Aerosol Forcing at Niamey During RADAGAST from the CERES Perspective

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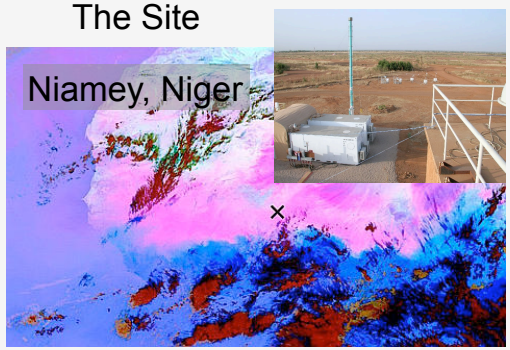
The Site



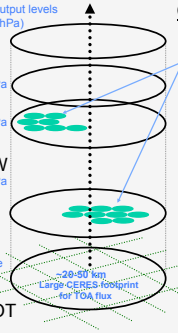
CERES/SARB Radiation Transfer

Google CERES "CAVE" to access on-line radiation transfer models

RT Model
- Langley Fu & Liou
- Delta 2-stream
- Up to 36 levels
- 2 near surface levels
- Floating cloud boundaries
- Correlated K with 15SW &12 LW bands

Ozone
- NCEP Mostly from SBUV/2

Aerosols
- MODIS & MATCH ->AOT
- MATCH -> type, height
- OPAC & Lacis-> SSA, g



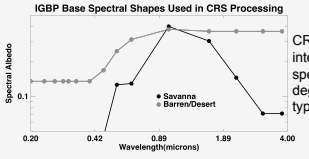
Cloud properties
- MODIS (Minnis)
- Given for 2 levels
- No overlap
- (Spatial Average)

Atmosphere
- GEOS4(GMAO) Reanalysis(1Deg)

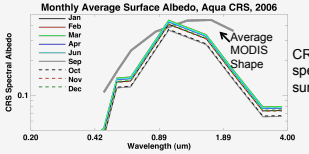
Surface properties
- $\alpha(\nu)$ – scene
- α Broadband
- clear – CERES
- cloudy – History

Skin T
- clear - MODIS
- cloudy – GEOS4

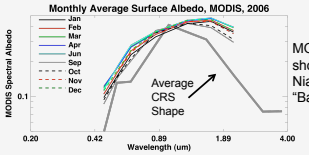
Surface Albedo & It's Impact



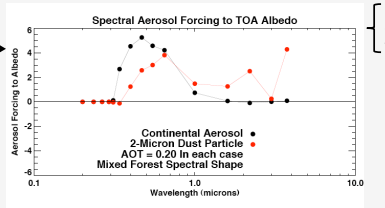
CRS calculates spectral shape as integral of a set of predefined spectral albedos assigned to 1/8 degree resolution IGBP scene type map.



CRS is constrained to fixed spectral shapes for retrieved surface albedo.



MODIS (MCD3C1) data product shows that the area around Niamey is a better fit to the CRS "Barren/Desert" shape.

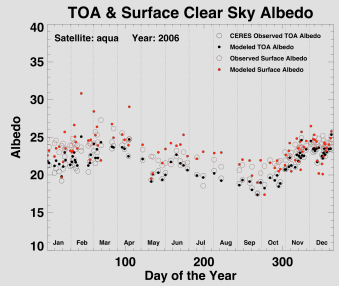


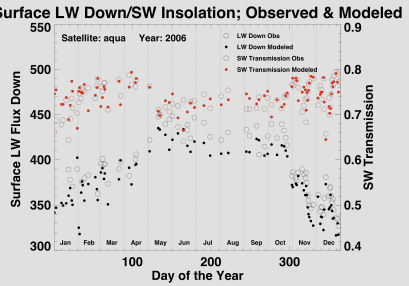
Plot from Rutan et al. (2009) shows effect of different spectral shapes on aerosol forcing to TOA albedo.

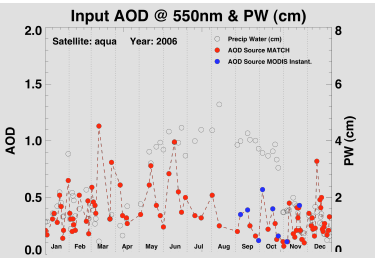
Even with the -13W bias in DLF we retain confidence in surface LW forcing as the bias appears uncorrelated to observed aerosol optical depth.

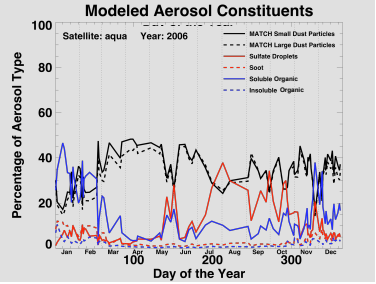
All results are instantaneous at Aqua over pass. CERES footprint is free from clouds.

Characterization

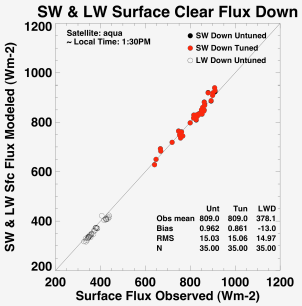


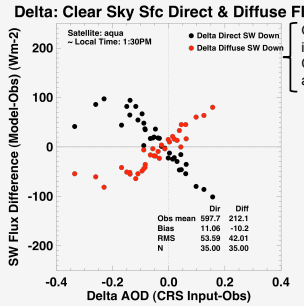






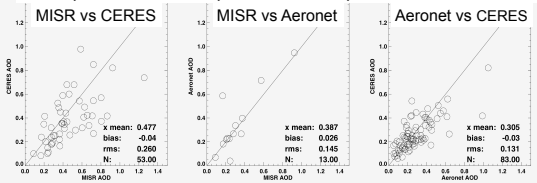
Validation



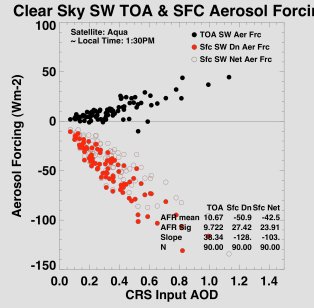


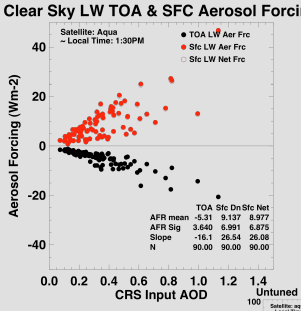
Observed AOD in plot to left includes only times with both CRS and AERONET available (Sep-Dec 2006)

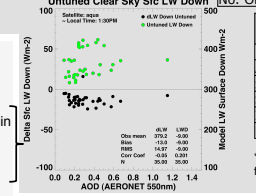
Comparison of CRS input AOD to independent observations



Aerosol Forcing







SW Surface Net Aerosol Radiative Forcing (Clear – Pristine)* All in W/m²	CERES results using model Surface SW	CERES results using observed Surface SW	McFarlane et al. 2009 using observed Surface SW
Aerosol Forcing	-42.5	-41.9	-38.5
Std Deviation	23.9	37.4	38.4
Slope	-103.0	-97.6	-88.3
Intercept	-6.7	-7.9	-7.6
No. Of Points	90	90	

TOA Aerosol Radiative Forcing (Clear – Pristine)* All in W/m²	SW Day	LW Day	LW Night
Aerosol Forcing	10.7	-5.3	-1.8
Std Deviation	9.7	3.6	1.6
Slope	38.3	-16.1	-3.5
Intercept	-2.7	0.3	-0.4
No. Of Points	90	90	133

LW Surface Net Aerosol Radiative Forcings (Clear – Pristine)* All in W/m2	Day	Night
Aerosol Forcing	9.0	10.5
Std Deviation	6.9	9.4
Slope	26.1	30.1
Intercept	-0.1	-1.7
No. Of Points	90	133

*Unless otherwise noted, forcing calculations use model Langley Fu & Liou fluxes (not observations) for both the "clear" and the "pristine" terms.

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3. NASA Langley Research Center, Science Directorate
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