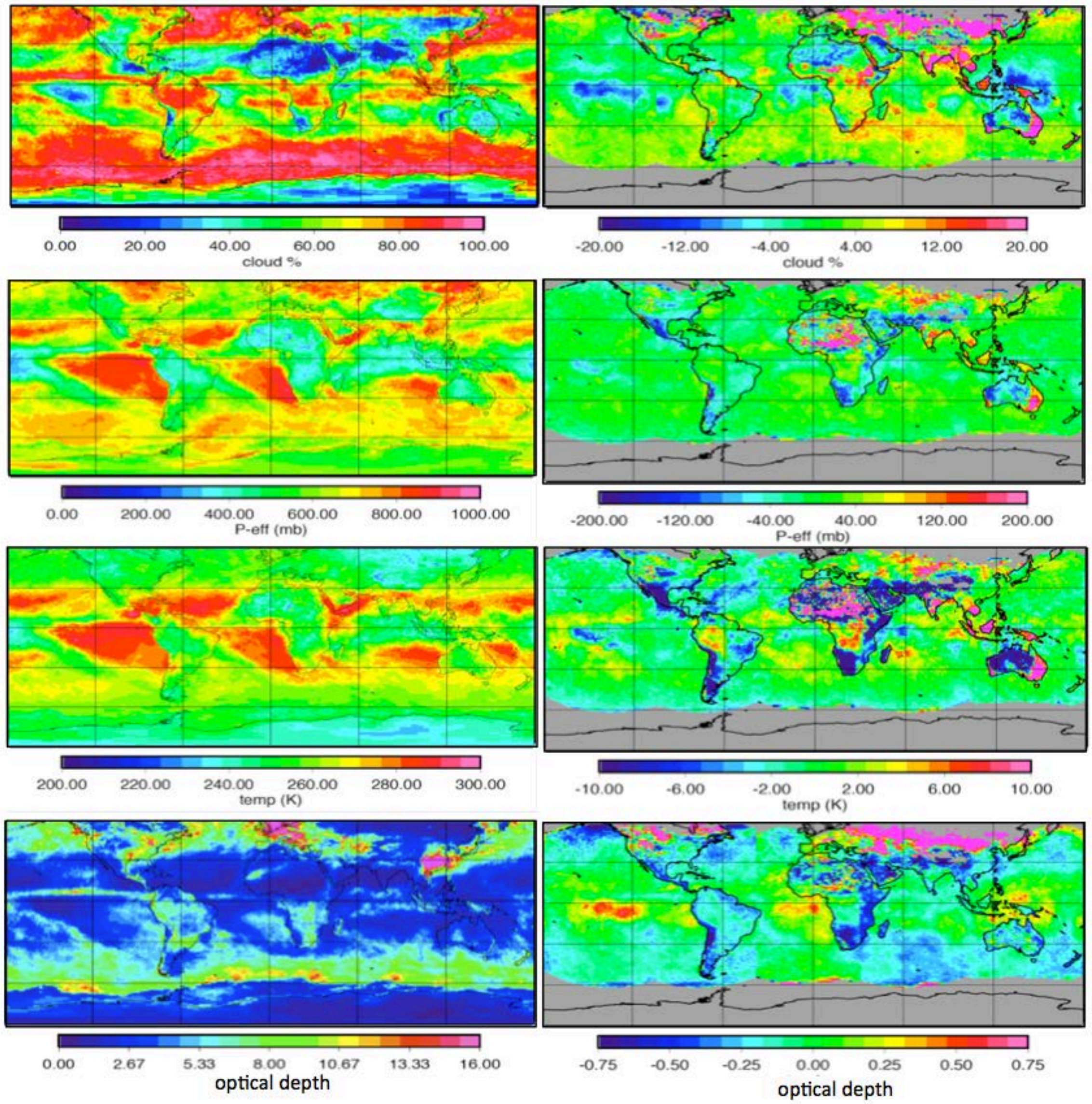

Figure 4-2. (left) ISCCP-D2like-Mrg regional total cloud property mean during December 2002 and (right) ISCCP-D2like-GEO minus Mrg total cloud property differences.

4.1.3 ISCCP-D2like Cloud Type Property Trends over Time

Another advantage of GEO-to-MODIS cloud property normalization is the temporal consistency of the GEO cloud properties with MODIS. The Aqua-MODIS Collection 5 0.65-µm channel is stable within 1% over 10 years (Wu et al. 2013). Any change in calibration is manifested in the cloud optical depth record. Figure 4-3 displays the Terra-MODIS and Aqua-MODIS 60°S to 60°N monthly mean optical depths between March 2000 and December 2010 from the SSF1deg product. The SSF1deg product contains only MODIS cloud properties, whereas the SYN1deg product contains both GEO and MODIS cloud properties. There might be a slight difference in cloud property means between daytime SSF1deg and ISCCP-D2like-day products, since the SSF1deg linearly interpolates the cloud properties over all hours of the day. The Terra optical depth in Figure 4-3 shows two distinct discontinuities during the record, one in 2003 and another in early 2009. These coincide with the Terra-MODIS instrument calibration anomalies, which are both mentioned in Wu et al. (2013), and the 2003 event is also referenced in Minnis et al. (2008). The Terra cloud amount is stable through time, as is the Aqua cloud amount, except for the first year of operation. Wu et al. (2013) claims the Aqua-MODIS instrument is better characterized than Terra as is demonstrated by the stability of the Aqua-MODIS optical depth, except during the first year of operation. The cause of the Aqua-MODIS first-year anomaly is unknown and may not be instrument related. It is anticipated that the use of MODIS Collection 6 radiances in the Edition 4 CERES processing effort will remove all these unphysical jumps in the MODIS-retrieved cloud properties.

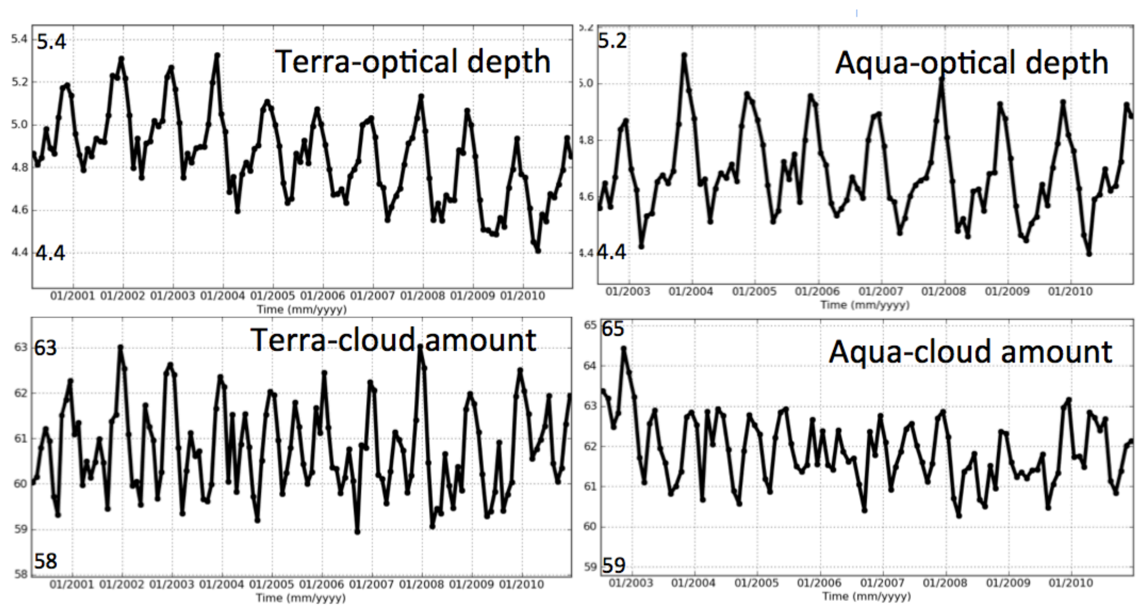

Figure 4-3. The 60°S to 60°N total cloud optical depth and cloud amount (%) monthly averages (left) for Terra-MODIS from March 2000 to December 2010 and (right) for Aqua-MODIS from July 2002 to December 2010 from the SSF1deg product. Note that the y-axis minimum and maximum ranges are not consistent between panels.

The deep convective cloud optical depth can magnify any calibration drift, since optical depth is logarithmically proportional to radiance. Figure 4-4 displays the temporal variations in deep convective cloud optical depth for Terra-MODIS and Aqua-MODIS over the GMS-5 domain. The Aqua record shows a discontinuity between MODIS Collections 4 and 5 in early 2006 and the early 2009 calibration adjustment (Wu et al. 2013). The Terra record shows the same discontinuities. However, these discontinuities are small compared to the GEO optical depth discontinuities. The GEO plot in Figure 4-4 shows the monthly mean optical depth over the GMS-5 domain (see 140°E Figure 2-1), where four satellites have been operational since 2000. The April 2003, October 2005, July 2010 and October 2010 discontinuities correspond with the replacement of GEO satellites as shown in Figure 2-1. Also, slight GEO optical depth drifts within a GEO satellite operational period can be observed between the discontinuities, signifying deficiencies in the GEO calibration procedure. The Edition 2/3 GEO cloud properties were incrementally calibrated to forward-process the CERES products. The upcoming Edition 4 CERES product processing will recalibrate the GEO radiances over the whole GEO satellite record, which should remove these drifts. As expected, the GEO optical depth artifacts are mitigated in the Mrg record, where the near noon 3-hourly time blocks were replaced with MODIS and for the remaining 3-hourly time blocks, the GEO optical depths were normalized against MODIS.

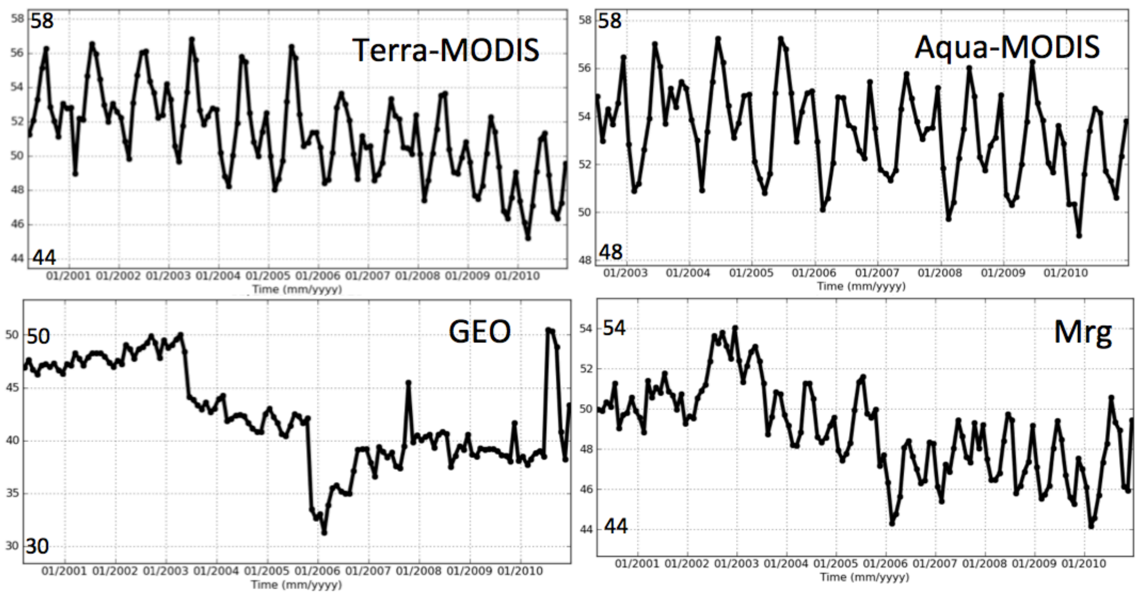

Figure 4-4. Monthly variation in the deep convective cloud type ice cloud optical depth over the 140°E GEO domain from March 2000 to December 2010 for the four ISCCP-D2like products. Note that the y-axis minimum and maximum ranges are not consistent between panels.

Figure 4-5 shows the ice cloud fraction associated with the Figure 4-4 cloud optical depths. Similar discontinuities in cloud amount are seen. The discontinuities in the Mrg product are somewhat reduced, which indicates that the normalized GEO cloud amount in the Mrg product is an improvement over the GEO product. Users deriving trends from the CERES ISCCP-D2like products are cautioned to make sure the trends are not artificial, due to replacements of GEO satellites and to MODIS calibration anomalies.

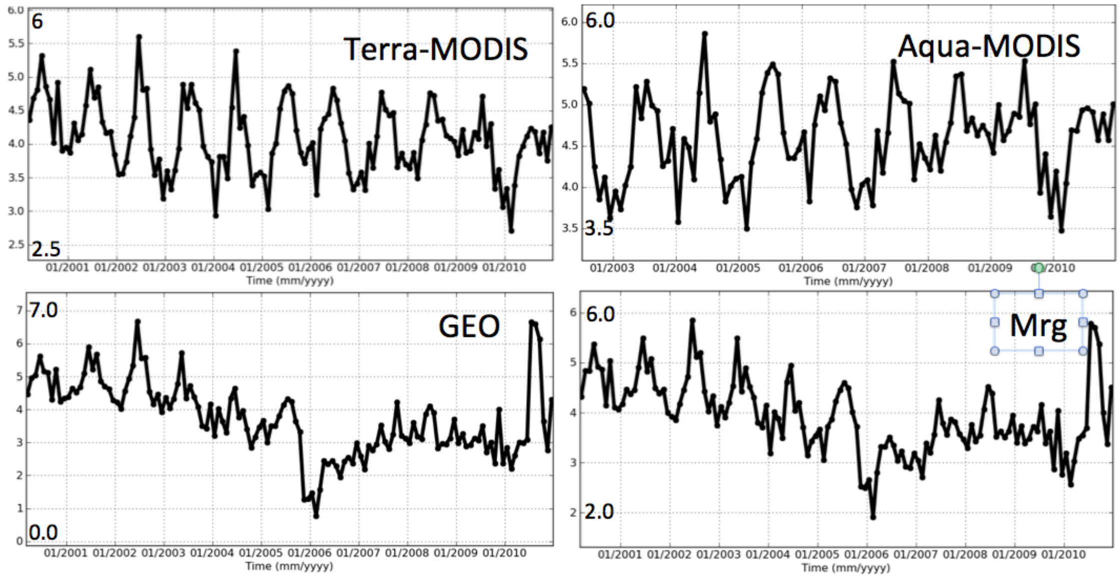

Figure 4-5. Monthly variation of ice cloud fraction for the deep convection cloud type over the 140°E GEO domain from March 2000 to December 2010 for the four ISCCP-D2like products. Note that the y-axis minimum and maximum ranges are not consistent between panels.

5.0 References

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6.0 Expected Reprocessing

There is a scheduled reprocessing of the Terra and Aqua levels 2 and 3 data products beginning in 2014. The CERES_ISCCP-D2like-Ed3A products will be superseded by CERES_ISCCP-D2like-Ed4A products. Edition 4 is a major reprocessing of all CERES level 2 and 3 products and includes science algorithm improvements in all stages of CERES processing. The ISCCP-D2like Edition 4 product will have improved MODIS cloud retrievals that are consistent between Terra and Aqua. The GEO visible radiances will be inter-calibrated with Aqua-MODIS Collection 6 radiances, and the GEO radiances will be monitored using both deep convective clouds and desert invariant targets. The MTSAT-1R PSF correction should eliminate the nonlinear visible radiance response. The GEO cloud properties will be retrieved hourly using a multi-channel cloud retrieval code similar to MODIS. Since the new GEO retrieval algorithm is pixel-based, no gamma distribution algorithm is needed to retrieve the optical depth.

Any updated version will be available for subsetting/visualization/ordering at: http://ceres.larc.nasa.gov/order_data.php.

7.0 Attribution

When referring to the CERES ISCCP-D2like products, please include the data product and the data set version as:

ISCCP-D2like-Day_Terra-MODIS Ed3A
ISCCP-D2like-Nit_Terra-MODIS Ed3A
ISCCP-D2like-Day_Aqua-MODIS Ed3A
ISCCP-D2like-Nit_Aqua-MODIS Ed3A
ISCCP-D2like-GEO_DAY Ed3A
ISCCP-D2like-Mrg_GEO-MODIS-DAY Ed3A

The CERES Team has made a considerable effort to remove major errors and to verify the quality and accuracy of this data. Please provide a reference to the following paper when you publish scientific results with the CERES ISCCP-D2like products:

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

When data from the Langley Atmospheric Science Data Center are used in a publication, we request the following acknowledgment be included: "These data were obtained from the Atmospheric Science Data Center at the NASA Langley Research Center."

The Langley ASDC requests a reprint of any published papers or reports or a brief description of other uses (e.g., posters, oral presentations, etc.) of data that we have distributed. This will help us determine the use of data that we distribute, which is helpful in optimizing product development. It also helps us to keep our product related references current.

8.0 Feedback and Questions

For questions or comments on the CERES ISCCP-D2like Quality Summary, contact the User and Data Services staff at the Atmospheric Science Data Center. For questions about the CERES subsetting/visualization/ordering tool at http://ceres.larc.nasa.gov/order_data.php, please click on the feedback link on the left-hand banner.