

# Update on ISCCP-D2-like CERES Data Product

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&

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# ISCCP-D2-like CERES Products

- Objective: produce monthly mean cloud properties product that emulates ISCCP D2 (NASA GISS) product to meet the needs of climate community.
- Three products (Beta1 delivered): MODIS-day, MODIS-night, and GGEO-day
- Future two products: MODIS/GGEO Merged product, MODIS-only radiative fluxes
  - MODIS: use data from **Terra** or **Aqua**, sun-synchronous
  - GGEO: use data from Geostationary Satellites, 3-hourly



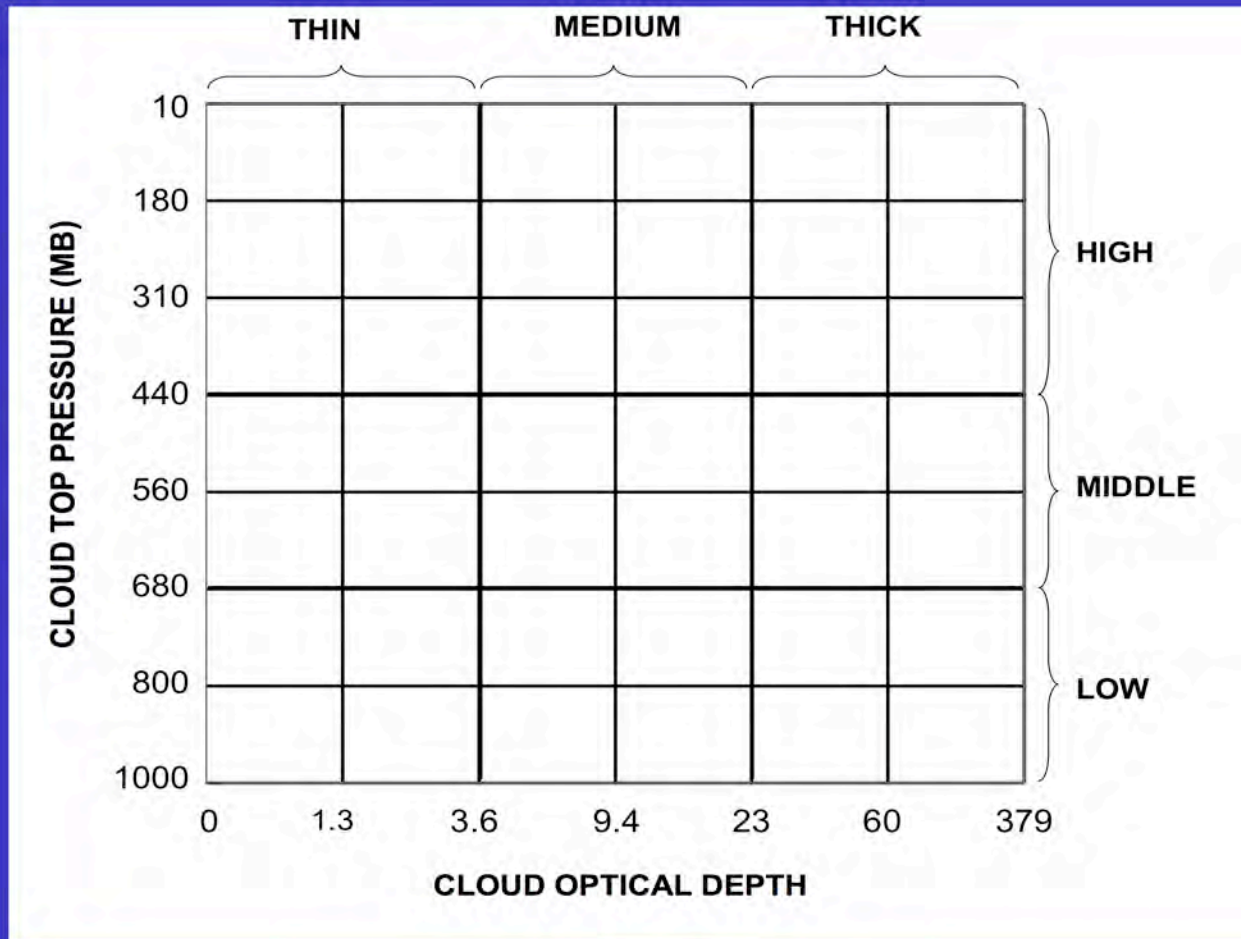
# ISCCP-D2-like CERES Cloud types

Cloud top (mb)				
High	10-440	Cirrus liq=13, ice=16	Cirrus-stratus liq=14, ice=17	Deep Convective liq=15, ice=18
Mid	440-680	Alto-cumulus liq=7, ice=10	Alto-stratus liq=8, ice=11	Nimbo-stratus liq=9, ice=12
Low	1000-680	Cumulus liq=1, ice=4	Strato-cumulus liq=2, ice=5	Stratus liq=3, ice=6
Cloud optical depth		0.0-3.6	3.6-23	23-380
		Thin	Mid	Thick

- Stratify clouds in cloud pressure and optical depth bins
- CERES adds a liquid category to each of the high cloud bins



# Cloud amount for ISCCP-D1like MODIS 42 cloud types



# CERES ISCCP-D2-like Variables

Cloud Parameter	MODIS-only	GEO-only
Cloud Fraction	X	X
Effective Pressure	X	X
Effective Temperature	X	X
Optical Depth	X	X
Infrared Emissivity	X	
Particle size (radius, diameter)	X	
Liquid/Ice Water Path	X	X
# of days/GMT box	X	X



ISCCPD2-like  
(MODIS) Method:



ISCCPD2-like  
(MODIS) Method:

SSF Input



ISCCPD2-like  
(MODIS) Method:

SSF Input



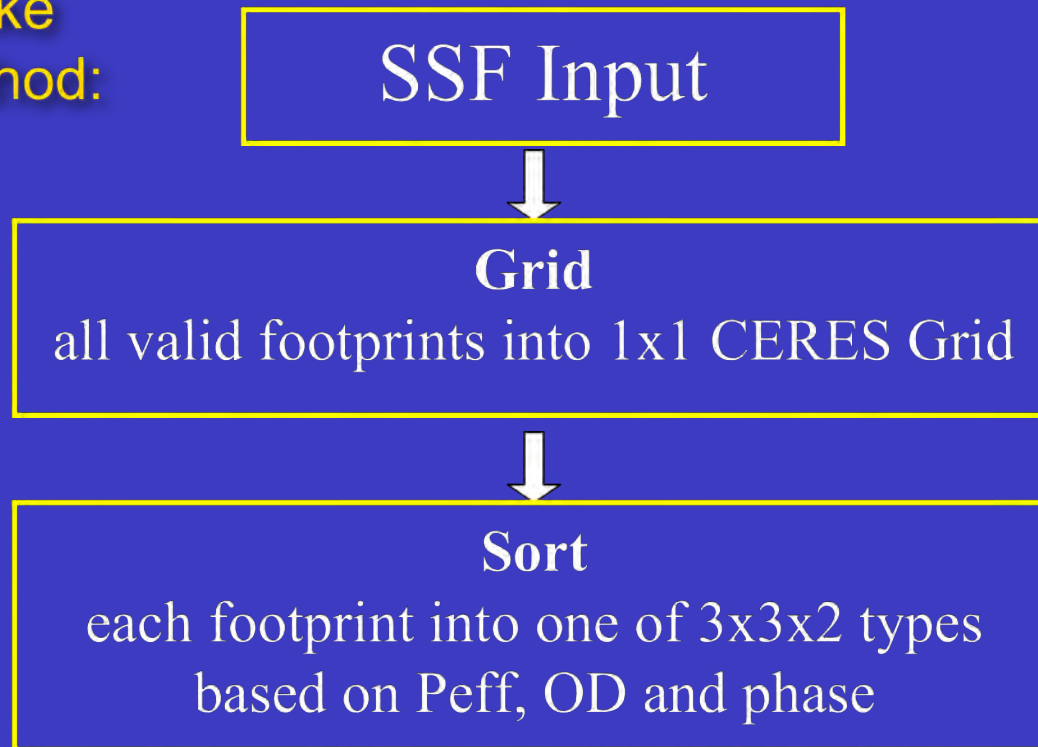
Grid

all valid footprints into 1x1 CERES Grid

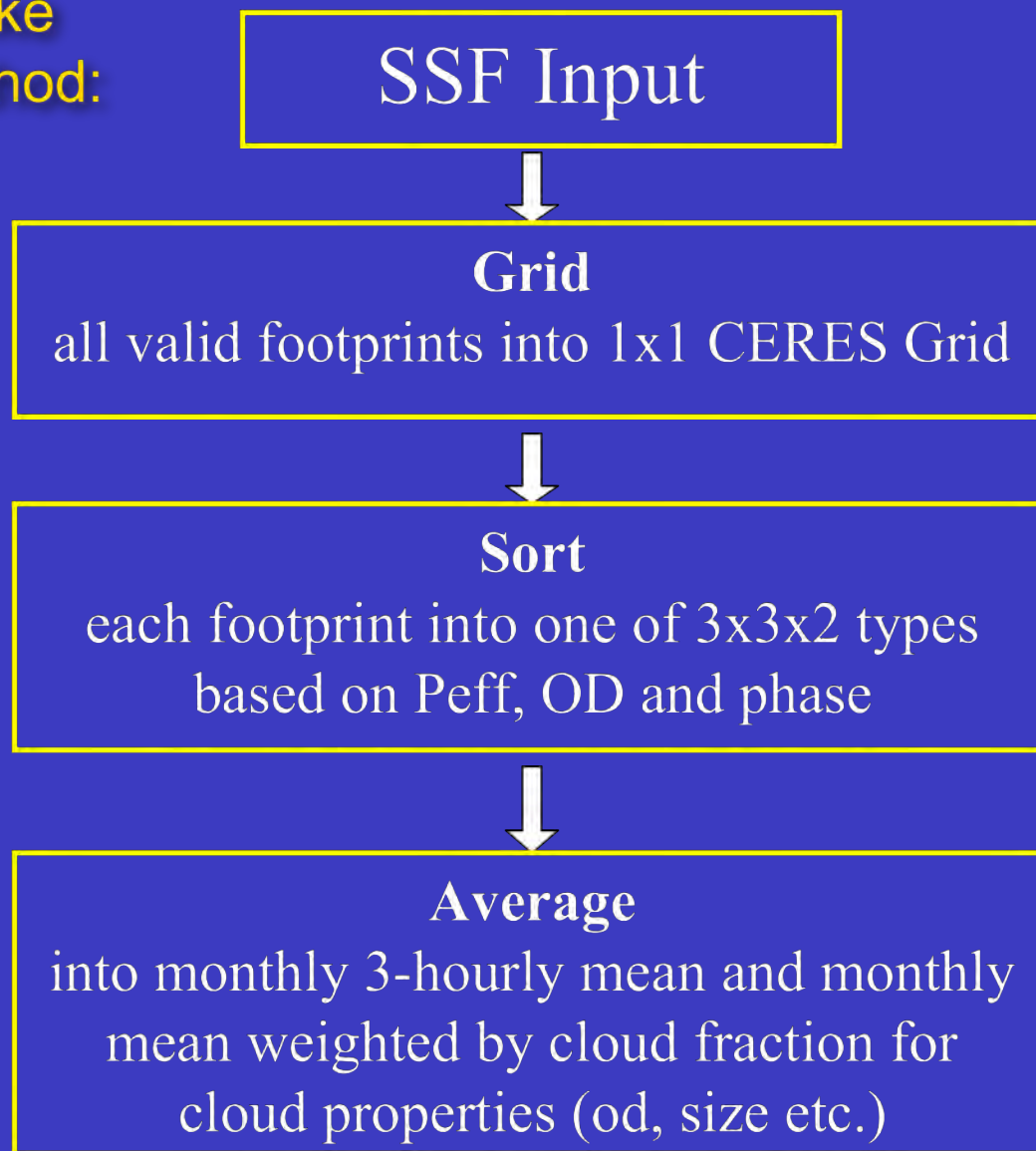


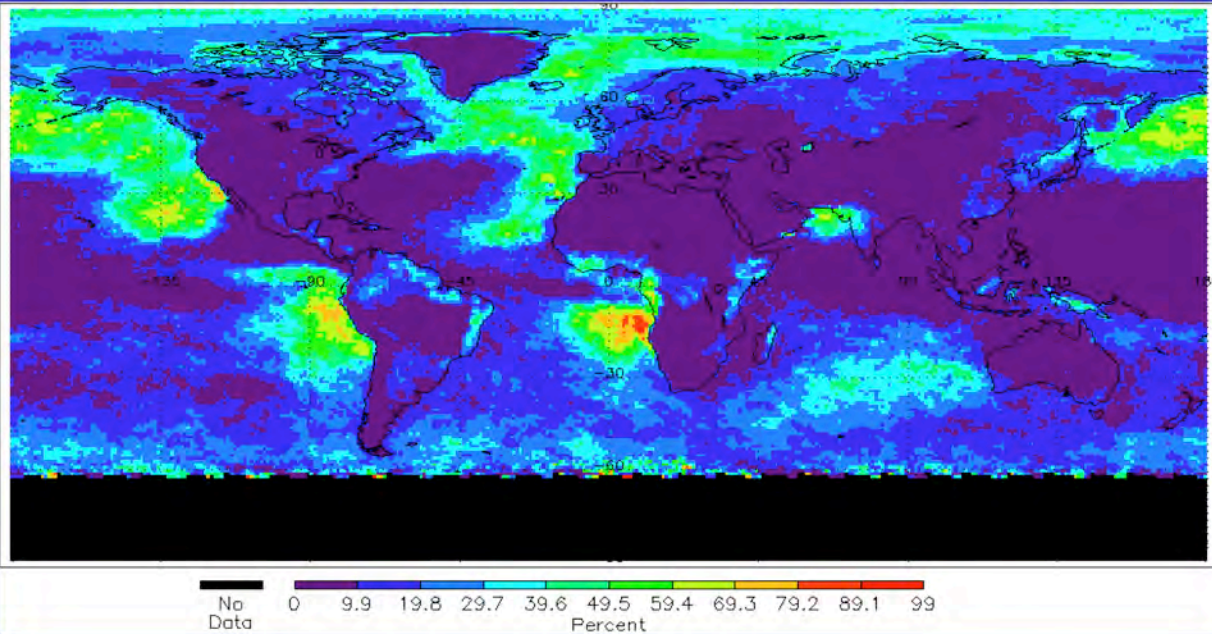


ISCCPD2-like  
(MODIS) Method:

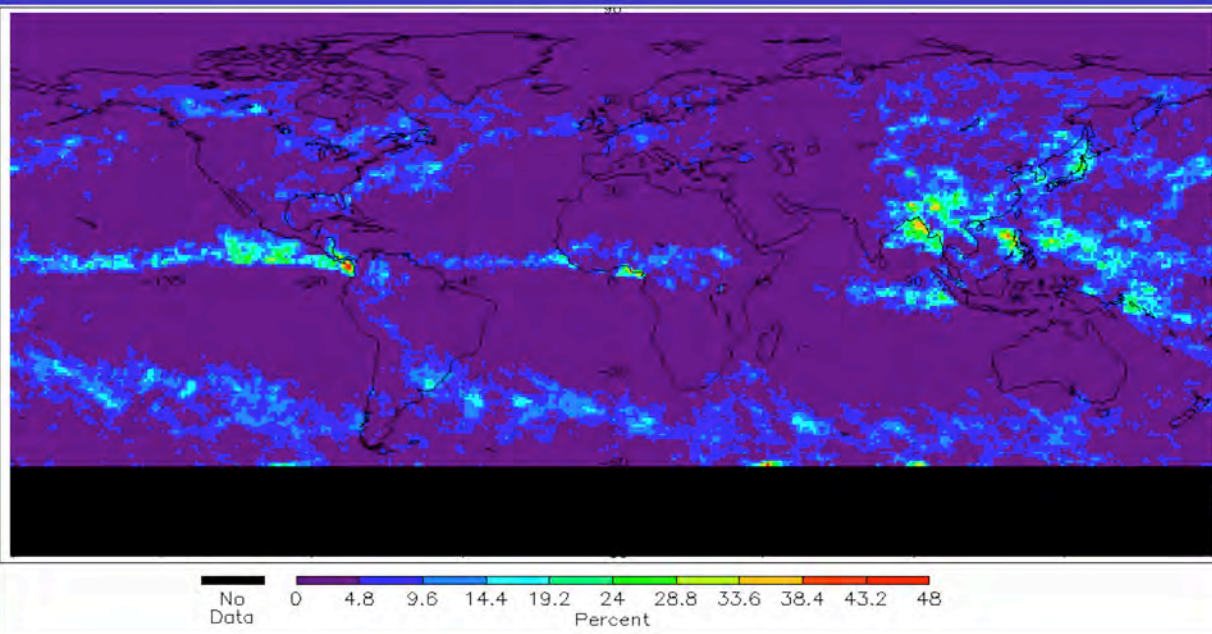


ISCCPD2-like  
(MODIS) Method:





Eg1. Daytime Terra Stratocumulus (low, mid thin) Cloud Fraction, July 2002



Eg.2 Daytime Terra Deep Convective (high, thick) Cloud Fraction, July 2002

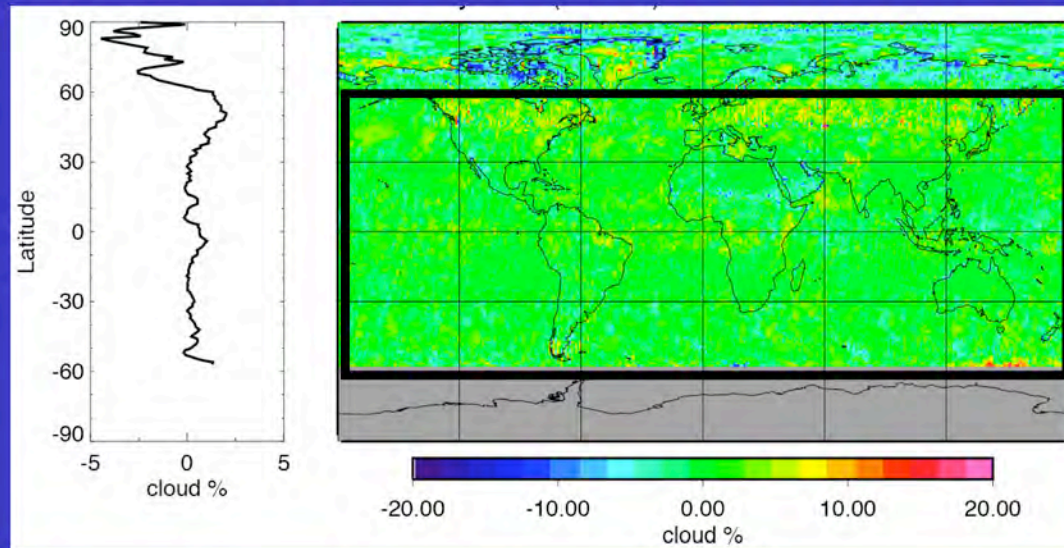


# ISCCP-D2-like MODIS Validation

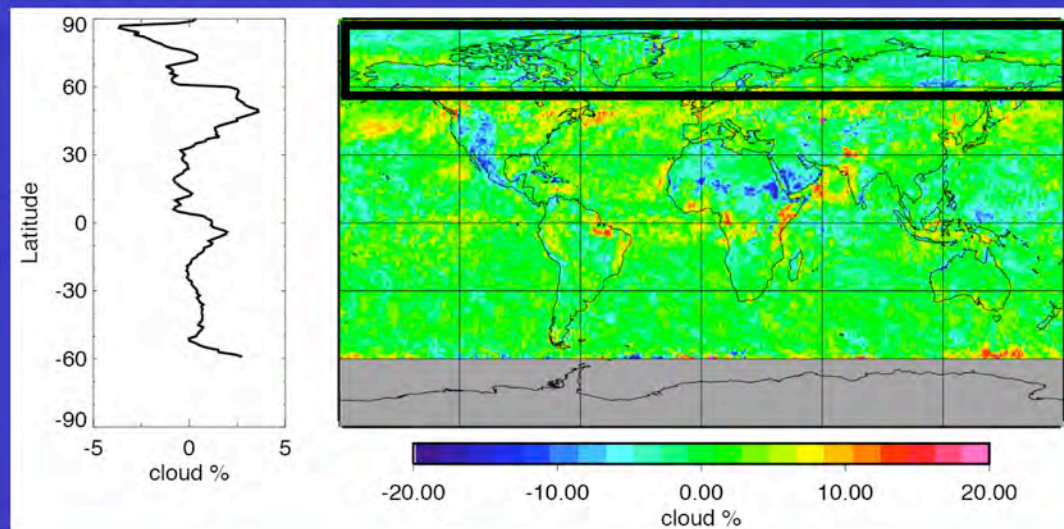
- Derive total cloud property means from ISCCP-D2-like MODIS and SRBAVG3 (MODIS only) and compare for consistency
  - ISCCP-D2-like employs no temporal interpolation as SRBAVG
  - The Terra product contains cloud properties based on 10:30 AM LST sampling, and Aqua at 1:30 PM
  - From 60°S to 60°N compare with SRBAVG local hourbox 11 (Terra), over polar regions all daytime/nighttime hours are considered
- Compare total cloud property means with the corresponding Cloud Working Group statistics



# Daytime ISCCP-D2-like -- SRBAVG Cloud Fraction, Terra, July 2002



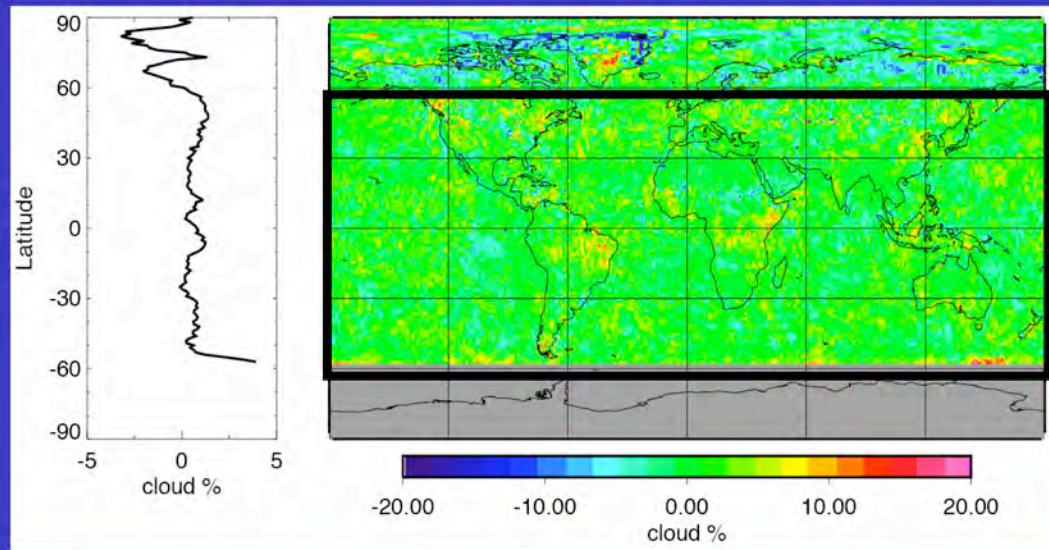
Local Hour=11



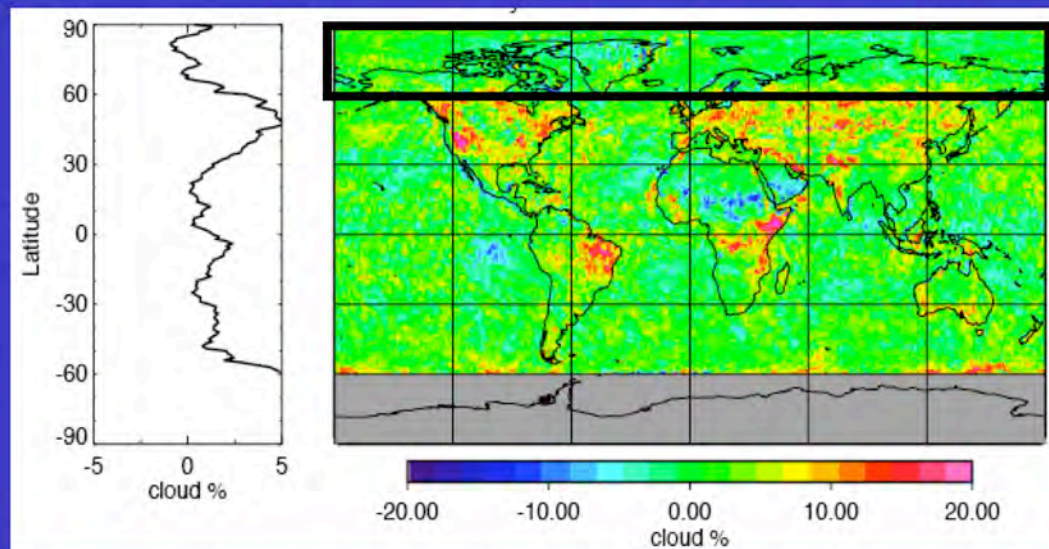
All daytime hours  
(SZA < 82)



# Daytime ISCCP-D2-like -- SRBAVG Cloud Fraction, Aqua, July 2002



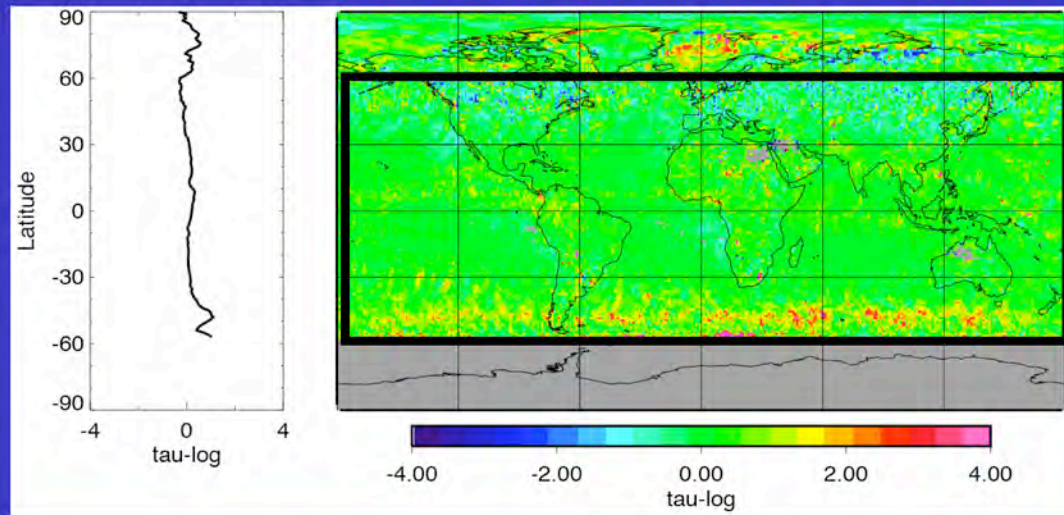
Local Hour=14



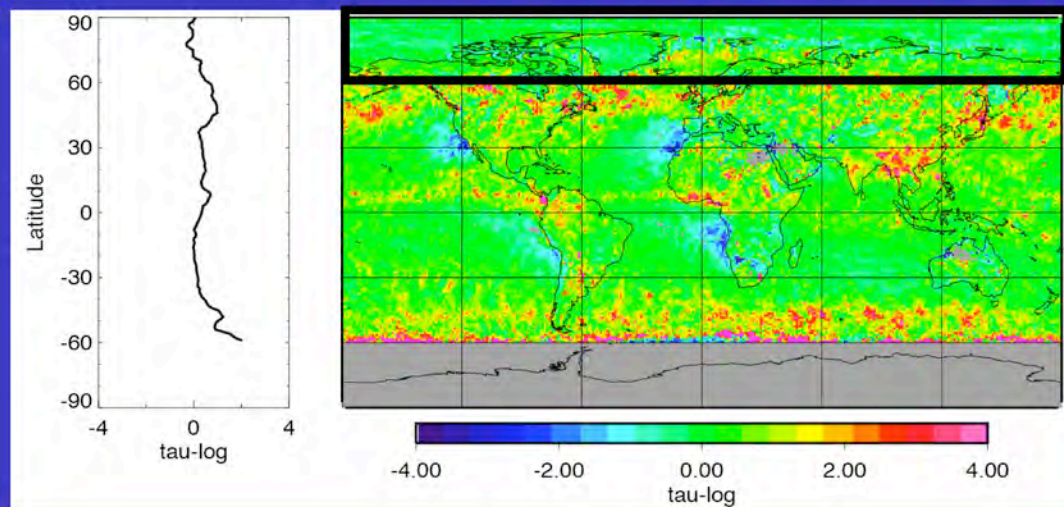
All daytime hours



# Daytime ISCCP-D2-like -- SRBAVG log optical depth, Terra, July 2002



Local Hour=11



All daytime hours



# Daytime Terra Summary, Global, July 2002

	ISCCP-D2like	SRBAVG	BIAS	Relative BIAS(%)	Cloud Group	
					Day	Night
cld	62.95	62.04	0.92	<b>1.48</b>	65.1	
peff	645.02	623.28	21.74	<b>3.49</b>	x	
teff	264.47	262.52	1.95	<b>0.74</b>	x	
log_tau	4.85	4.43	0.42	9.48	x	
lwp	112.34	78.37	33.97	<b>43.35</b>	103.34	72.45
reff	13.99	13.2	0.79	5.98	13.53	
iwp	256.27	170.08	86.19	<b>50.68</b>	249.95	78.10
deff	53.88	50.2	3.69	7.35	55.36	
emiss	0.85	0.81	0.03	<b>3.70</b>	x	

- Statistics are based on the SRBAVG daytime comparison
- The large LWP/IWP differences between ISCCP-like and SRBAVG are due to the large differences between the MODIS day and night retrievals. SRBAVG temporally interpolates between day and night.





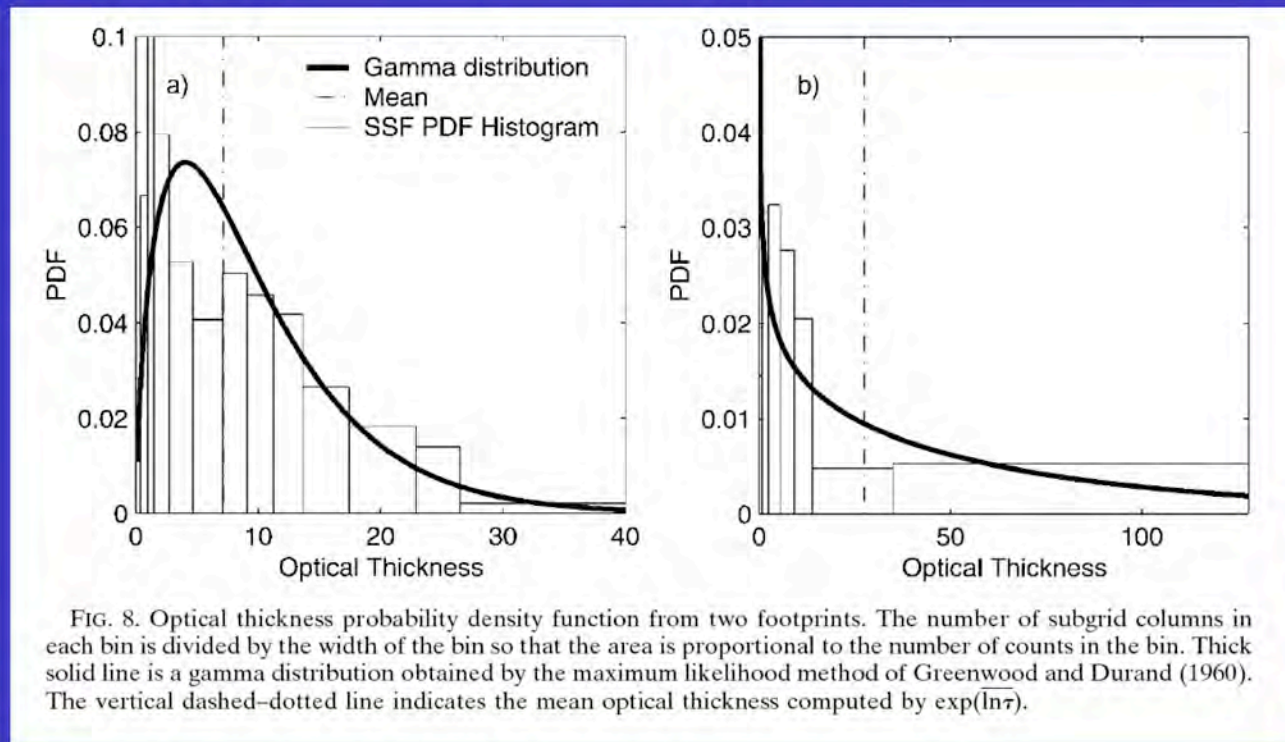
# ISCCP-D2-like GGEO Product

- Use existing GGEO dataset
  - 5 geostationary satellite, 3-hourly GMT, nominal 8km, 2-channel (visible and IR), (60°S to 60°N) daytime cloud property retrievals
  - GEO radiance are normalized to MODIS calibration
  - Clear-sky determined by GEOS4 clear-sky predicted brightness Temperatures and MODIS monthly clear-sky albedo maps
  - Assume 10 $\mu$ m radii liquid and 60 diameter  $\mu$ m ice particle sizes
  - Retrieve cloud amount, temperature, pressure, optical depth and LWP or IWP based subset of CERES-MODIS algorithm
  - Spatially gridded into 1° latitude by longitude regions and 4 static cloud pressure layers (SFC-700mb, 700-500mb, 500-300mb, 300-100mb)

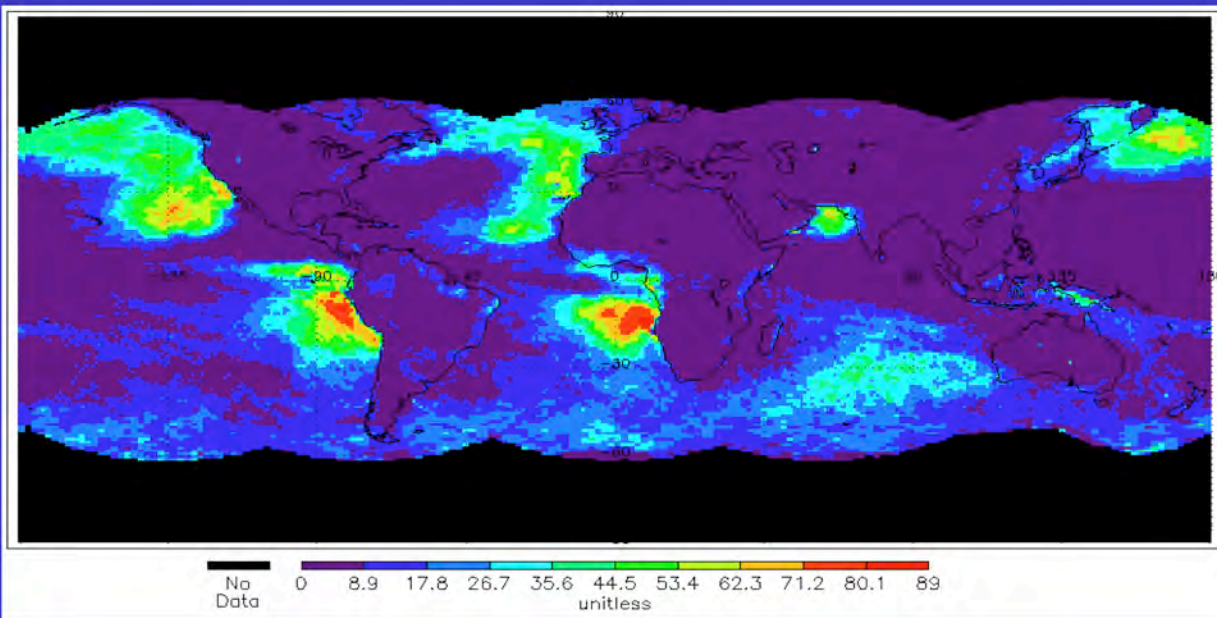


# GCEO Product method

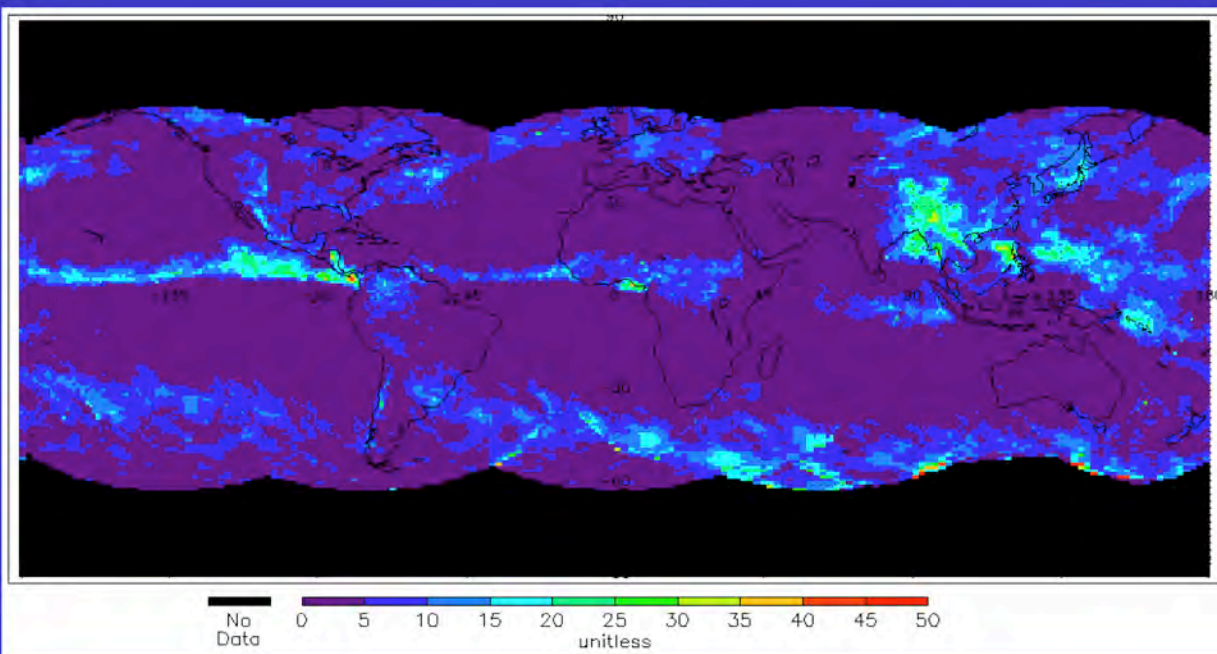
- Use gamma distribution
  - using log and linear optical depth to back out optical distribution for each of the layers



*Kato S., F. Rose and T. Charlock, P158., J. A.O. Tech. 2004*



Eg1. Daytime GGeo  
Stratocumulus  
(low, mid thin)  
Cloud Fraction, July 2002



Eg2. Daytime GGeo Deep  
Convective (high, thick)  
Cloud Fraction, July 2002



# ISCCP-D2-like GGEO Validation

- Compare total cloud property summed from ISCCP-D2-like GGEO sub-cloud types to that of SRBAVG (GEO only) for consistency
  - ✓ SRBAVG product does not include GEO snow or glint retrievals.
  - ✓ SRBAVG daytime is based on all daylight hourboxes and includes interpolation.
  - ✓ ISCCP-D2-like daytime is defined by  $SZA < 82^\circ$  and performs no interpolation.



# Daytime D2-like GGEO Summary (D2-GGEO - SRBAVG, 60S-60N)

	Jul. 2002		Oct. 2002		Jan. 2003		Apr. 2003	
	D2-like	Bias	D2-like	Bias	D2-like	Bias	D2-like	Bias
Cld	66.08	1.96	64.4	0.75	63.99	-0.36	64.13	-0.17
Peff	639.31	0.77	627.99	-3.5	635.93	-1.89	624.53	-1.46
Teff	264.14	-0.34	262.21	-0.25	262.92	0.32	262.59	0.16
Tau	3.59	-0.24	3.68	-0.23	4.15	-0.09	3.44	-0.08

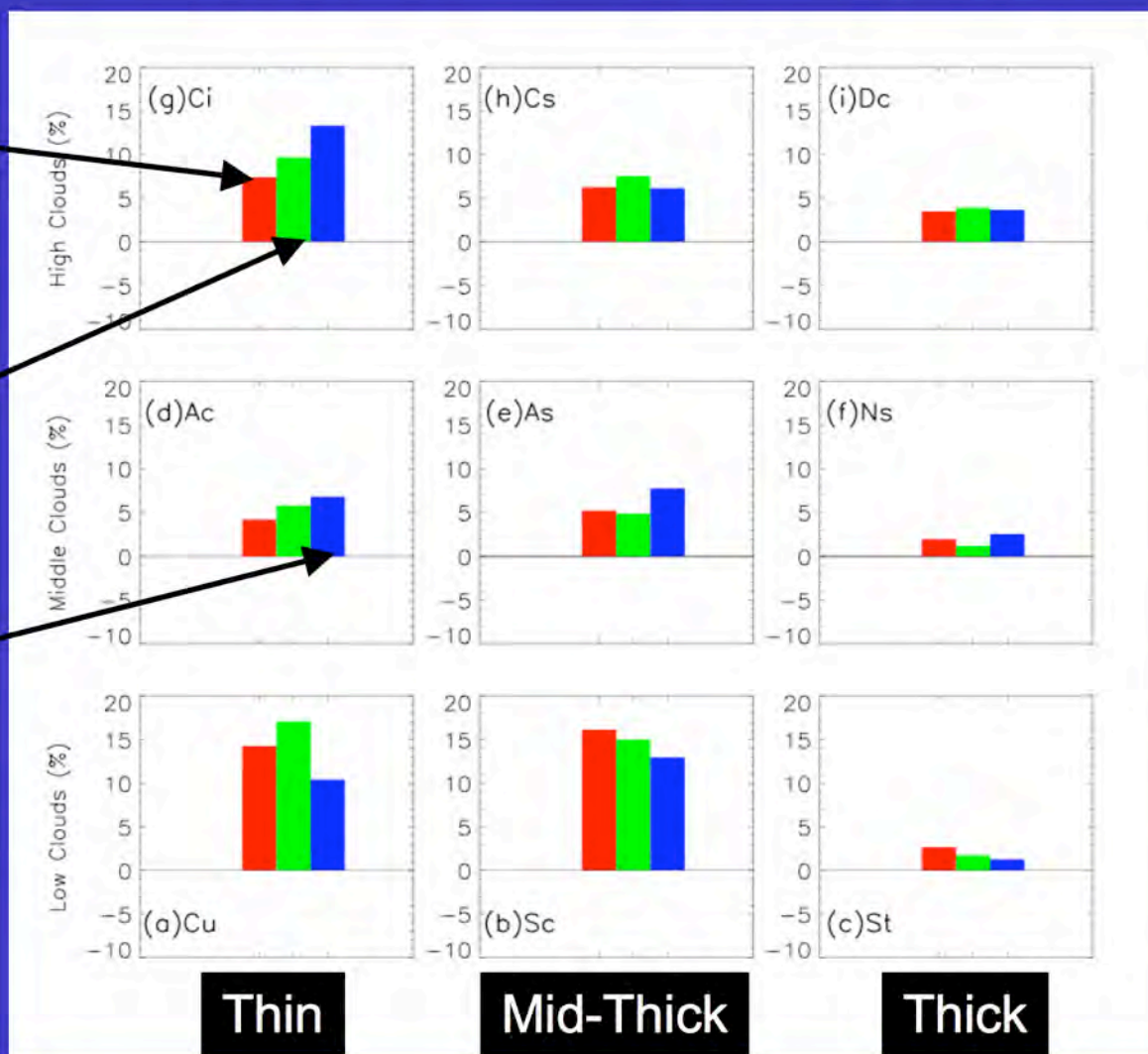


# D2-like MODIS, GGEO vs. ISCCP D2 for 60N-60S Mean, July 2002

MODIS

GGEO

ISSCP



High

Mid

Low

Thin

Mid-Thick

Thick



# Current Status and Future plan

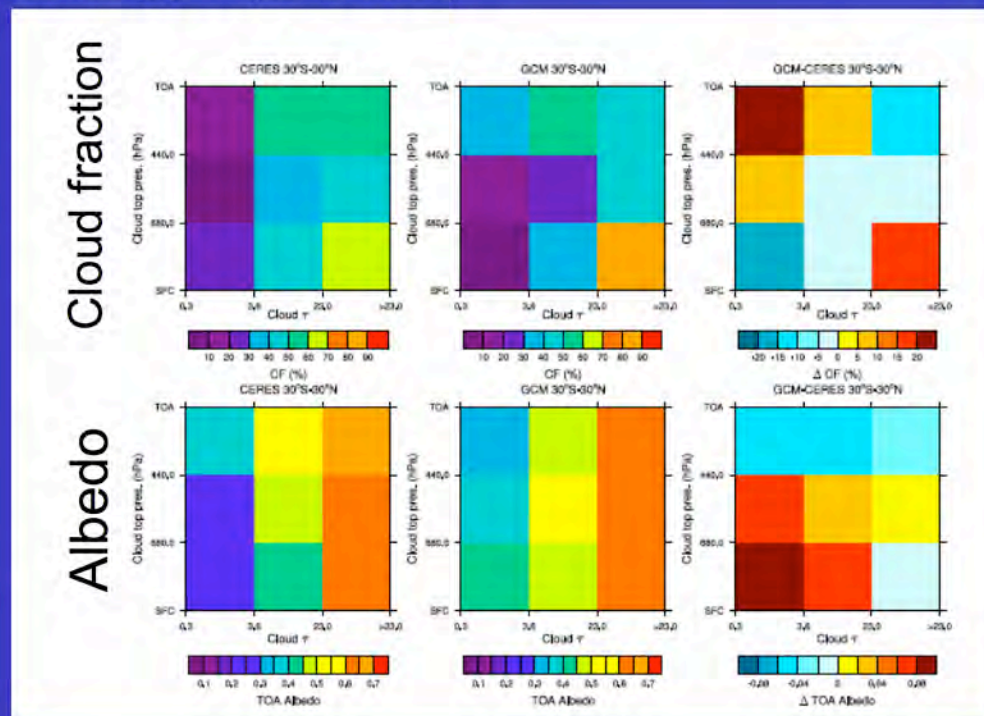
1. ISCCP-D2like MODIS (Terra and Aqua, Day and Night) Beta1 is delivered. 7 months available.
2. ISCCPD2-like GGEO (5 Geo satellites) Beta1 is delivered. 4 months available.
3. Currently working on MODIS and GGEO Merged data product (70% done, need ~ 3 months more).
  - Terra/Aqua has Sun-synchronous orbits that limit diurnal sampling
  - GGEO has the diurnal sampling but less accurate
  - Strategy: use Terra/Aqua measurements where exist, use normalized GGEO elsewhere



# Current Status and Future plan

- Propose to develop ISCCP-D2like CERES flux product that are associated with D2like cloud types. (~ 3-6 months)

January  $p-\tau$  (30°S-30°N)



J. Cole etc.





# Time Line

- Beta1 for ISCCP-D2like (MODIS day/nit, GGEO) complete record Mar00-Oct05 available by Jan 1, 2009
- Edition1 for ISCCP-D2like (MODIS day/nit,GGEO) available by July 2009
- Edition1 for ISCCP-D2like Merged available by Sep 2009
- Edition1 for ISCCP-D2like flux available by Jan 2010



Thank You!





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**NASA Langley Research Center / Atmospheric Sciences**



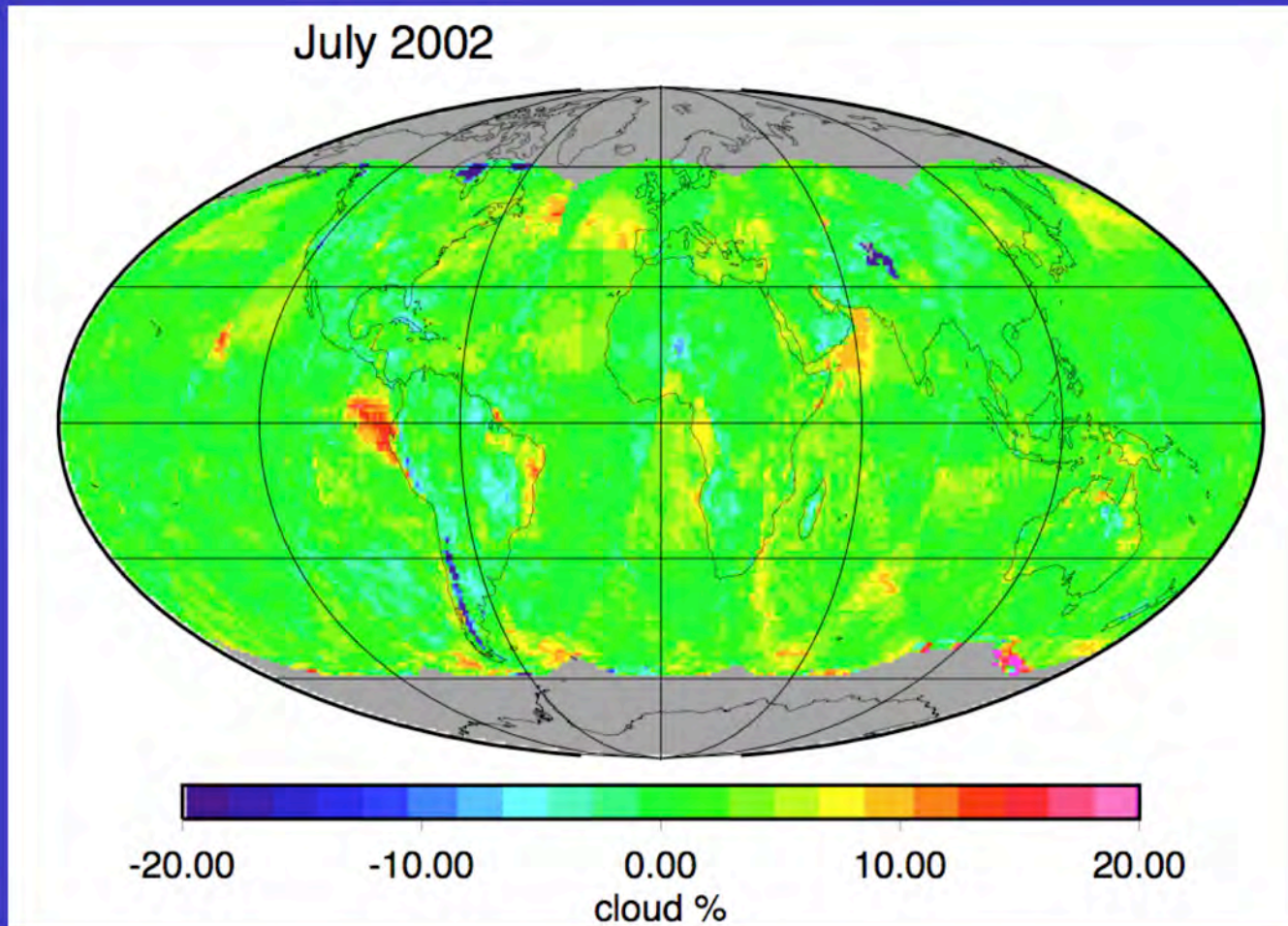
# Back up



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# D2-like - SRBAVG2



# Available Months ISCCP-D2like-MODIS (Beta1)

- CER\_ISCCP-D2like-Day\_Aqua-FM3-MODIS\_Beta1\_023030.200207  
200301
- Day\_Aqua-FM4: 200210, 200304 200401, 200607
- Day\_Terra-FM1: 200207, 200210, 200301, 200304, 200607
- Day\_Terra-FM2: 200004, 200601
- Nit\_Aqua-FM3: 200207, 200301
- Nit\_Aqua-FM4: 200210, 200304, 200401, 200607
- Nit\_Terra-FM1: 200207, 200210 , 200301, 200304, 200607
- Nit\_Terra-FM2: 200004, 200601

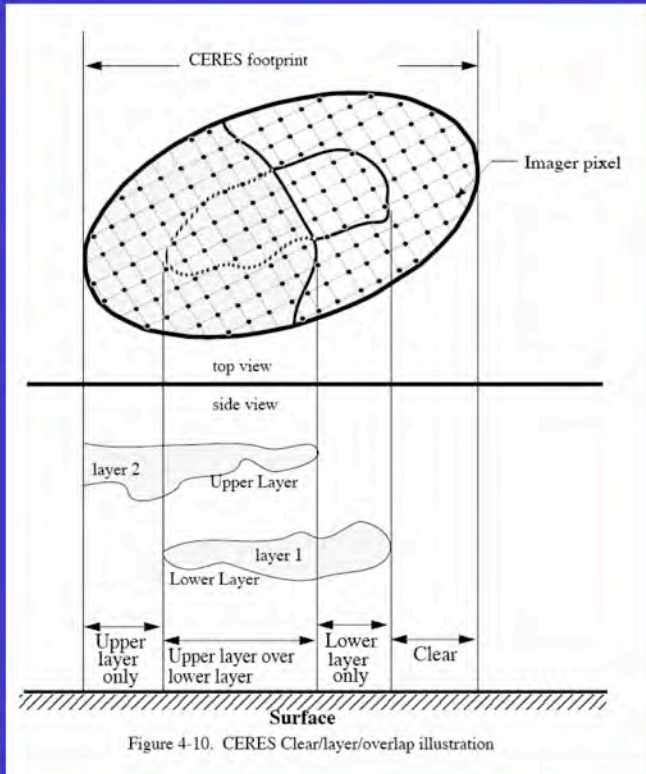


# Available Months ISCCP-D2like-GGEO (Beta1)

- CER\_ISCCP-D2like-GEO\_Composite\_Beta1\_023031.200207  
200210, 200301, 200304



# ISCCPD2-like Flux Proposal



## Assumption:

- clear-sky BB flux can be estimated using a narrow-to-broadband radiance+ADM conversion.
- broadband flux ( $F1\_est$  and  $F2\_ext$ ) for each of the two cloud layer can be estimated by MODIS radiance.
- The ratio of the BB flux for the two cloud layers is equal to the ratio of the two estimated BB flux as above.

By Norman Leob