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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Toward an Observation-Based Estimate of Dust Net Radiative Effects in Tropical North Atlantic Through Integrating Satellite Observations and In Situ Measurements of Dust Properties" *by* Qianqian Song et al.

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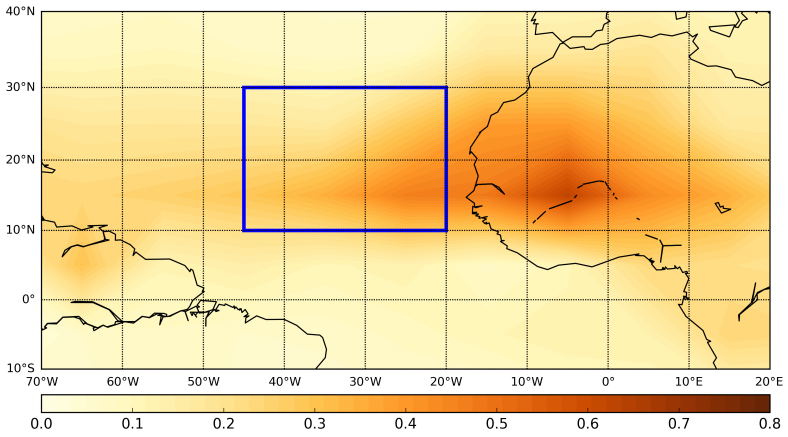
40°N
30°N
20°N
10°N
0°
10°S
70°W
60°W
50°W
40°W
30°W
20°W
10°W
0°
10°E
20°E
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

Fig. 1.

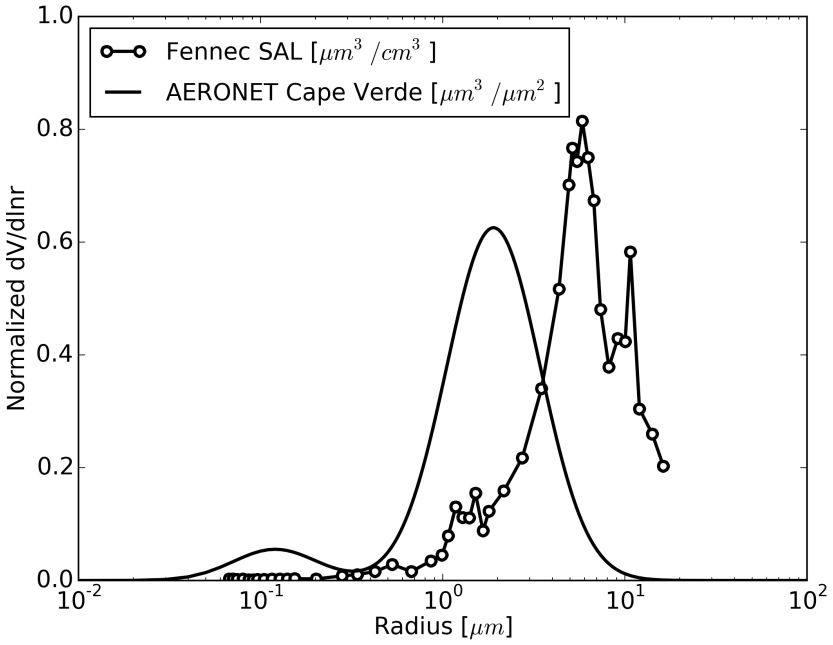
Fennec SAL [μm^3 /cm^3]
AERONET Cape Verde [μm^3 /μm^2]
Normalized dV/dlnr
Radius [μm]
0.0
0.2
0.4
0.6
0.8
1.0
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

Fig. 2.

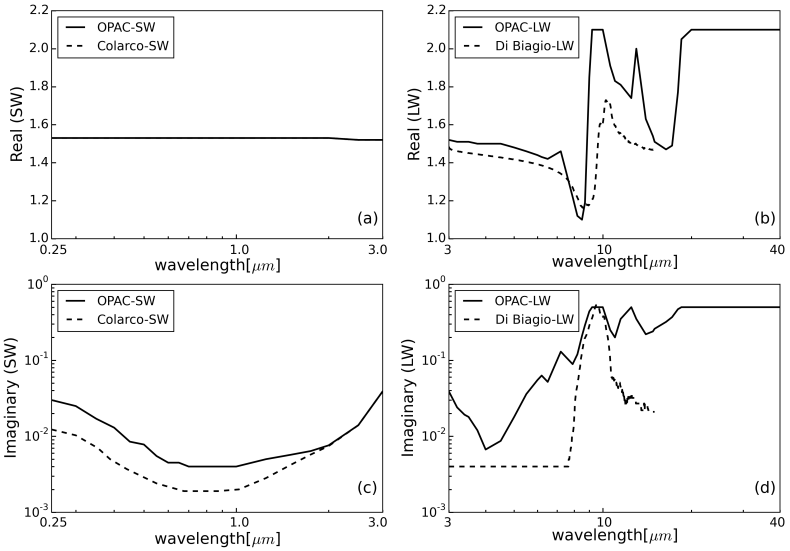
OPAC-SW
Colarco-SW
Real (SW)
wavelength[μm]
(a)
OPAC-LW
Di Biagio-LW
Real (LW)
wavelength[μm]
(b)
OPAC-SW
Colarco-SW
Imaginary (SW)
wavelength[μm]
(c)
OPAC-LW
Di Biagio-LW
Imaginary (LW)
wavelength[μm]
(d)

Fig. 3.

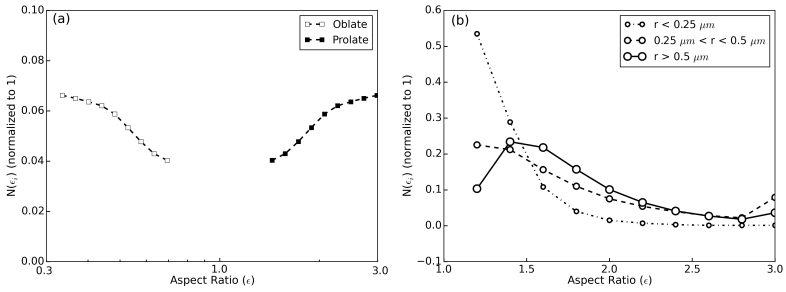
(a)
Oblate
Prolate
N(ϵ_i) (normalized to 1)
Aspect Ratio (ϵ)
(b)
r < 0.25 μm
0.25 μm < r < 0.5 μm
r > 0.5 μm
N(ϵ_i) (normalized to 1)
Aspect Ratio (ϵ)

Fig. 4.

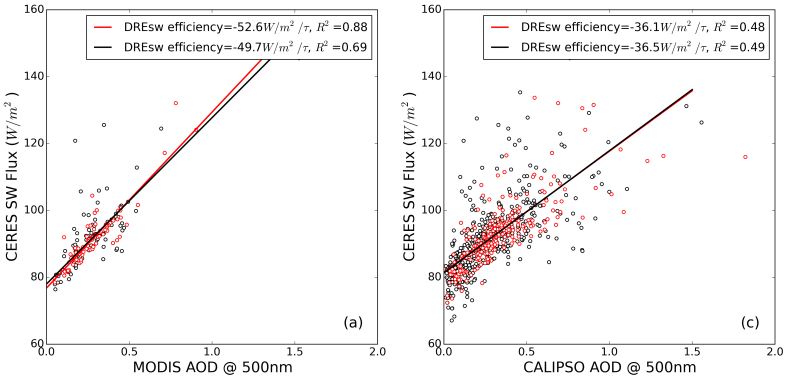
DREsw efficiency=-52.6W/m^2 /τ, R^2 =0.88
DREsw efficiency=-49.7W/m^2 /τ, R^2 =0.69
CERES SW Flux (W/m^2)
MODIS AOD @ 500nm
(a)
DREsw efficiency=-36.1W/m^2 /τ, R^2 =0.48
DREsw efficiency=-36.5W/m^2 /τ, R^2 =0.49
CERES SW Flux (W/m^2)
CALIPSO AOD @ 500nm
(c)

Fig. 5.

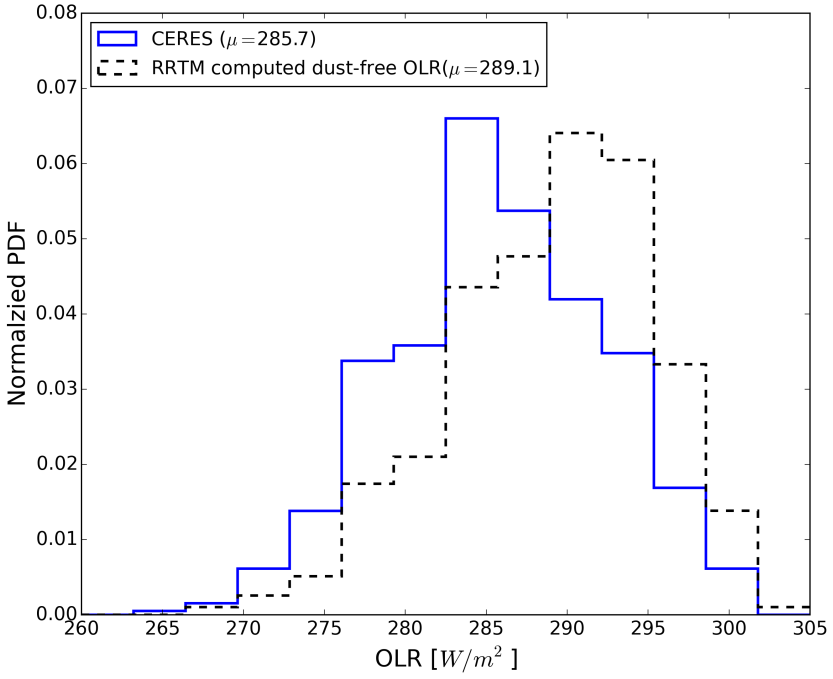
CERES (μ=285.7)
RRTM computed dust-free OLR(μ=289.1)
Normalzied PDF
OLR [W/m^2]

Fig. 6.

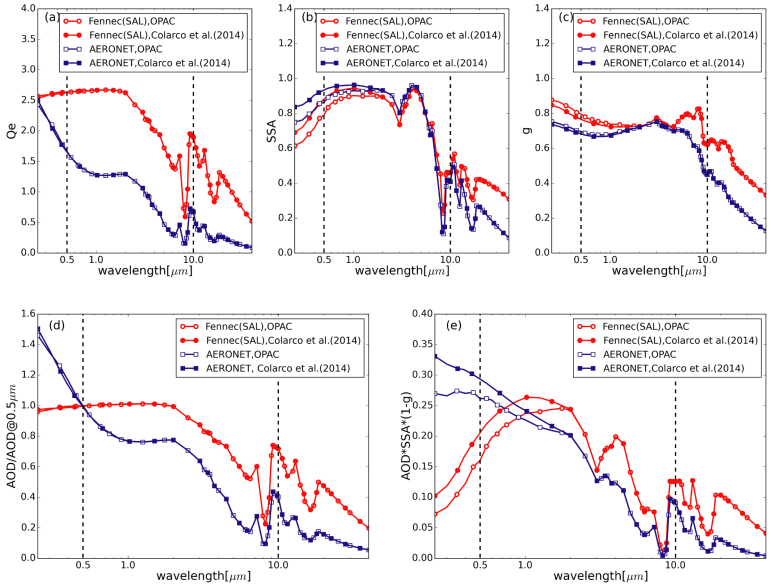
(a)
Fennec(SAL),OPAC
Fennec(SAL),Colarco et al.(2014)
AERONET,OPAC
AERONET,Colarco et al.(2014)
Qe
wavelength[μm]
(b)
SSA
(c)
g
(d)
AERONET, Colarco et al.(2014)
AOD/AOD@0.5μm
(e)
AOD*SSA*(1-g)

Fig. 7.

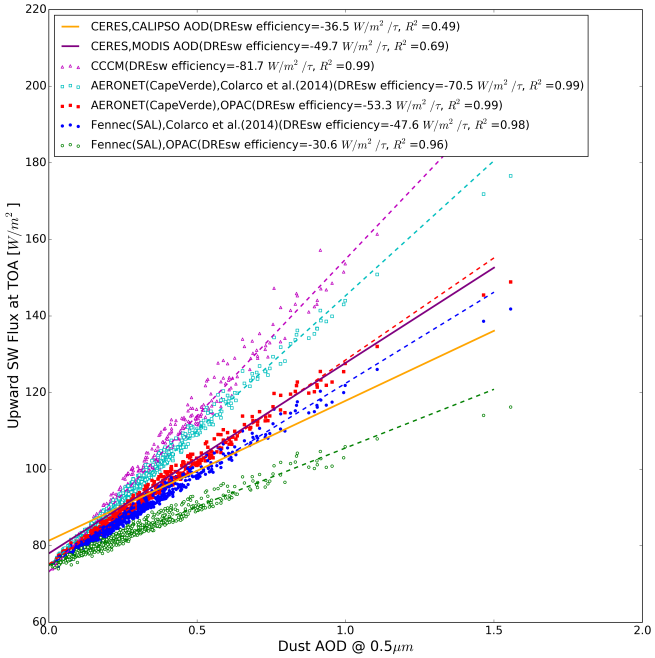
CERES,CALIPSO AOD(DREsw efficiency=-36.5 $W/m^2/\tau$, R^2 =0.49)
CERES,MODIS AOD(DREsw efficiency=-49.7 $W/m^2/\tau$, R^2 =0.69)
CCCM(DREsw efficiency=-81.7 $W/m^2/\tau$, R^2 =0.99)
AERONET(CapeVerde),Colarco et al.(2014)(DREsw efficiency=-70.5 $W/m^2/\tau$, R^2 =0.99)
AERONET(CapeVerde),OPAC(DREsw efficiency=-53.3 $W/m^2/\tau$, R^2 =0.99)
Fennec(SAL),Colarco et al.(2014)(DREsw efficiency=-47.6 $W/m^2/\tau$, R^2 =0.98)
Fennec(SAL),OPAC(DREsw efficiency=-30.6 $W/m^2/\tau$, R^2 =0.96)
Upward SW Flux at TOA [W/m^2]
Dust AOD @ 0.5μm

Fig. 8.

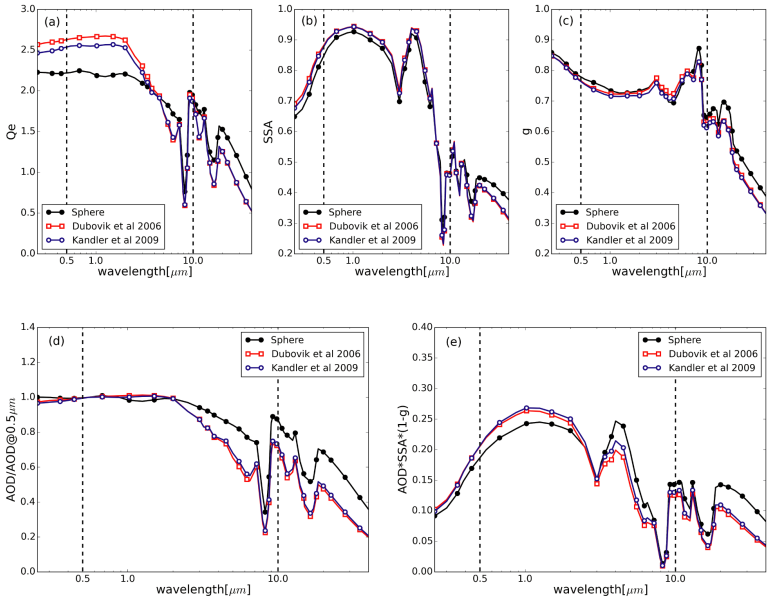
(a)
Qe
wavelength[μm]
(b)
SSA
wavelength[μm]
(c)
g
wavelength[μm]
(d)
AOD/AOD@0.5μm
wavelength[μm]
(e)
AOD*SSA*(1-g)
wavelength[μm]
Sphere
Dubovik et al 2006
Kandler et al 2009

Fig. 9.

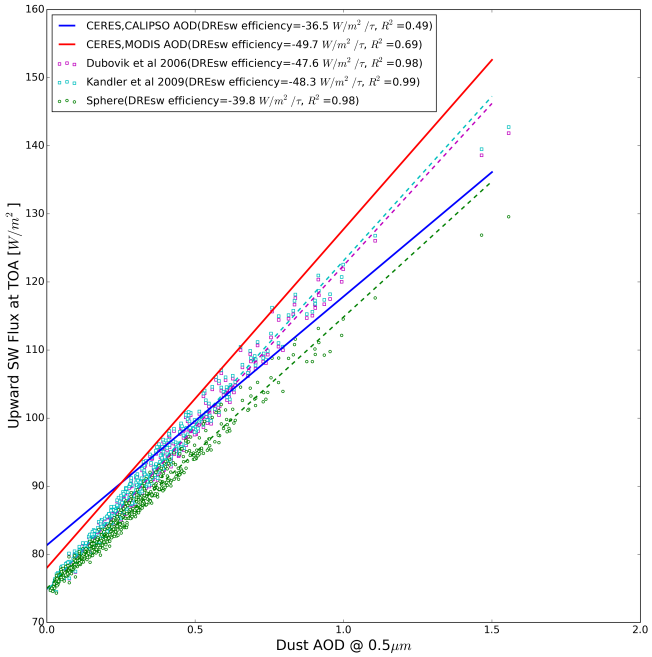
CERES,CALIPSO AOD(DREsw efficiency=-36.5 $W/m^2/\tau$, R^2 =0.49)
CERES,MODIS AOD(DREsw efficiency=-49.7 $W/m^2/\tau$, R^2 =0.69)
Dubovik et al 2006(DREsw efficiency=-47.6 $W/m^2/\tau$, R^2 =0.98)
Kandler et al 2009(DREsw efficiency=-48.3 $W/m^2/\tau$, R^2 =0.99)
Sphere(DREsw efficiency=-39.8 $W/m^2/\tau$, R^2 =0.98)
Upward SW Flux at TOA [W/m^2]
Dust AOD @ 0.5μm

Fig. 10.

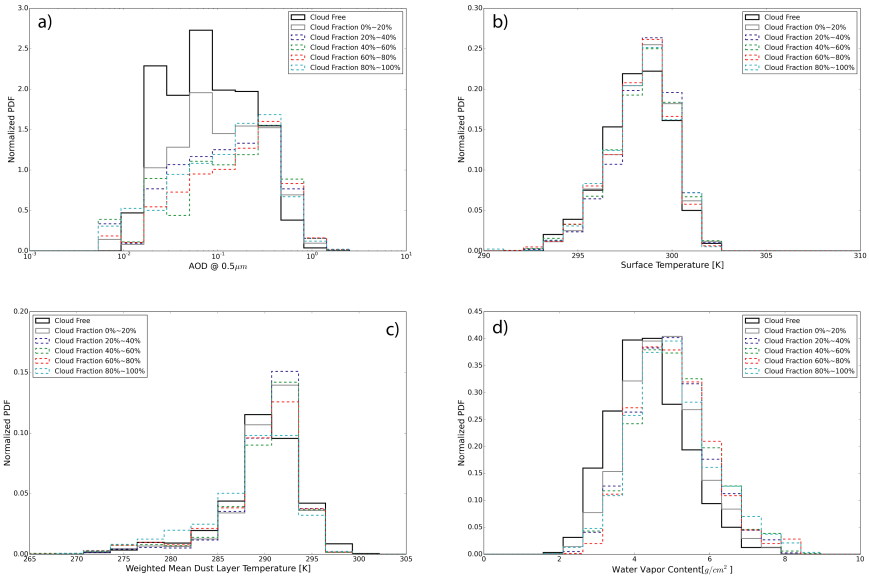
a)
b)
c)
d)
Cloud Free
Cloud Fraction 0%~20%
Cloud Fraction 20%~40%
Cloud Fraction 40%~60%
Cloud Fraction 60%~80%
Cloud Fraction 80%~100%
Normalized PDF
AOD @ 0.5μm
Surface Temperature [K]
Weighted Mean Dust Layer Temperature [K]
Water Vapor Content[g/cm^2]

Fig. 11.