The narrow-to-broadband reflectance conversion with CERES and MODIS data and comparison with MISR results

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1. Narrow-to-broadband reflectance conversion
2. Results
3. Conclusions

Narrow-to-broadband reflectance conversion

Linear regression: BB = a + b*NB(0.645um)+c*NB(0.858um)

SZA and VZA bins:

0 [0-10), 1 [10-20), 2 [20-30), 3 [30-40), 4 [40-50), 5 [50-60), 6 [60-70), 7 [70-80), 8 [80-90]

AZA bins:

0 [0-20), 1 [20-40), 2 [40-60), 3 [60-80), 4 [80-100), 5 [100-120), 6 [120-140), 7 [140-160), 8 [160-180]

Cloud Fraction bins:

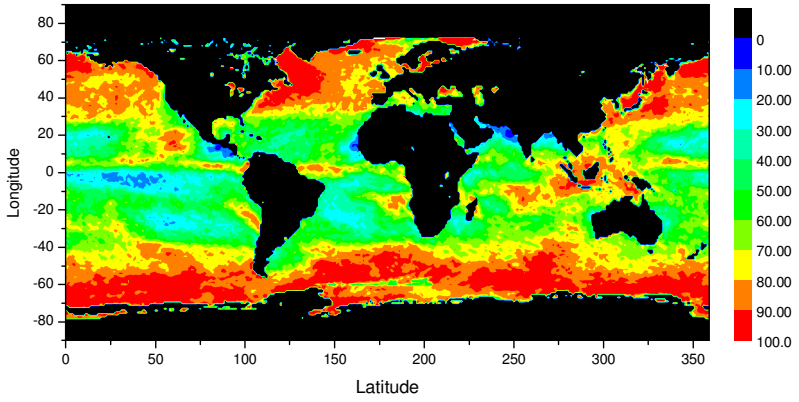
0 [0-10%), 1 [10-20%), 2 [20-30%), 3 [30-40%), 4 [40-50%), 5 [50-60%), 6 [60-70%), 7 [70-80%), 8 [80-90%), 9 [90-100%]

Conversion coefficients a, b, and c are functions of SZA, VZA, VAZ, and cloud fraction and are from linear regression of 183-day SSF data.

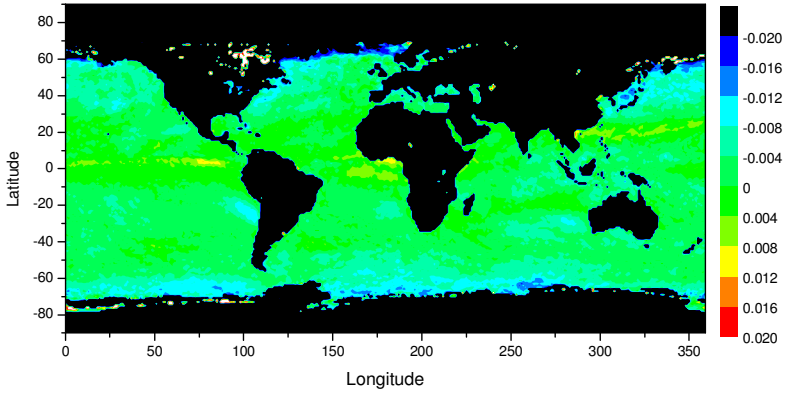
NB-BB errors in albedo are estimated by applying the BB anisotropic factor to NB-converted BB reflectance (A = r/R) and then comparing with the BB albedo saved in the SSF dataset from CERES.

Results

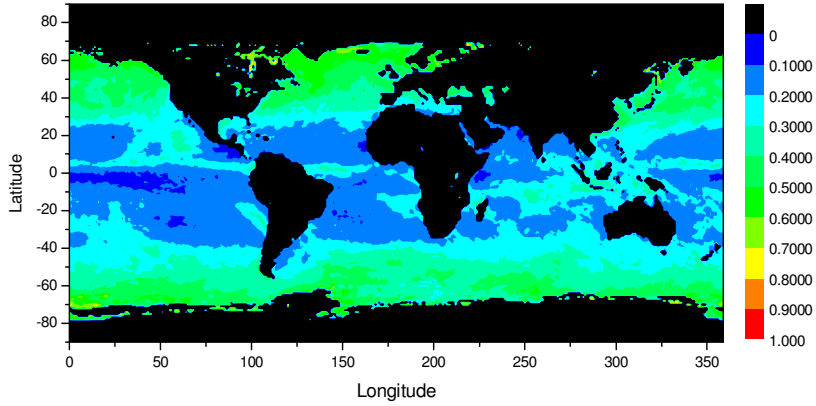
Jan 2001



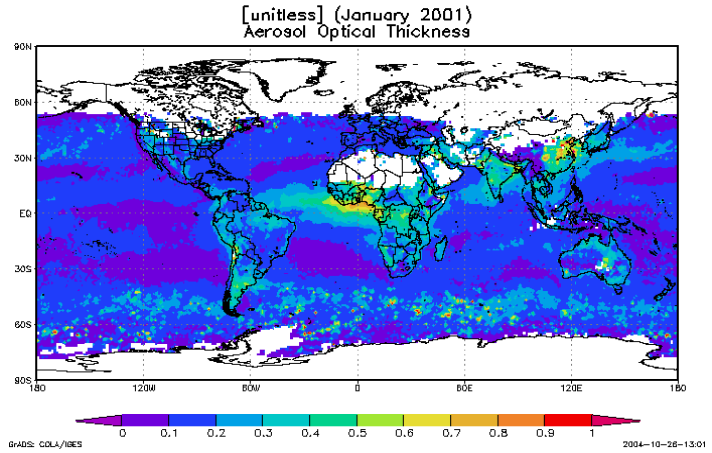
mean cloud coverage in January 2001(%)



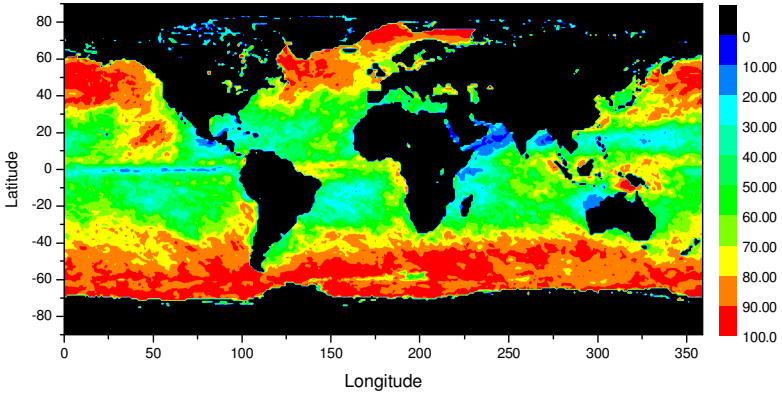
mean bias error of NB-to-BB albedo in January 2001



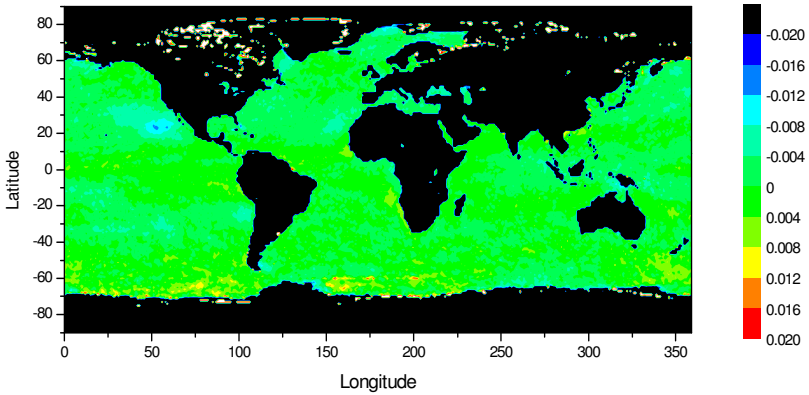
mean sw albedo in January 2001



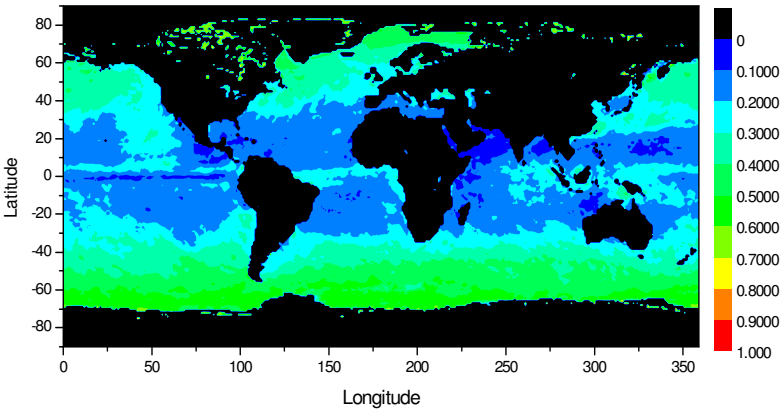
Apr 2001



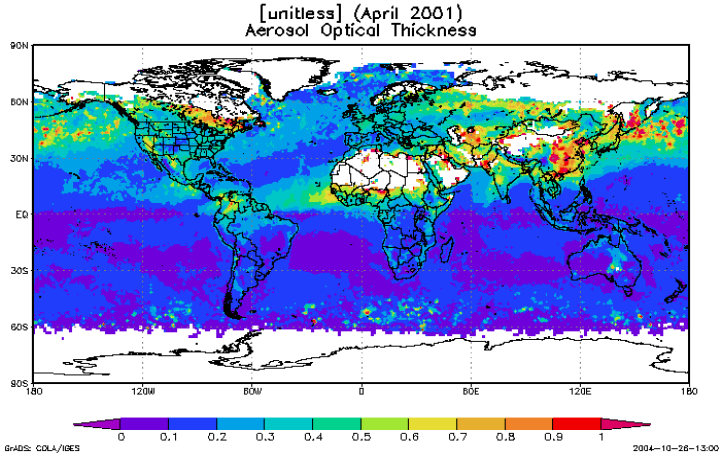
mean cloud coverage in April 2001 (%)



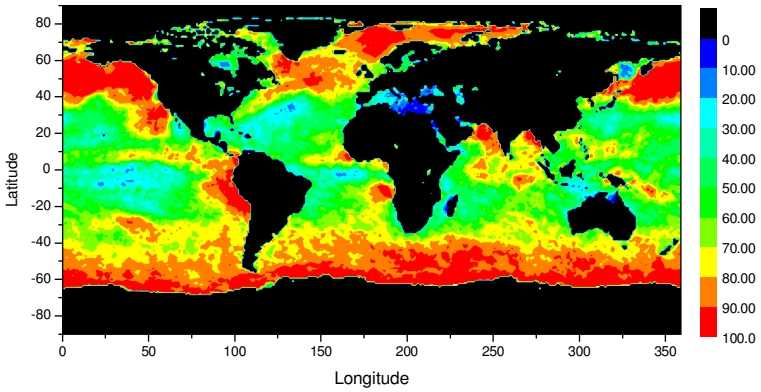
mean bias error of NB-to-BB albedo in April 2001



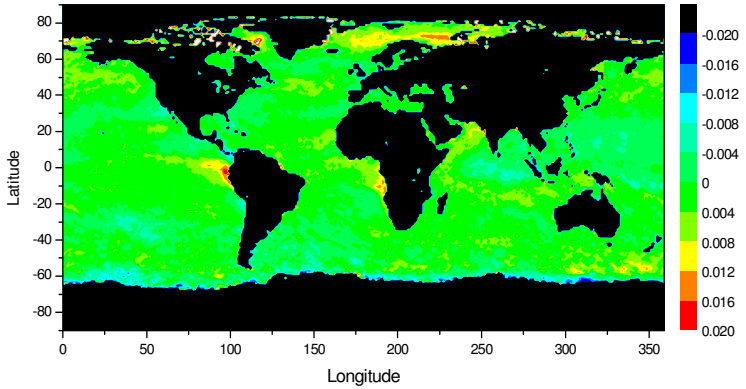
mean sw albedo in April 2001



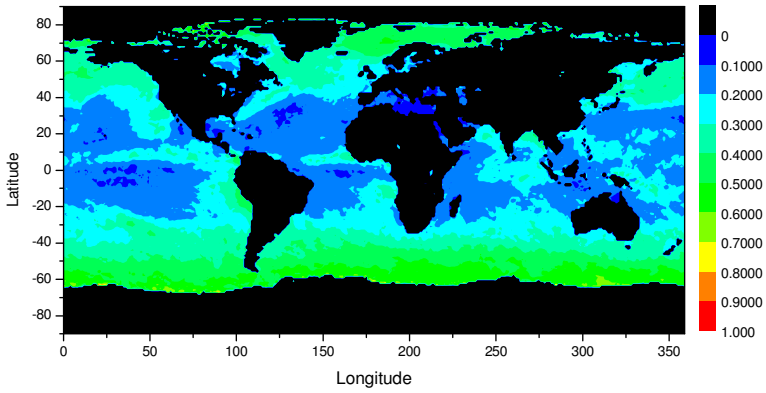
Jul 2001



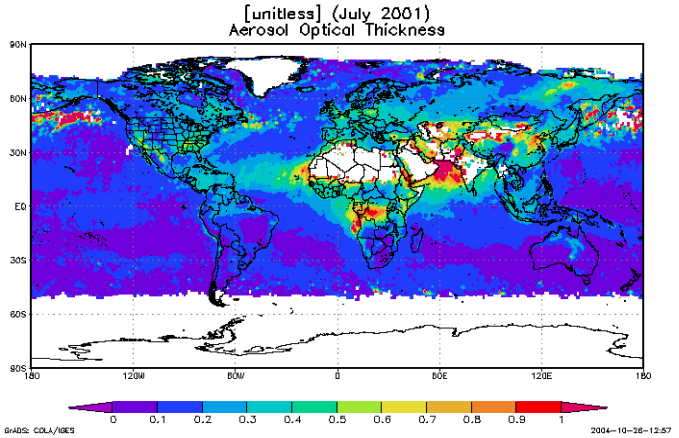
mean cloud coverage in July 2001 (%)



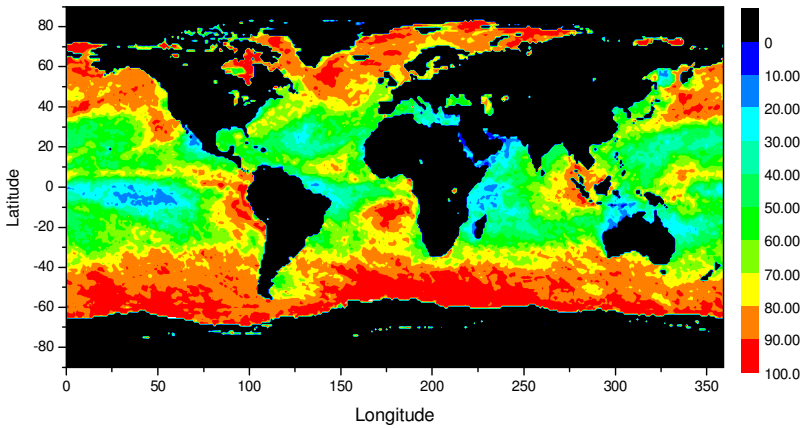
mean bias error of NB-to-BB albedo in July 2001



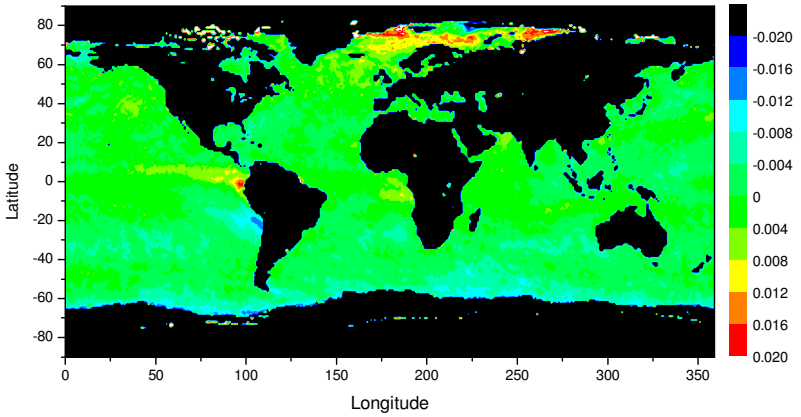
mean sw albedo in July 2001



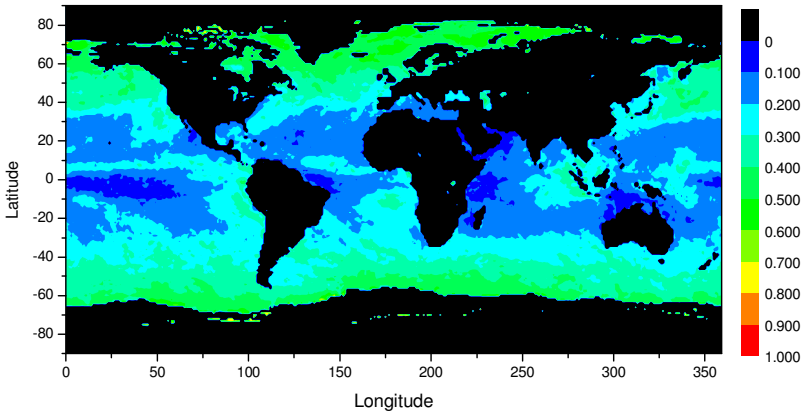
Oct 2001



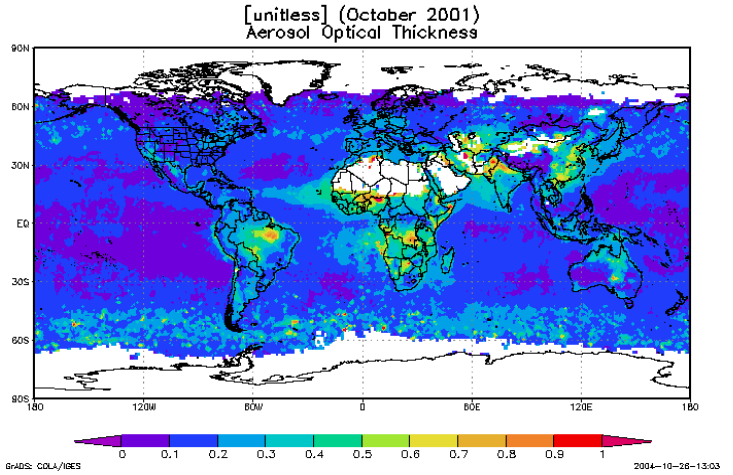
mean cloud coverage in October 2001 (%)

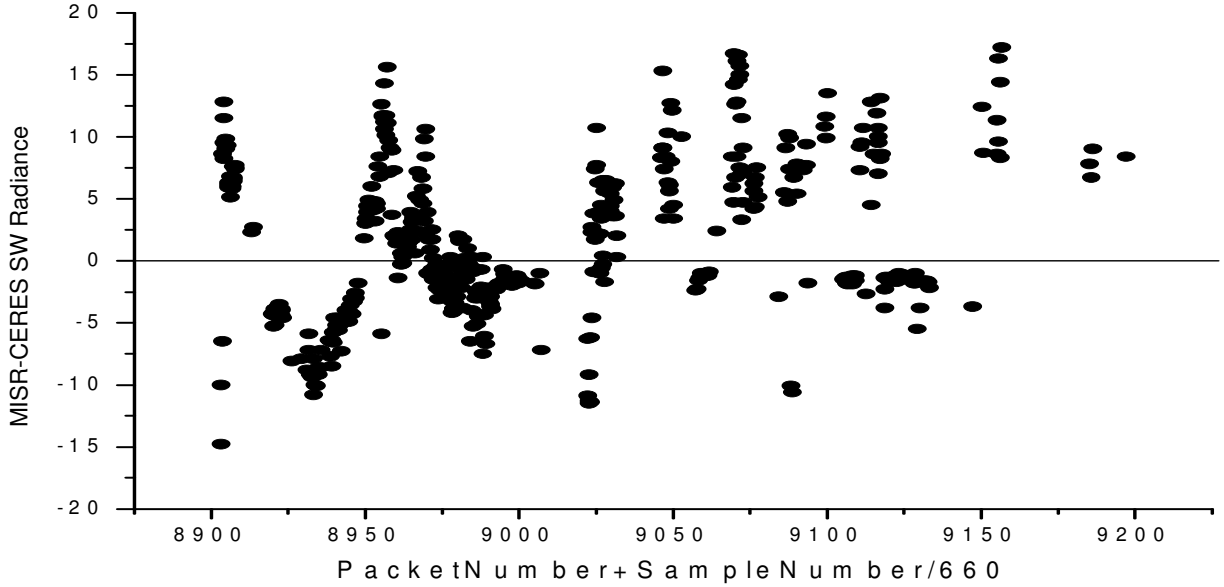


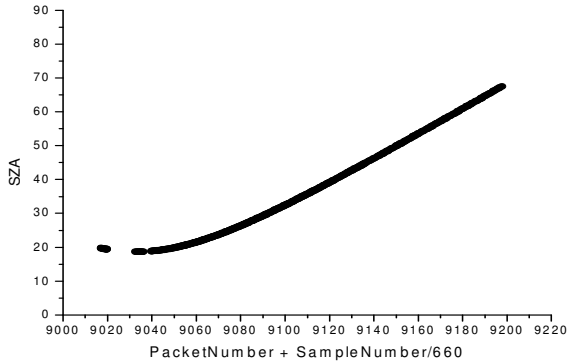
mean bias error of NB-to-BB albedo in October 2001

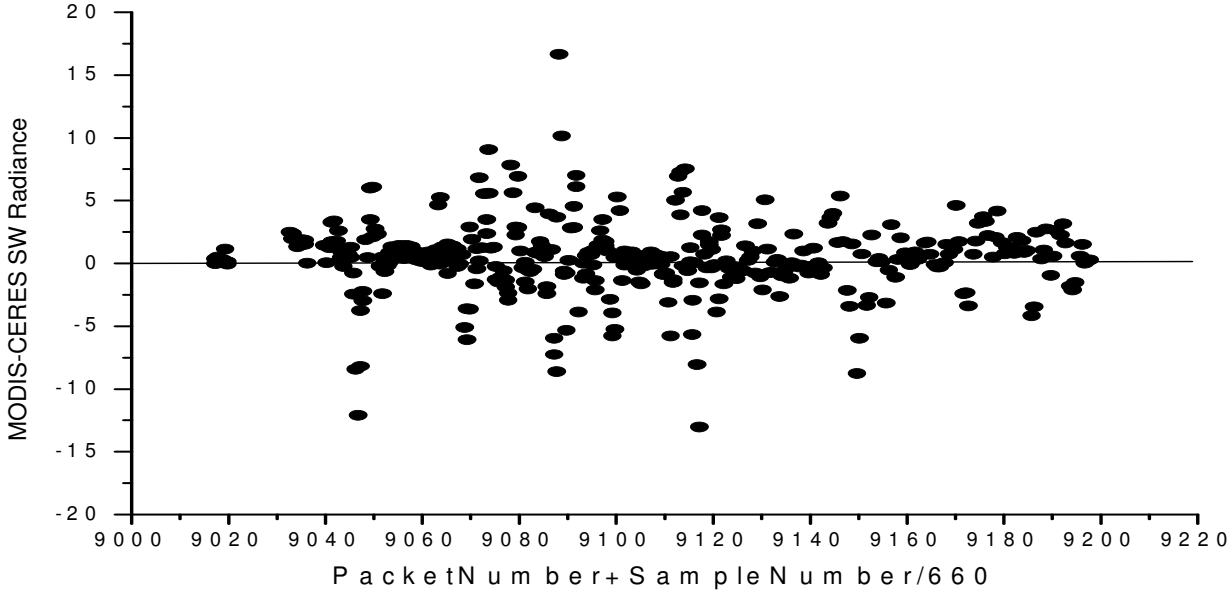


mean sw albedo in October 2001

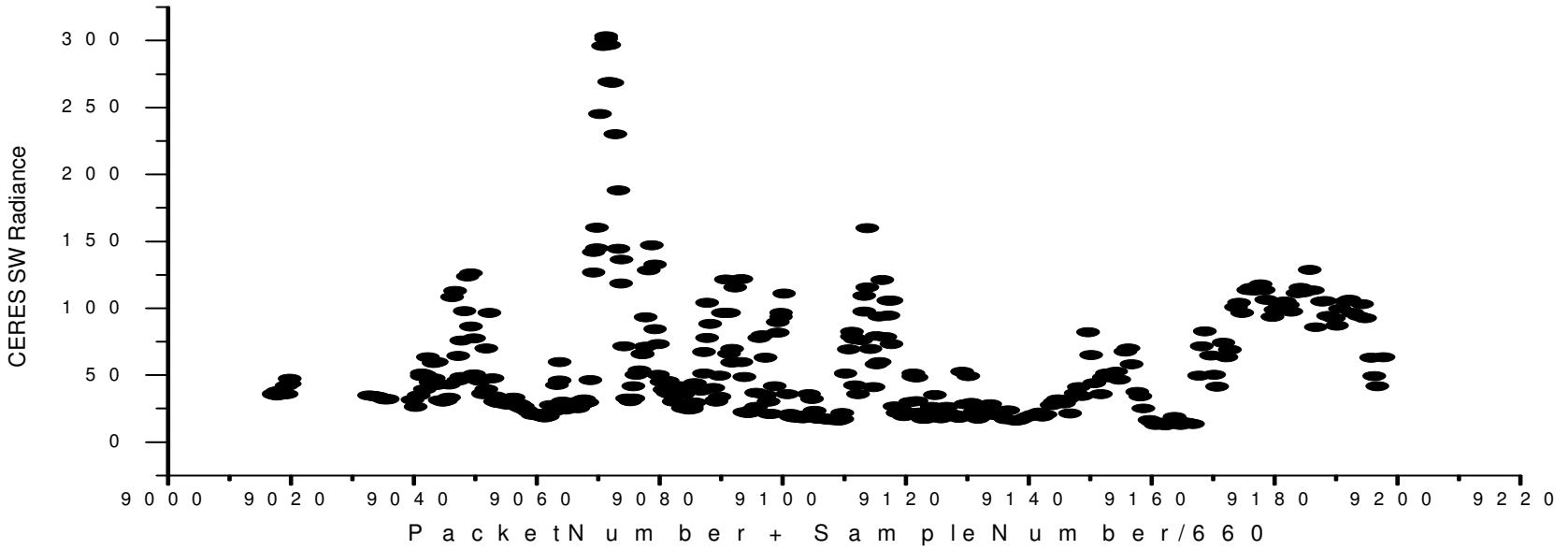


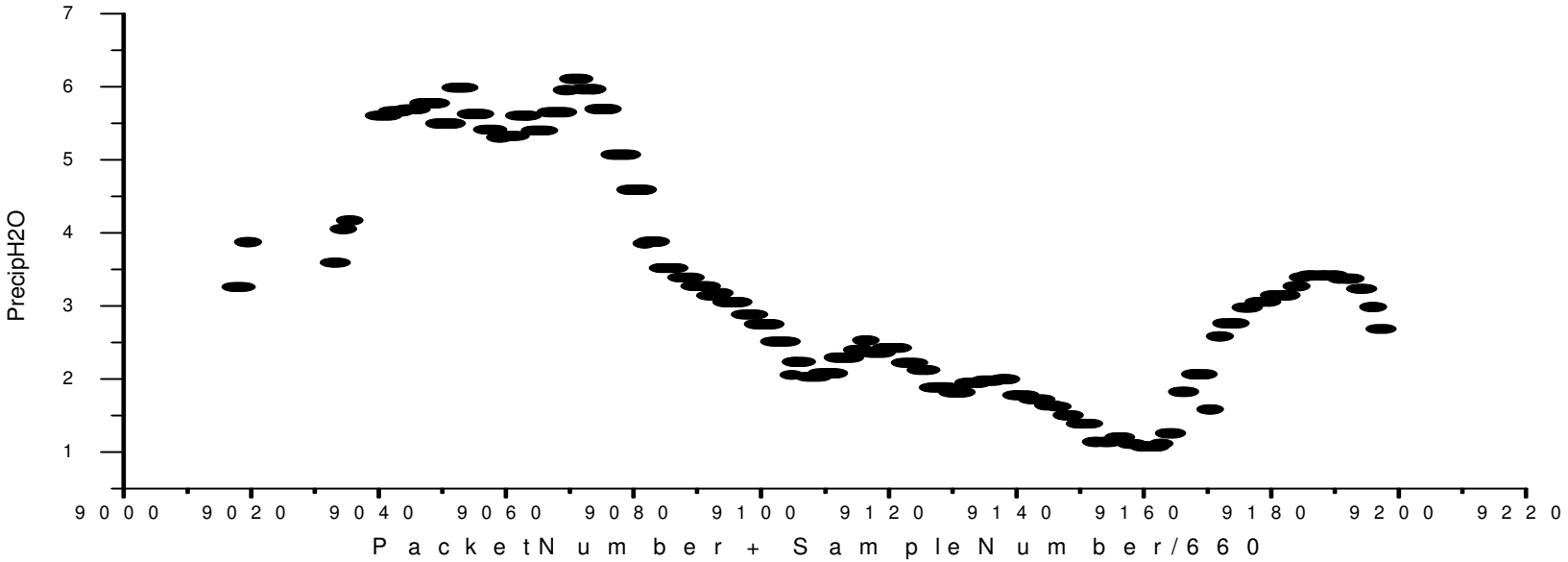


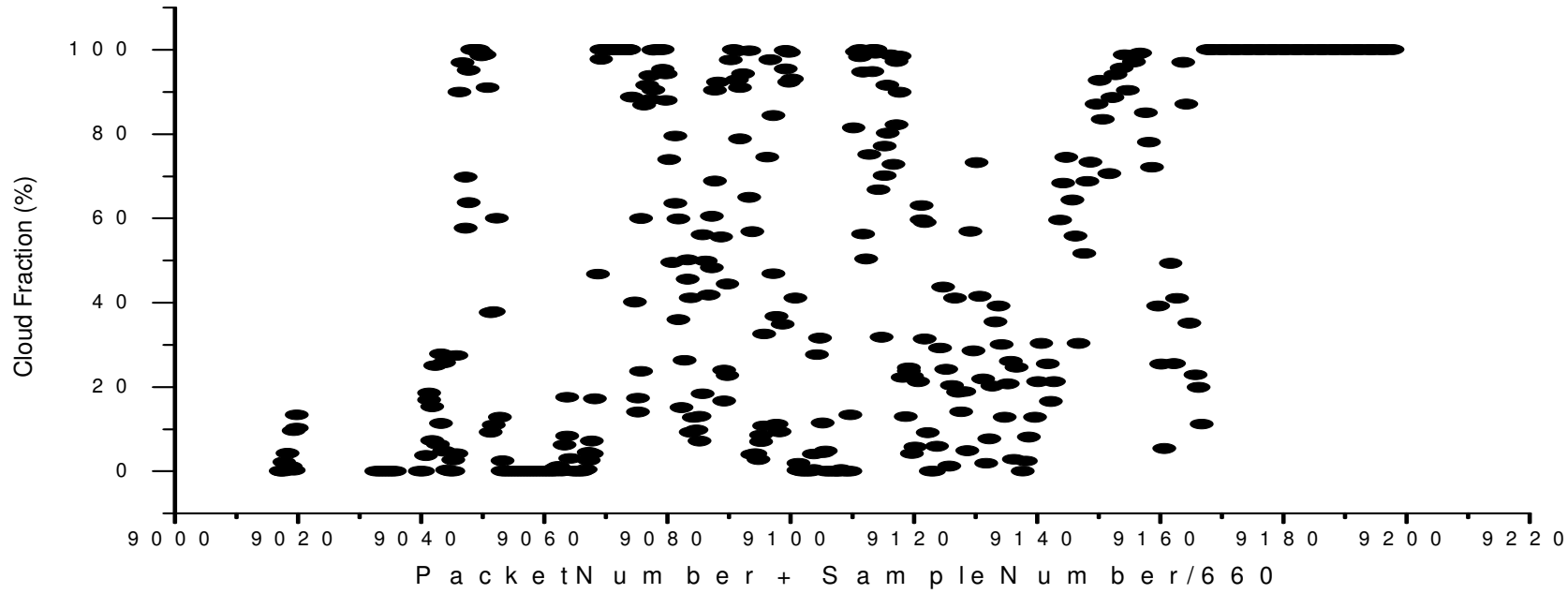


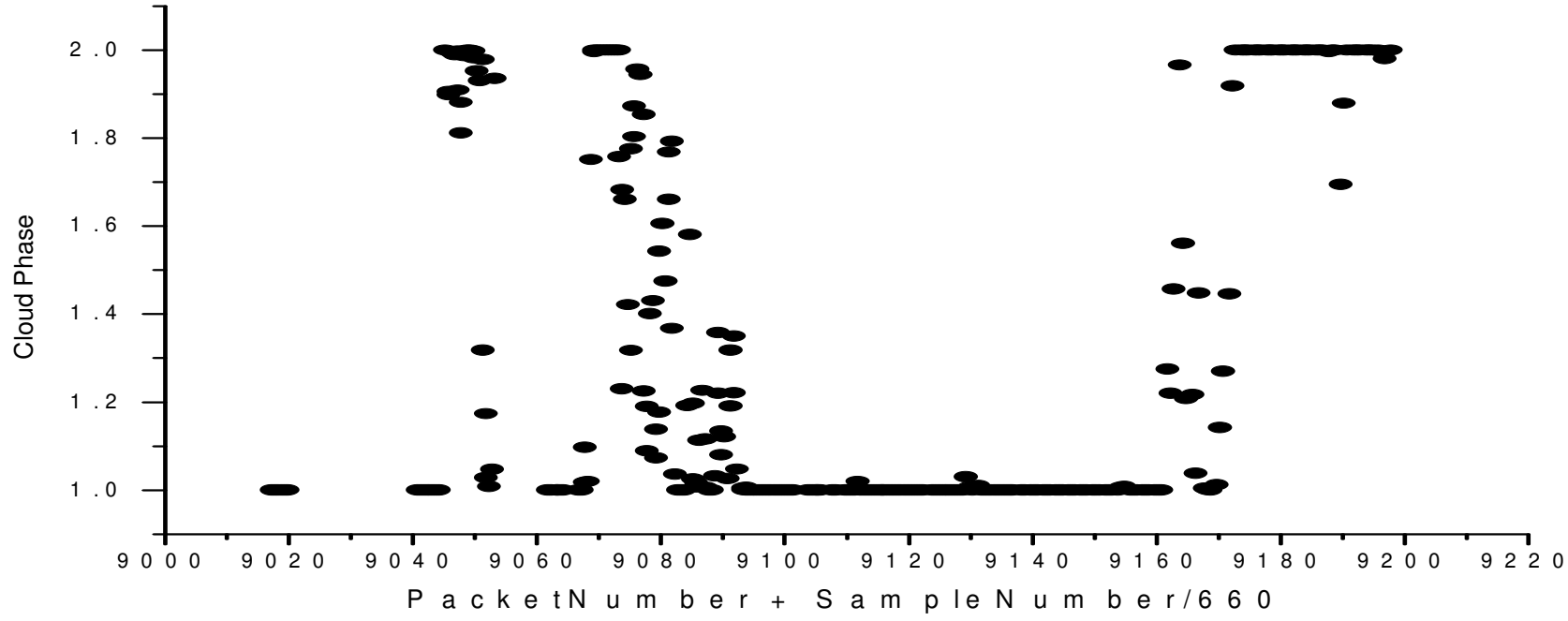


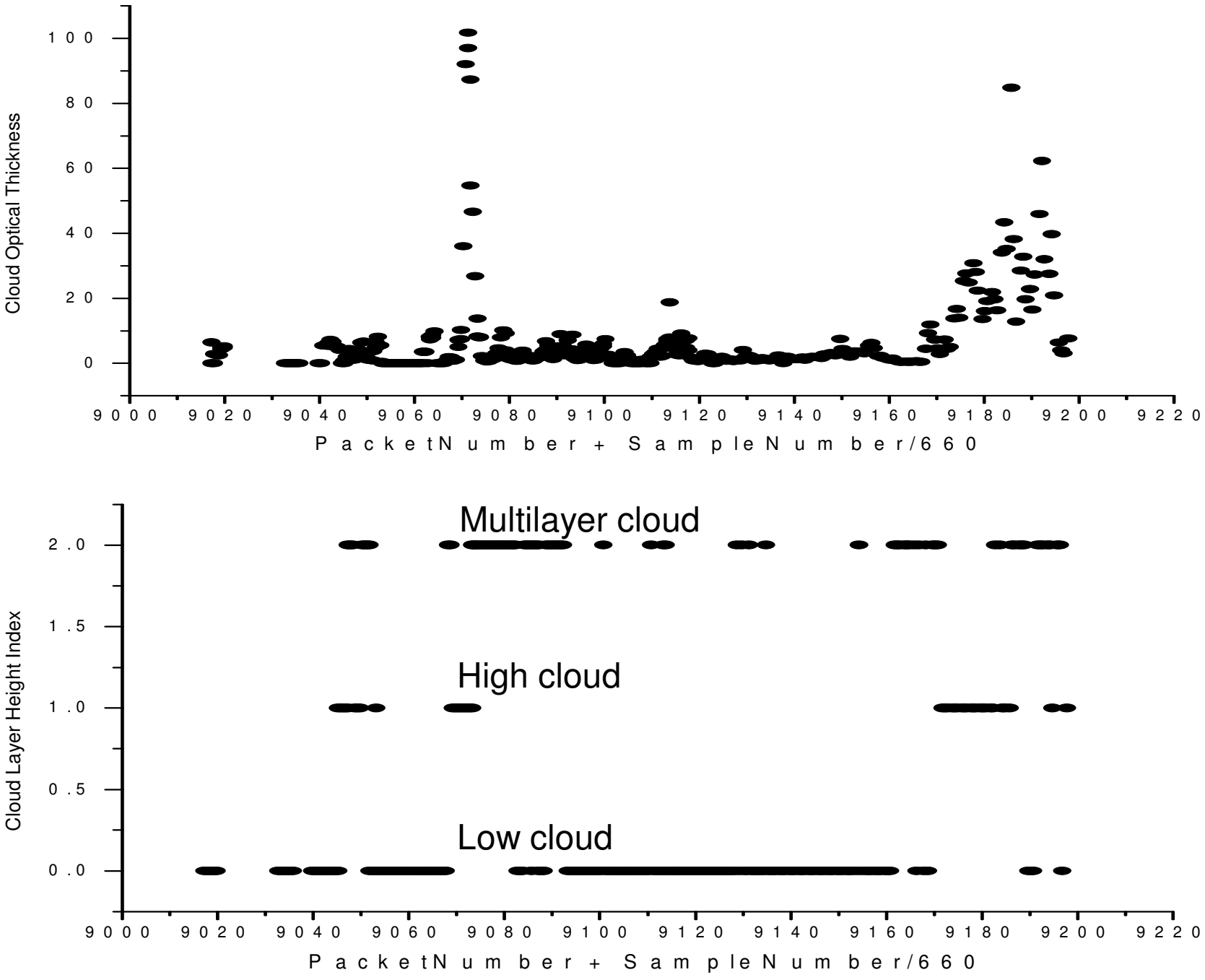
Terra Orbit 6980
April 10, 2001
Along-track


CERES SW Radiance
300
250
200
150
100
50
0
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660


PrecipH2O
7
6
5
4
3
2
1
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660


Cloud Fraction (%)
100
80
60
40
20
0
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660


Cloud Phase
2.0
1.8
1.6
1.4
1.2
1.0
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660


Cloud Optical Thickness
100
80
60
40
20
0
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660
Cloud Layer Height Index
2.0
1.5
1.0
0.5
0.0
Multilayer cloud
High cloud
Low cloud
9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220
PacketNumber + SampleNumber/660

Outliers in MODIS NB to CERES BB radiance conversion
Orbit 6980 Terra Along-track April 10, 2001

PacketNo	9046.255	9046.755	9047.253	9087.756	9088.255	9088.755	9116.755	9117.253	
Lat.	6.149	5.973	5.82	-10.319	-10.611	-10.787	-21.934	-22.085	
Lon.	-87.975	-88.014	-88.05	-91.481	-91.538	-91.578	-94.081	-94.12	
SZA	19.34	19.39	19.43	28.46	28.68	28.81	37.93	38.06	
Radiance	108.264	112.857	64.475	77.593	88.113	40.496	78.41	94.499	
Residual	**-8.465**	**-12.115**	**-8.205**	**-8.636**	**16.645**	**10.141**	**-8.086**	**-13.059**	
PreciH2O	5.688	5.772	5.772	3.387	3.387	3.387	2.523	2.356	
Cld Frac	89.95	96.92	69.74	68.8	92.29	55.57	72.8	82.14	
Cld Phas	1.994	1.989	1.998	1	1	1.032	1	1	
Cld Tau	4.384	3.846	1.904	4.084	5.479	2.432	4.238	4.754	
Cld LyrHt	1	1	1	0	0	2	0	0	

Conclusions

1. The relative rms and bias errors for NB to BB reflectance conversion are ~3% and ~0.7% for overcast pixels. Broken clouds show significantly larger relative rms error of ~7% and bias error of ~4%.
2. The areas with large NB-converted BB albedo errors seem related with large aerosol optical thickness, which show seasonal change as well.
3. The outliers in NB-BB residuals do NOT correlate to cloud phase, height, and layers.
4. The outliers in NB-BB residuals are all corresponding to cloud coverage of more than 50% but less than 100%.
5. The outliers in NB-BB residuals are all corresponding to medium effective optical thickness and solar zenith angle.