Update on CERES ISCCP-D2-like Data Product

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CERES Science Team Meeting
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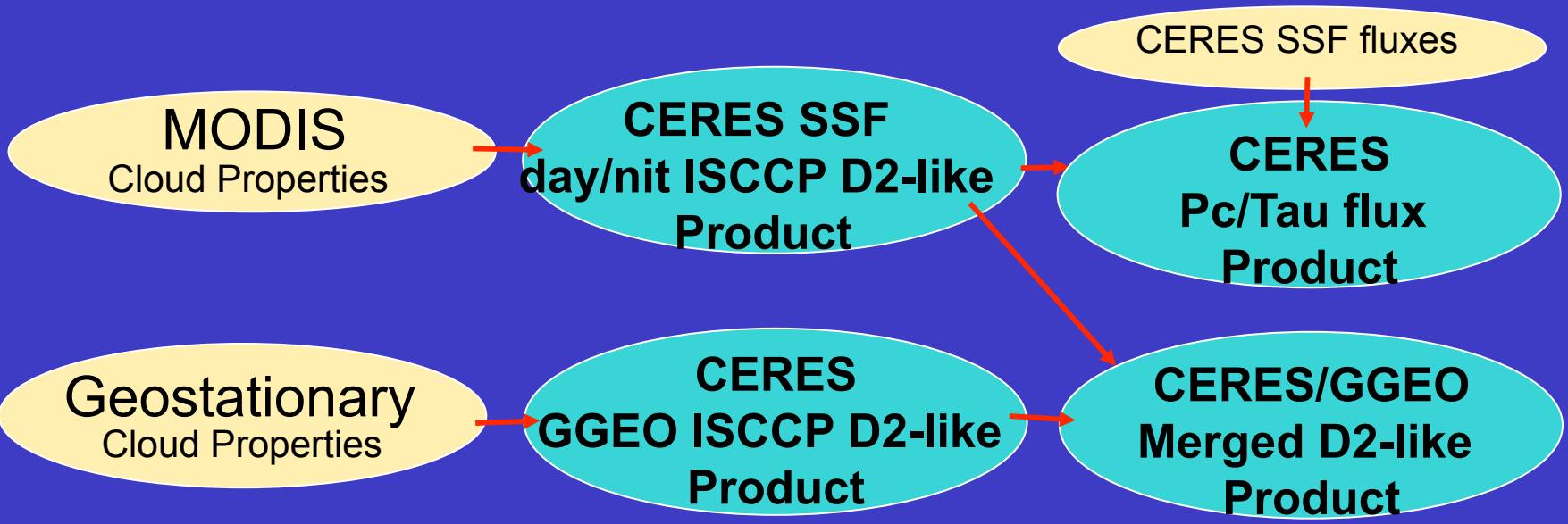
ISCCP-D2-like Products

- Product Features:
  - CERES cloud properties classified into pressure and optical bins that emulate the (GISS) ISCCP D2 monthly mean product



- Appropriate Usage:
  - GCM and climate studies that need Pc/Tau cloud properties to improve cloud parameterizations, etc.

ISCCP-D2-like CERES Cloud types

Cloud top (mb)	Thin	Mid	Thick
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

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

CERES ISCCP-D2-like Variables

ISCCP-D2like Product Cloud Parameter	**Day/Nit** (MODIS-only)	**GGEO** GEO-only	**Merged**	**Flux**
Cloud Fraction	X	X	X X	X
Effective Pressure	X	X	X X	X
Effective Temperature	X	X	X X	X
Optical Depth	X	X	X X	X
Infrared Emissivity	X		X	X
Particle size (radius, diameter)	X		X	X
Liquid/Ice Water Path	X	X	X	X
# of days/GMT box	X	X	X X	X
CERES fluxes				X

X = MODIS measurement
X = GGEO measurement
X X = merged MODIS and GGEO measurements

- Day/Nit MODIS and GGEO Edition2 delivered on Jan., 2010
- Merged Beta1 in May, 2010
- Flux Beta1 in Aug 2010

ISCCP D2-like Merge Product

- Purpose:
  To combine MODIS and GGEO cloud properties to create a dataset that is better than either dataset alone can offer.
  - MODIS has better cloud retrievals but has limited sampling
  - GEO has better diurnal coverage but clouds are inferior to MODIS

Local Hr	06 <4.5-7.5>	09 <7.5-10.5>	12 <10.5-13.5>	15 <13.5-16.5>	18 <16.5-19.5>
Terra day		T	T		
Aqua day			A	A	
GEO day	G	G	G	G	G
Merge	G'	T/G'	T	A/G'	G'

- Merged dataset uses MODIS clouds whenever possible
- Use normalized GEO cloud properties for the remaining hours

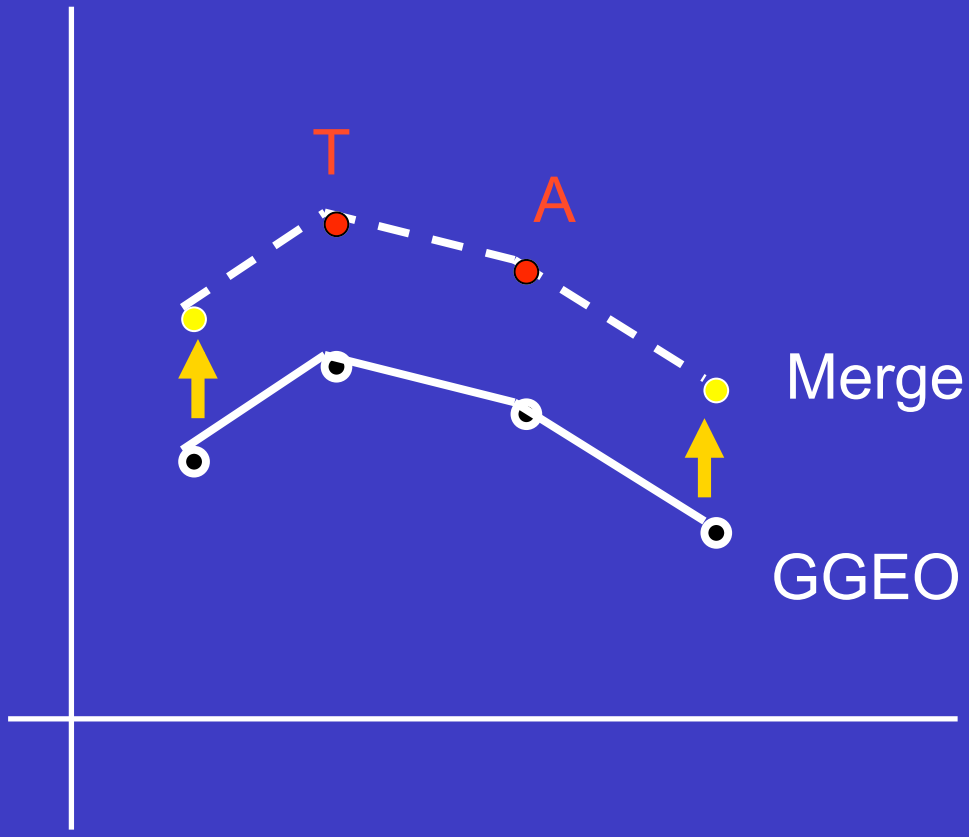
Normalization Procedure

1. Match MODIS and GGEO data to create two time series based on
   - Within 5x5 regions spatially and 1.5 hours temporally
   - Same surface types and geo-satellite
   - Exclude snow region and glint hours

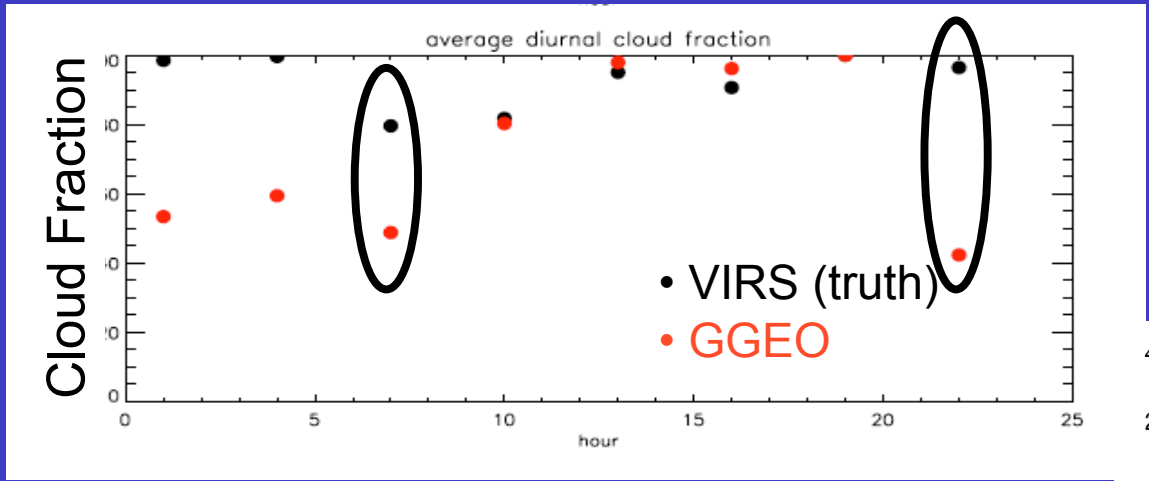
2. Obtain Slope and Offset from linear regression of above two time series based on **total** cloud properties.

3. Create new GGEO (G') using the coefficients and then adjust each ISCCP-D2 subtype by the ratio of G'/G.

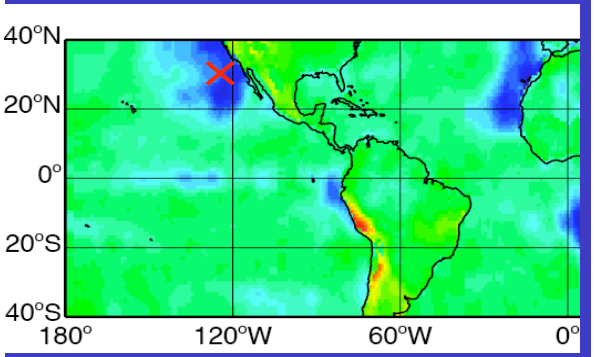
Normalization effect

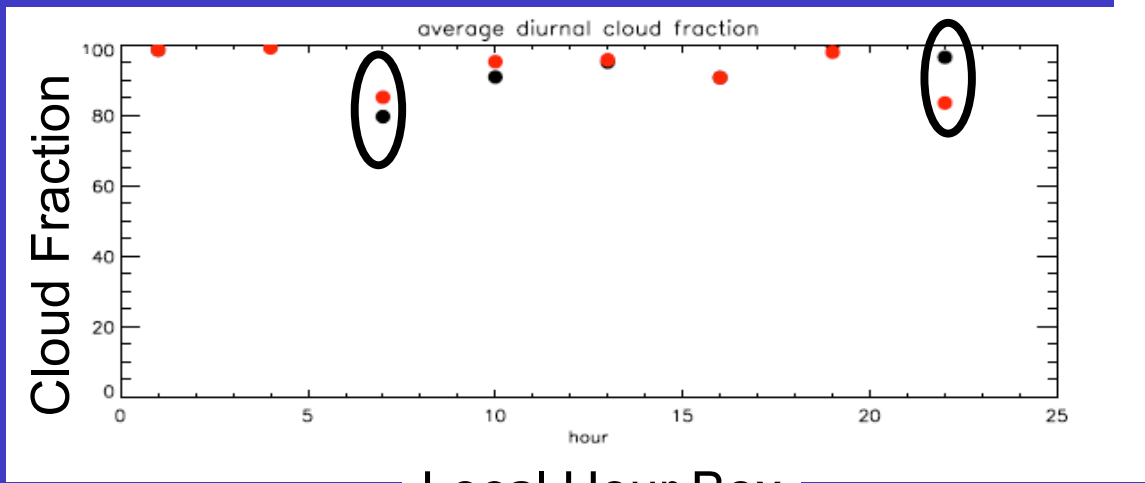


Comparison of the monthly 3-hourly mean cloud amount over Ocean (West of US: 124W, 28.5N) for July 1998



Before Normalization

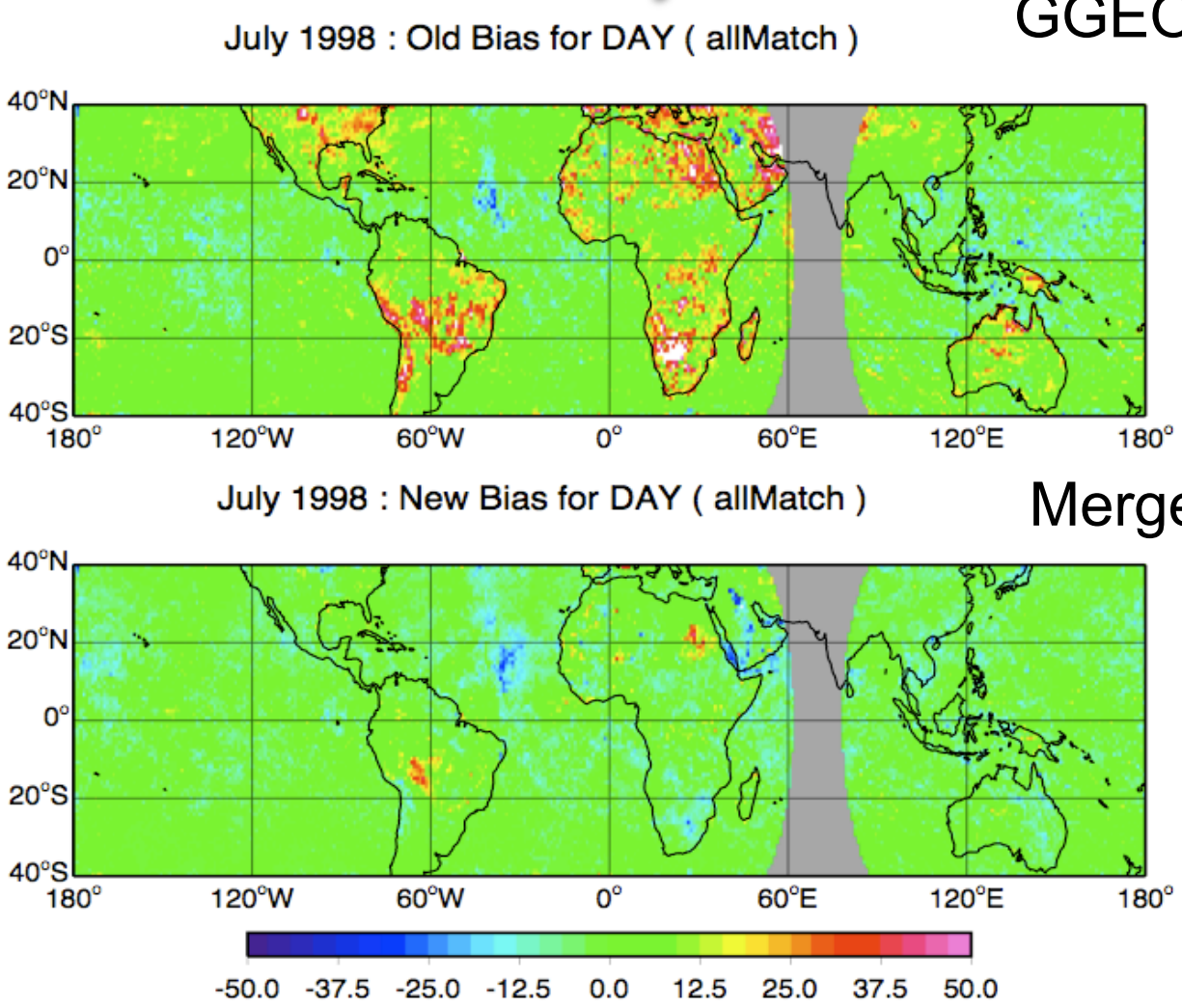




After Normalization

Local Hour Box

Comparison of the mean daytime cloud amount for July 1998



GGEO-VIRS

Before Normalization

Bias = 4.22

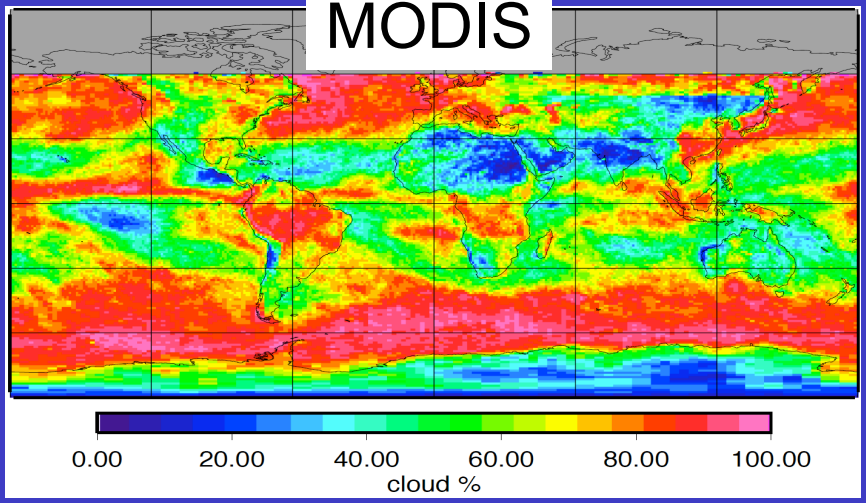
Merged-VIRS

After Normalization

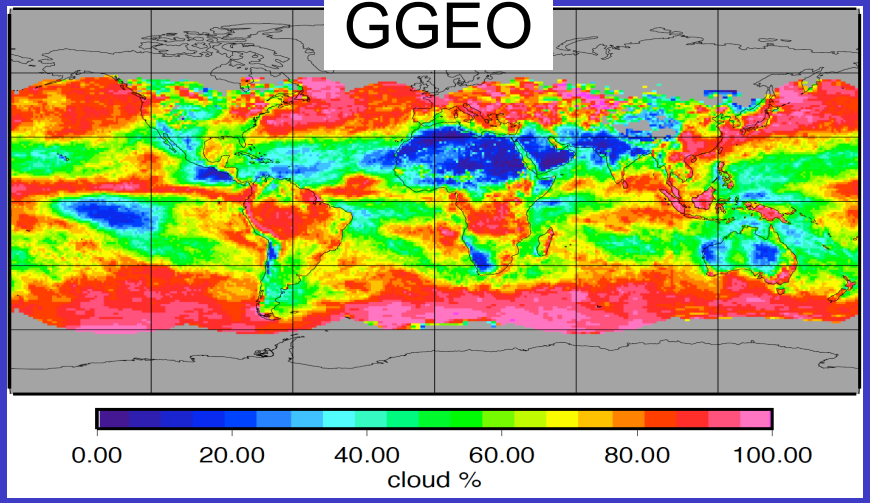
Bias = -1.25

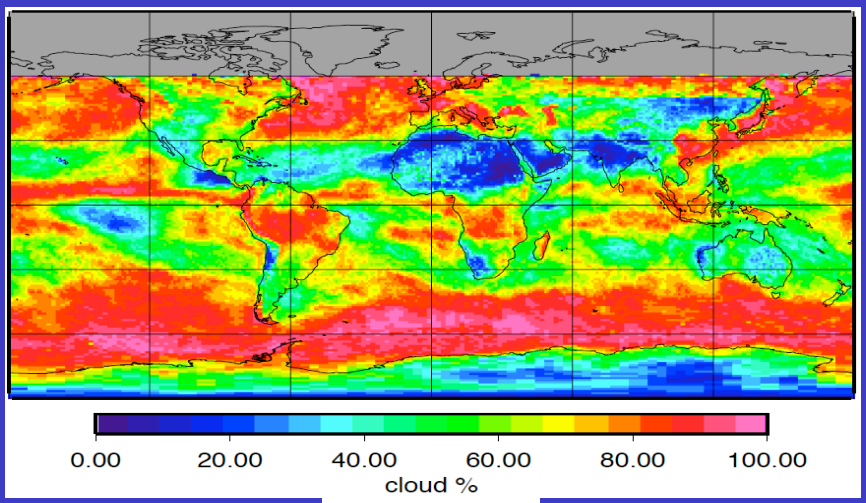
Results(1): Cloud fraction Dec 2002

MODIS



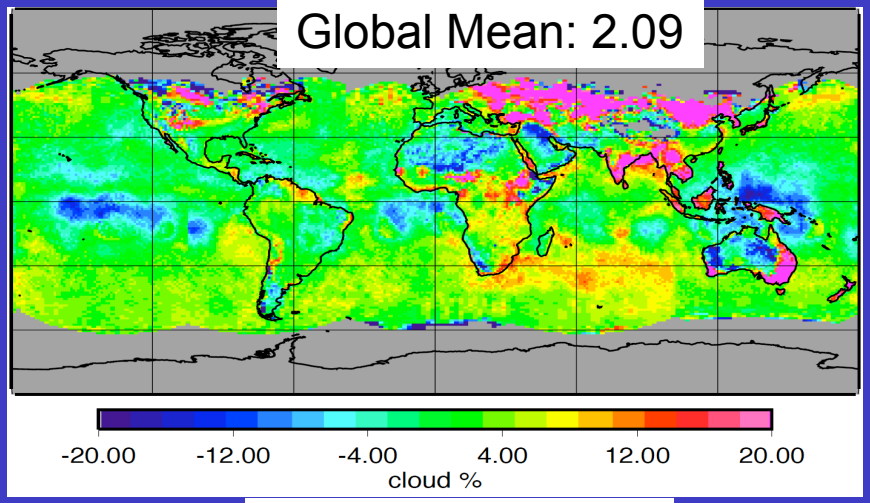
GGEO





Merge

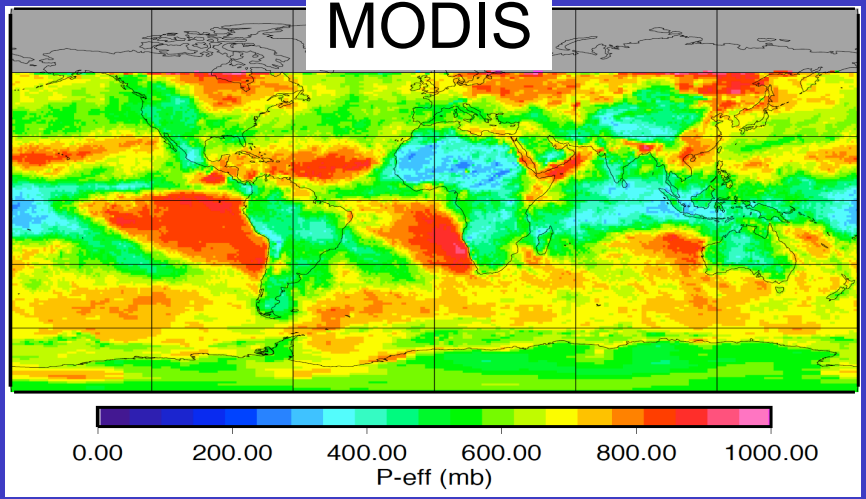
Global Mean: 2.09



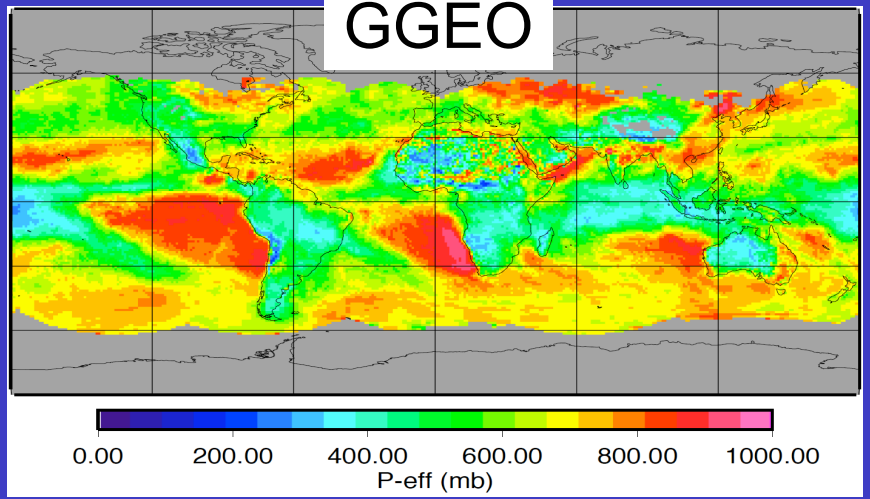
GGEO-Merge

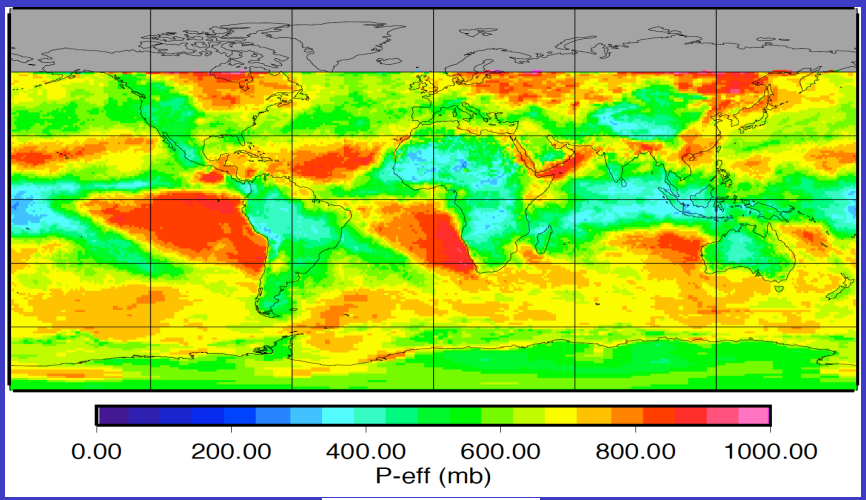
Results(2): Peff Dec 2002

MODIS



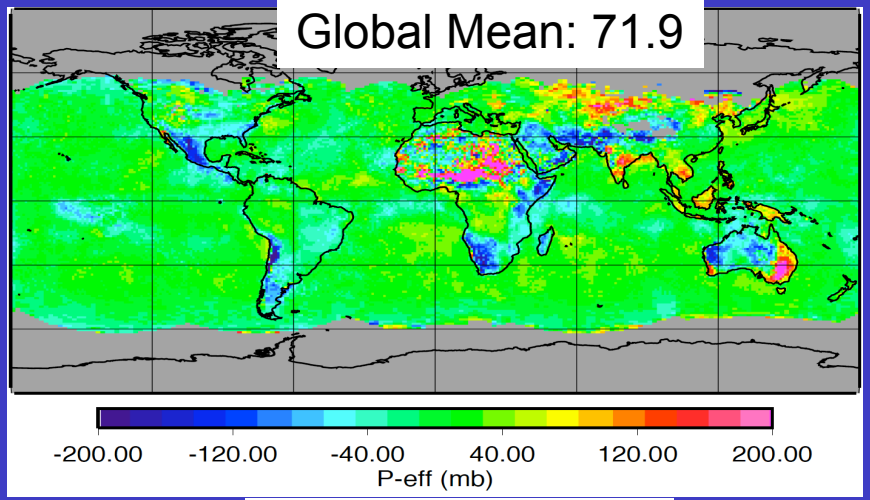
GGEO





Merge

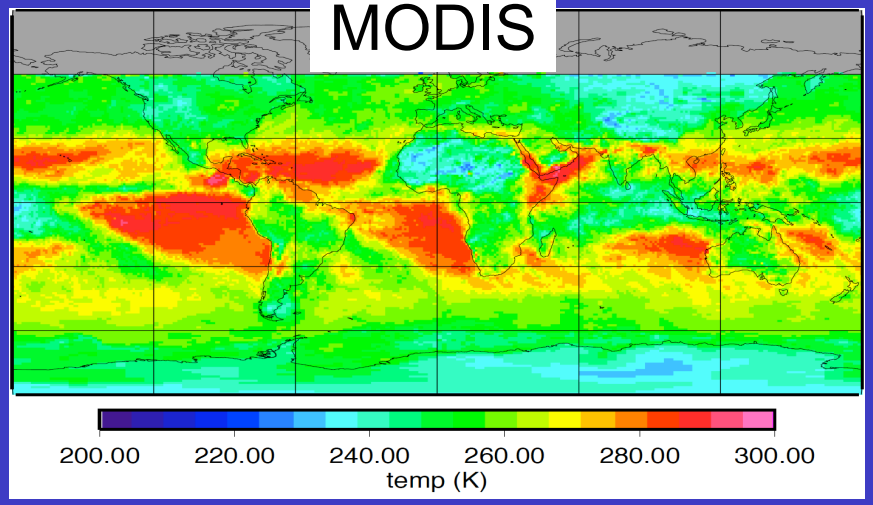
Global Mean: 71.9



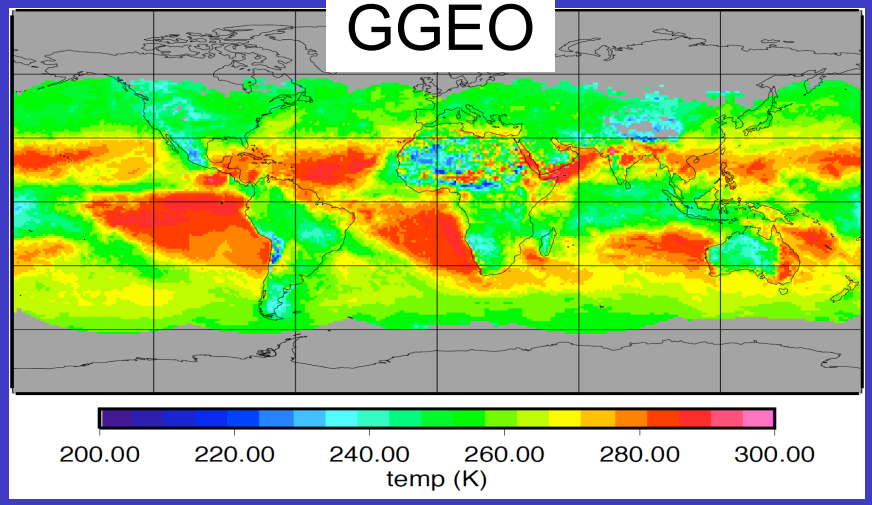
GGEO-Merge

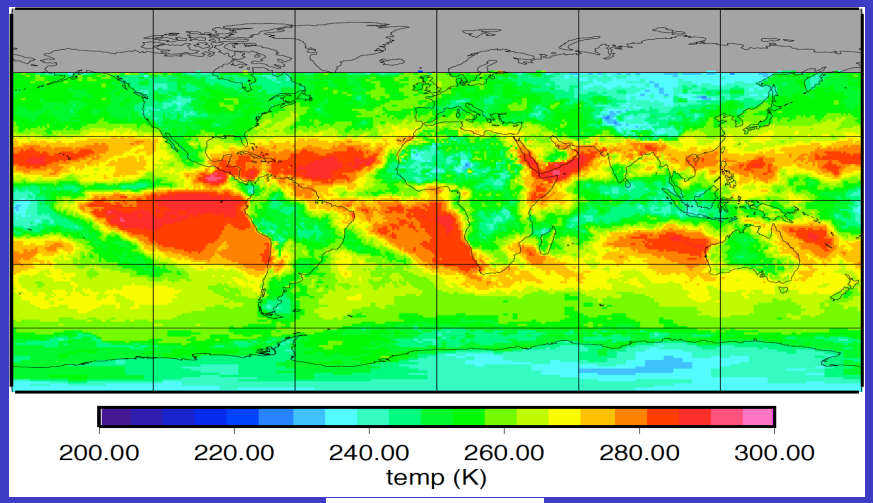
Results(3): Teff Dec 2002

MODIS



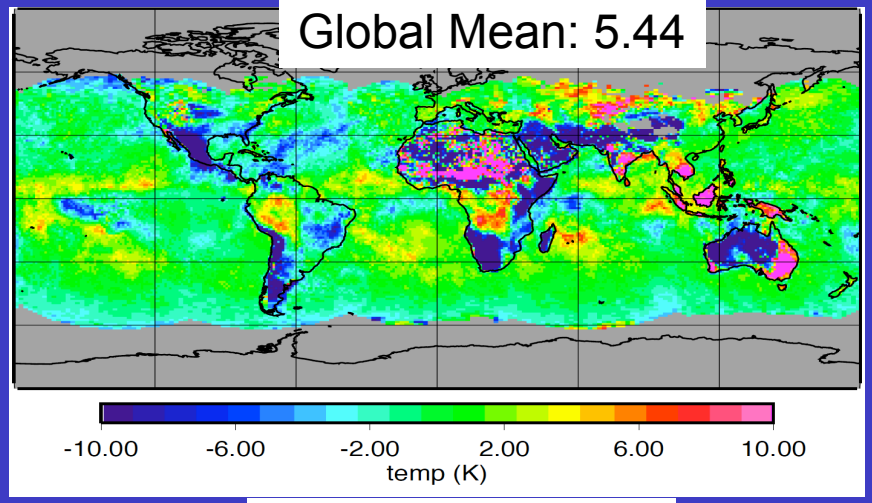
GGEO





Merge

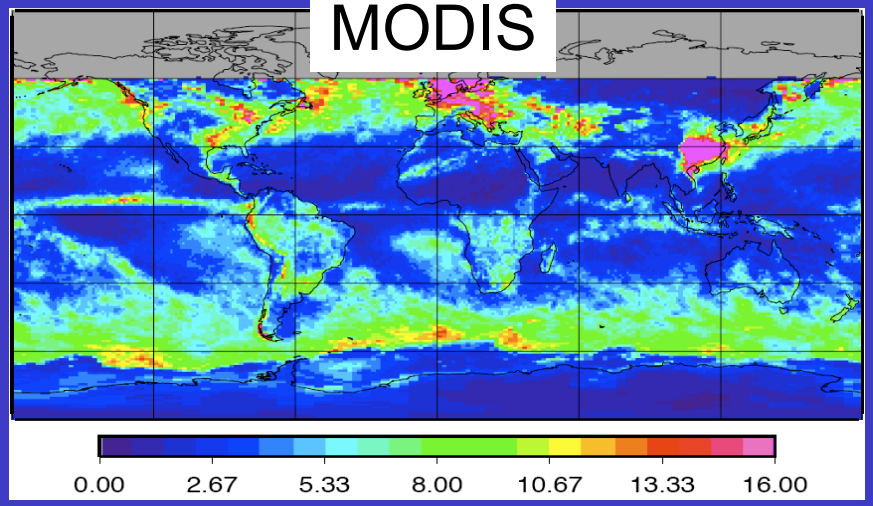
Global Mean: 5.44



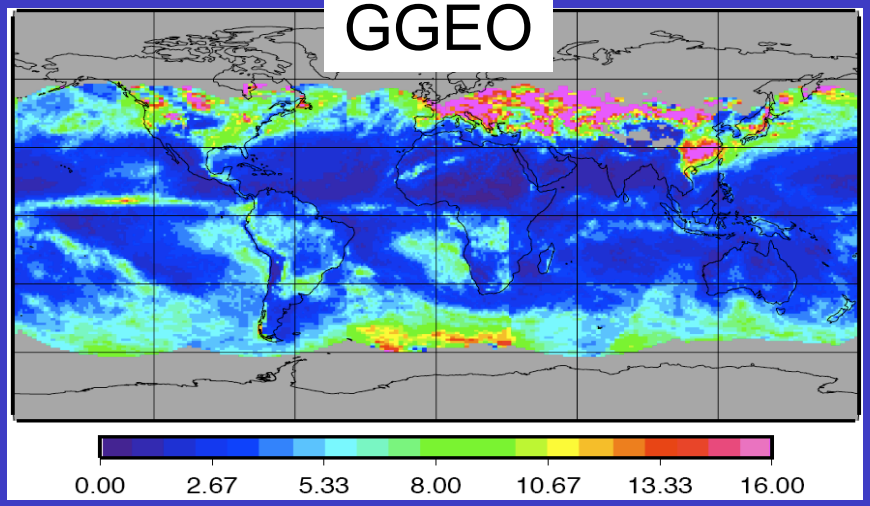
GGEO-Merge

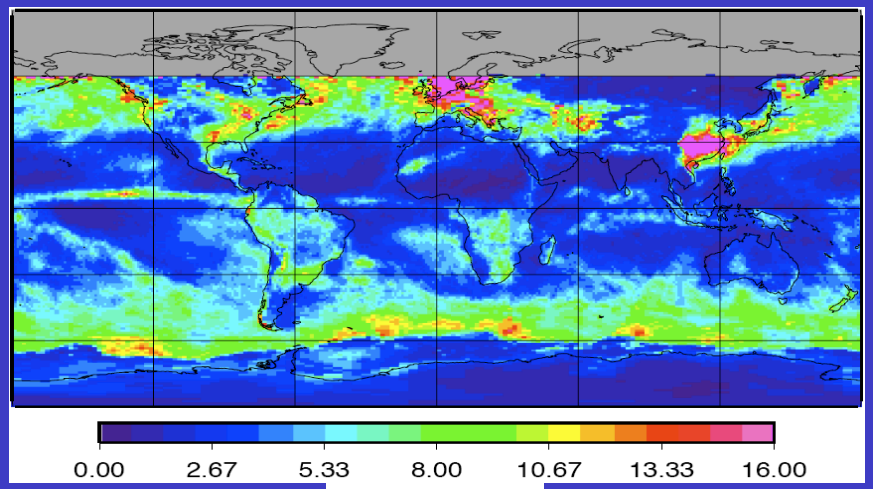
Results(4): Cloud optical depth Dec 2002

MODIS



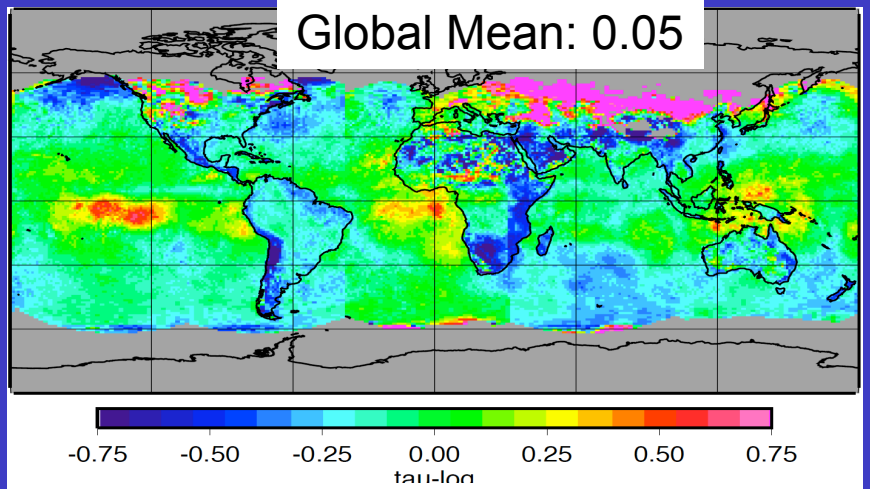
GGEO





Merge

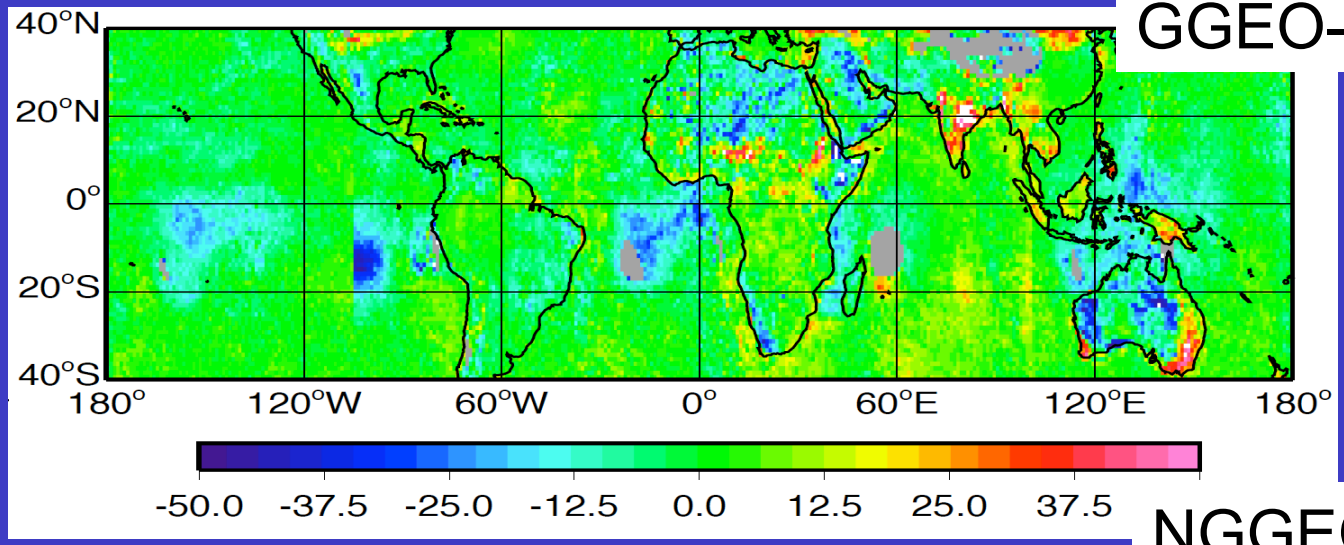
Global Mean: 0.05



GGEO-Merge

Validation(1): Cloud difference for Dec 2002

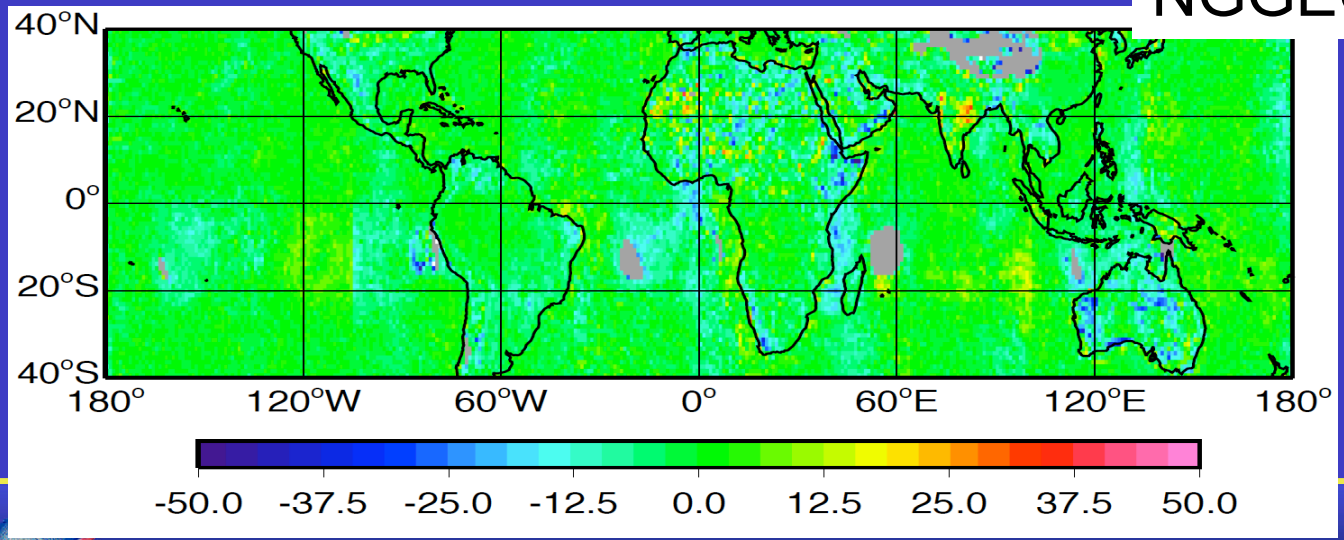
GGEO-Aqua



Before Normalization

Bias = -0.53
RMS = 9.78

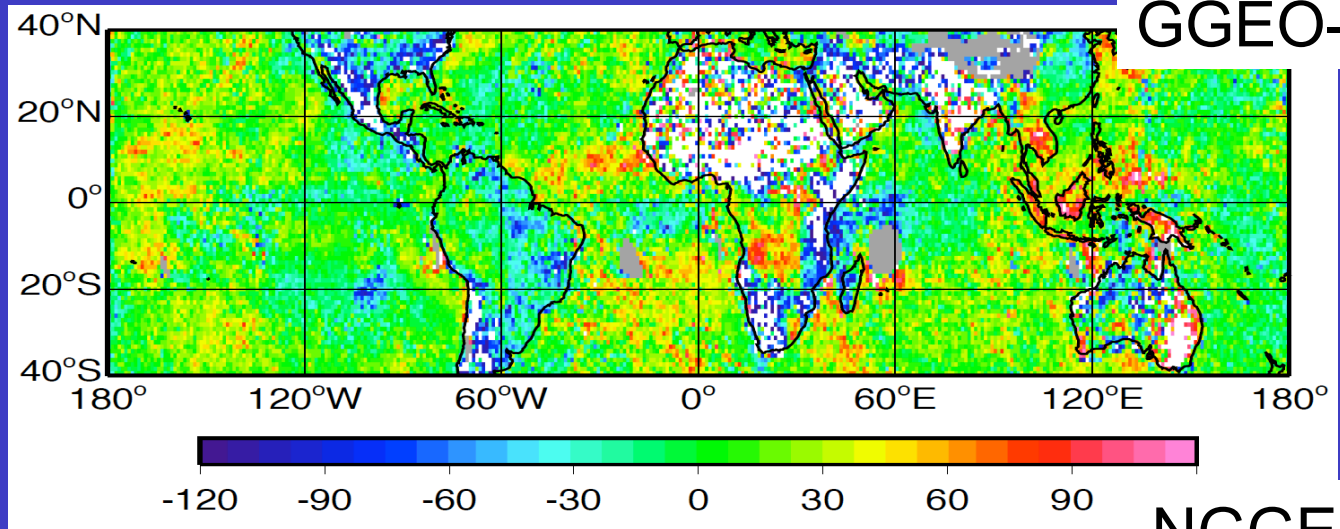
NGGEO-Aqua



After Normalization

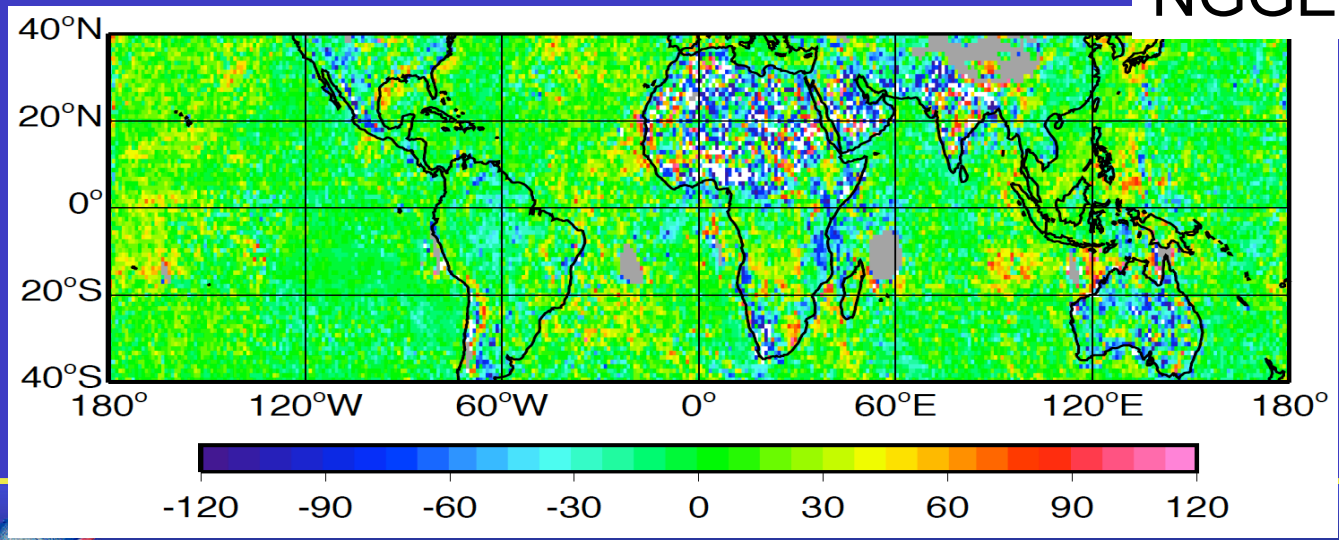
Bias = -1.51
RMS = 5.91

Validation(2): Peff difference for Dec 2002



Before Normalization

Bias = 3.26
RMS = 56.71

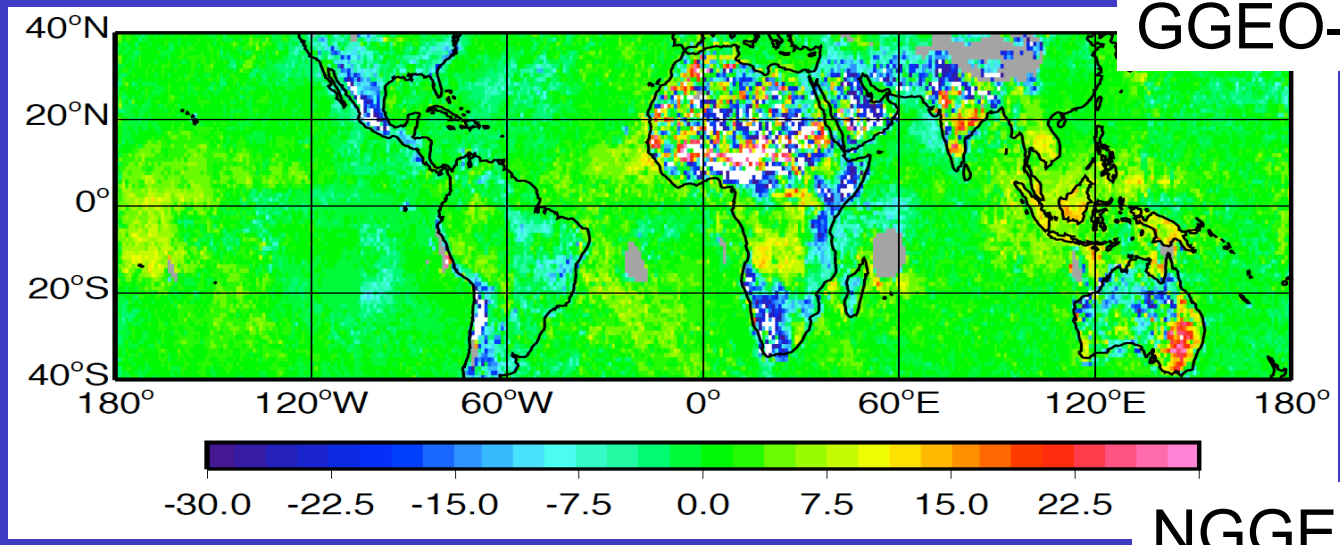


After Normalization

Bias = -0.9
RMS = 32.84

Validation(3): Teff difference for Dec 2002

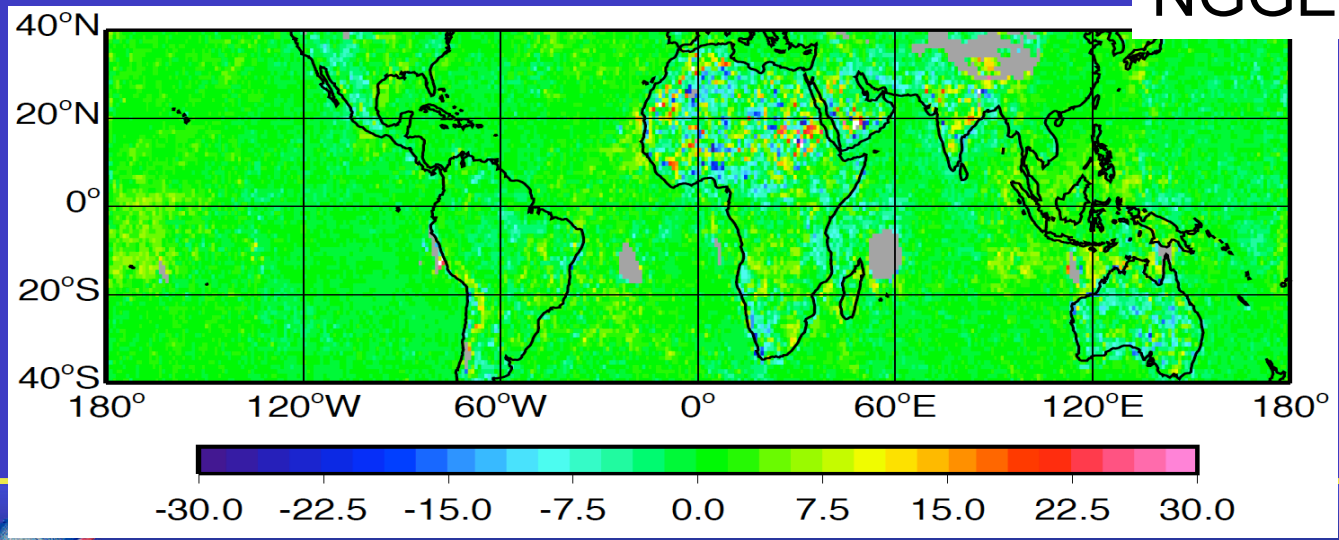
GGEO-Aqua



Before Normalization

Bias = -0.15
RMS = 6.73

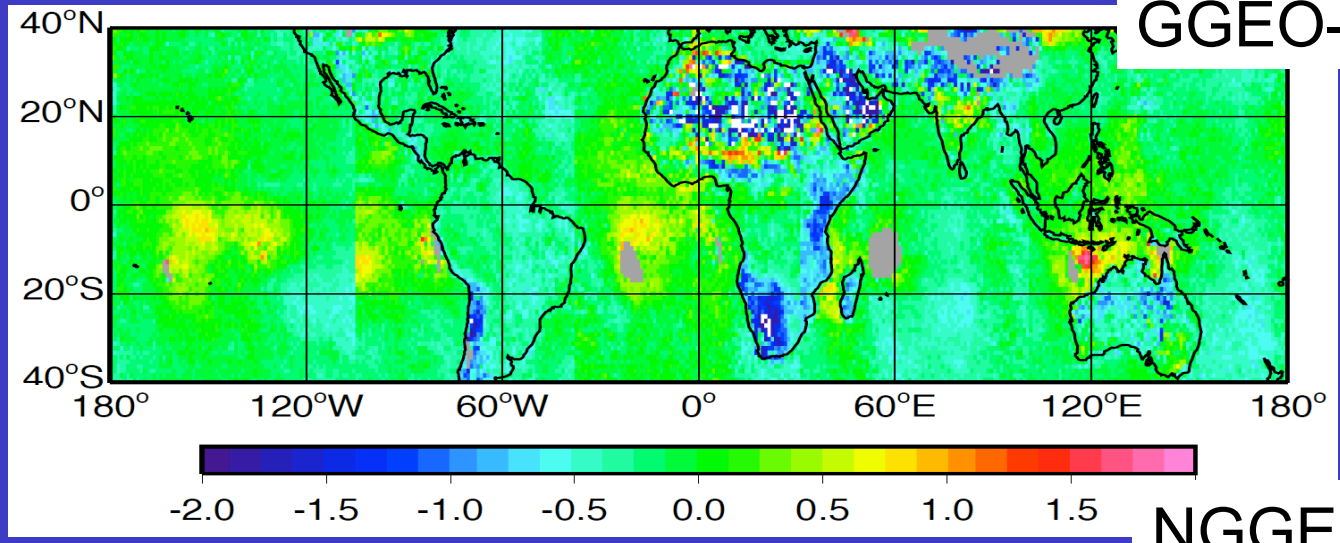
NGGEO-Aqua



After Normalization

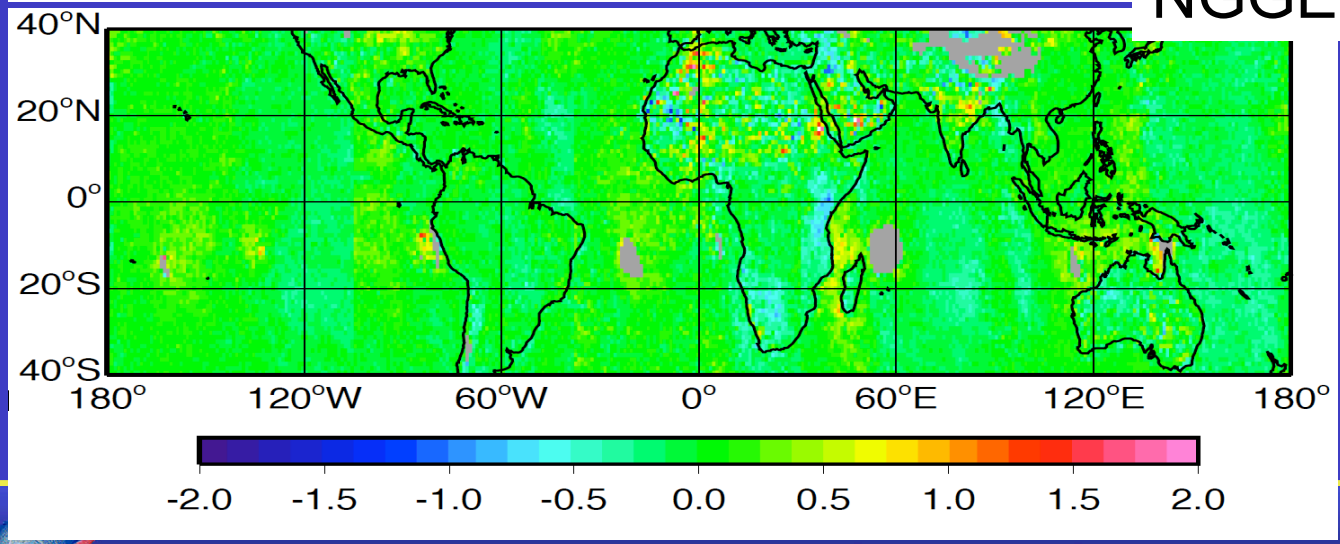
Bias = 0.24
RMS = 3.09

Validation (4): Tau difference for Dec 2002



Before Normalization

Bias = -0.16
RMS = 0.42



After Normalization

Bias = -0.01
RMS = 0.20

Validation (5): Summary Table 40N-40S (Dec 2002)

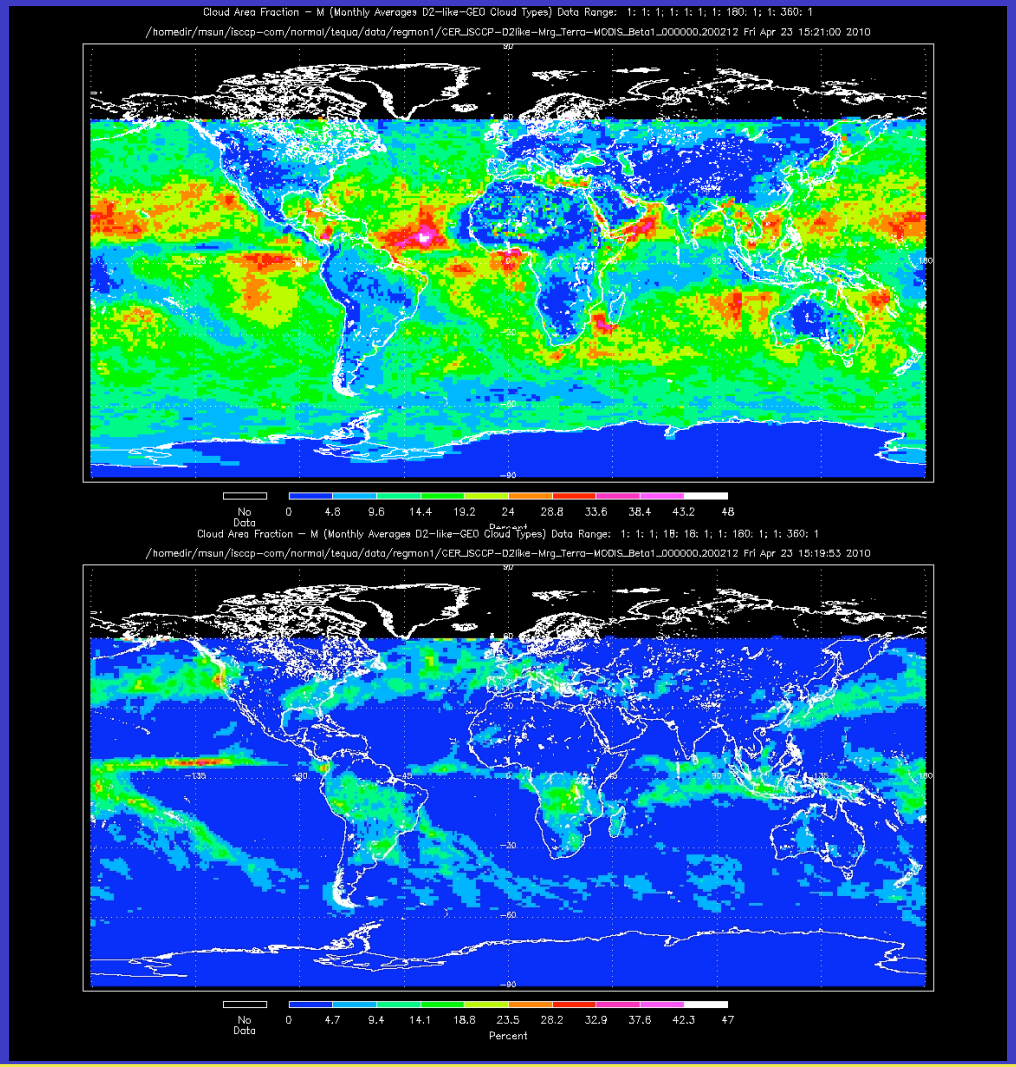
	Cloud	Peff	Teff	Tau
OGEO	-0.53	3.26	-0.15	-0.16
Merge	-1.51	-0.90	0.24	-0.01

Bias

	Cloud	Peff	Teff	Tau
OGEO	9.78	56.71	6.73	0.42
Merge	5.91	32.84	3.09	0.20
Reduced	40%	42%	54%	52%

RMS

Snapshot: ISCCP D2-like Merge

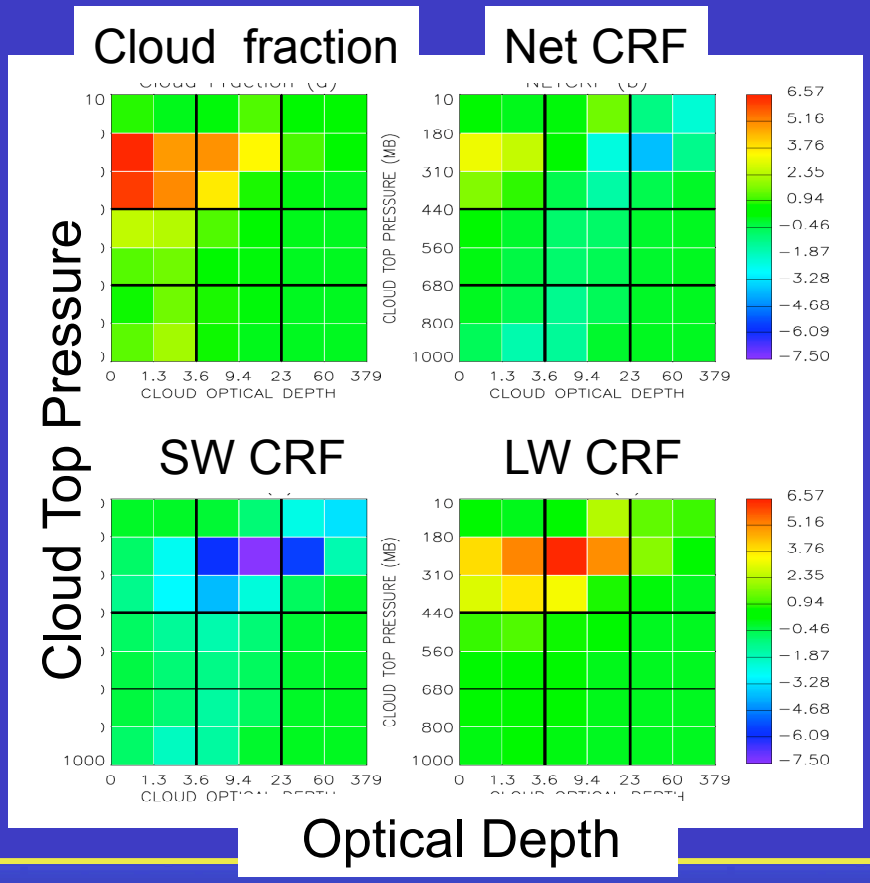


Cumulus Cloud fraction (sub-1)

Deep Convective Cloud fraction (sub-18)

Current Status and Future plan

- Deliver Merge Beta1 in May 2010.
- To develop ISCCP-D2-like CERES flux product that is associated with D2-like cloud types in Aug 2010.



Sun and Cess

Thank You!