Investigating VIIRS aerosol retrievals during the SEAC4RS experiment

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AERONET grid spacing about 400 km

Provided opportunity for deep dive into VIIRS aerosol retrieval

http://aeronet.gsfc.nasa.gov
AERONET station at SEARCH_Centreville
Collocated data set SEUS stations Aug/Sep 2013

VIIRS AOT(λ) collocated with AERONET

MODIS AOT(λ) collocated with AERONET

VIIRS and MODIS not collocated with each other
VIIRS 6km EDR

$y = 0.041 + 0.962x$, $R = 0.766$

All SEAC4RS, no DRAGON

550 nm
%within = 73%
Accuracy = 0.036
Precision = 0.092
N = 352

MODIS 10 km

$y = -0.002 + 1.068x$, $R = 0.864$

550 nm
%within = 73%
Accuracy = 0.009
Precision = 0.078
N = 590

Both products validating very well
MODIS has slightly higher accuracy, better precision and more samples
(MODIS also allows negatives)
Houston DRAGON network within SEAC4RS
AERONET grid spacing about 10 km
AERONET station at the University of Houston
(Note downtown Houston within the collocation circle)
VIIRS and MODIS products are biased high in urban areas especially when AOT is low.
Early validation of Angström Exponent

In first analysis for Beta level validation, it appeared as though VIIRS AngExp over land had little skill

Not surprising because MODIS had no skill over land either
In SEAC4RS, MODIS definitely has no skill. But VIIRS IDPS product shows skill at producing an AngExp over land, as compared with AERONET.

3 different AOT ranges
SEAC4RS and Houston DRAGON
6 points
Inlets grabbing air into the DC8

UMBC PI-Neph inside the DC8
3 case studies from SEAC4RS:
- Saharan dust 8 Aug 2013
- Aged smoke 19 Aug 2013
- Biogenics 19 Sep 2013

Flight tracks of the DC8
8 Aug 2013  Saharan Dust

19 Aug 2013 Aged Smoke

19 Sep 2013 Biogenics

NOAA STAR VIIRS AOT 550 nm
Gridded 0.25° x 0.25°
Available as image or data

http://www.star.nesdis.noaa.gov/smcd/emb/viirs_aerosol/products_gridded.php
8 Aug 2013 Saharan Dust

NOAA STAR VIIRS AOT 550 nm
Gridded 0.25° x 0.25°
Available as image or data

19 Aug 2013 Aged Smoke

19 Sep 2013 Biogenics

http://www.star.nesdis.noaa.gov/smcd/emb/viirs_aerosol/products_gridded.php
Dubovik GRASP retrieval transforms measurements into retrieved aerosol properties.
In 3 examples, the VIIRS IDPS algorithm chooses an aerosol model VERY CLOSE to that measured by PI-Neph.

- **08Aug Saharan Dust**: VIIRS AOT\textsubscript{550} = 0.40. VIIRS chose Dust model.
- **19Aug Aged Smoke**: VIIRS AOT\textsubscript{550} = 0.60. VIIRS chose low abs smoke.
- **19Sep Biogenics**: VIIRS AOT\textsubscript{550} = 0.40. VIIRS chose low abs urban.
Conclusions:

- **VIIRS IDPS AOT retrievals** at 6 km matched AERONET well over the southeast U.S. during August/September 2013.

- VIIRS IDPS AOT retrievals are **less capable** over the **urban surface** in greater Houston.

- Unlike MODIS, the VIIRS algorithm is showing some **skill** at deriving **size parameter** over land.

- The VIIRS IDPS algorithm seems to be **able to choose the correct aerosol model**.
Back up
VIIRS 6 km validation statistics more comparable to MODIS 3 km