Poster# 2-5

Evaluation of the VIIRS Risk Reduction Aerosol Optical Thickness Algorithm

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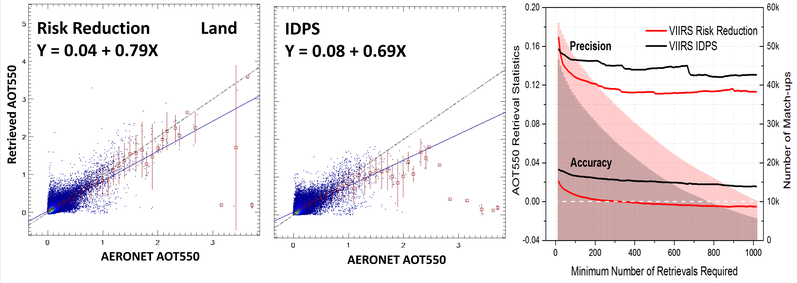
1. VIIRS Risk Reduction Aerosol Algorithm

Under the JPSS Risk Reduction (RR) project, an Aerosol Optical Thickness (AOT) retrieval algorithm is developed at NOAA/NESDIS based on the experience from evaluation of the operational VIIRS algorithm and development of the GOES-R ABI algorithm. Compared with the operational VIIRS algorithm (IDPS), the RR AOT algorithm has : (1) more stringent internal tests for detecting unfavorable retrieval conditions, (2) extended the spatial coverage (includes bright land surface and inland lake) and measurement range (from -0.05 to 5.0) of retrieved AOT, (3) updated aerosol models that account for the non-spherical shape of dust and are consistent with the ones used in the MODIS algorithm, (4) scene dependent land surface spectral reflectance relationship, and (5) refined quality control. The RR AOT algorithm can also be used with GOES-R ABI data to achieve a cross-platform consistency of NOAA satellite-based aerosol retrievals.

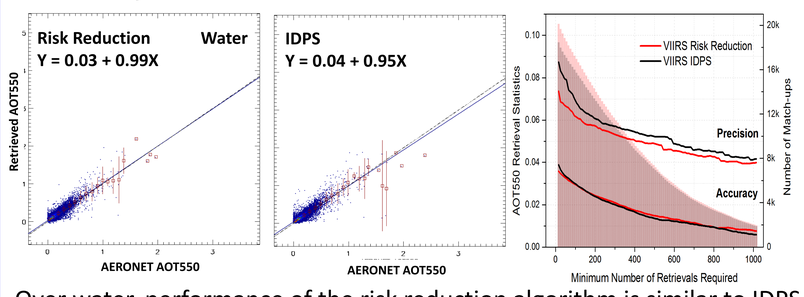
2. Validation against AERONET

Validation of the VIIRS risk reduction (RR) and current operational IDPS pixel-level high-quality aerosol retrieval against AERONET (V1.5) is performed for the periods of 01/24/2013 –12/31/2014 over land, and 11/27/2012-12/31/2014 over ocean (at least 100 retrievals within each match-up).



LAND	RR	IDPS
Accuracy	0.007	0.027
Precision	0.128	0.146
Number	47,047	36,980

Over land, risk reduction algorithm has higher accuracy and precision and more high-quality retrievals than IDPS. These statistics are a function of number of retrievals within the matching domain (20km-radius circle center on ground stations) , accuracy and precision improve along with the clear-sky dominance as more retrievals are available.



WATER	RR	IDPS
Accuracy	0.030	0.030
Precision	0.062	0.070
Number	17,119	15,868

Over water, performance of the risk reduction algorithm is similar to IDPS with slightly higher precision and more high-quality retrievals.

Acknowledgement

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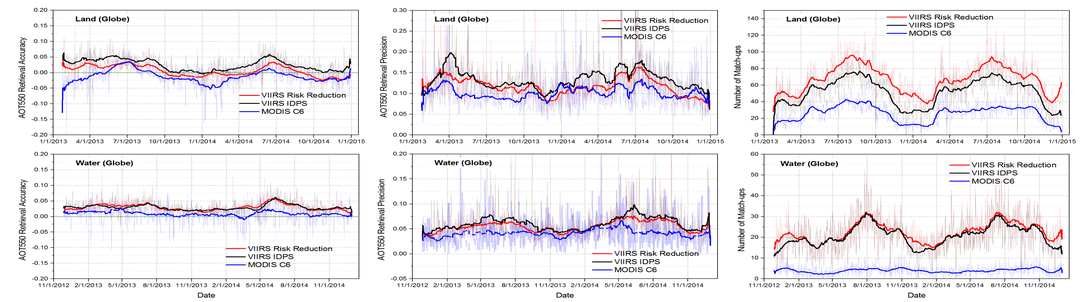
3. Comparison with MODIS Collection 6 Dark-Target Aerosol Retrievals

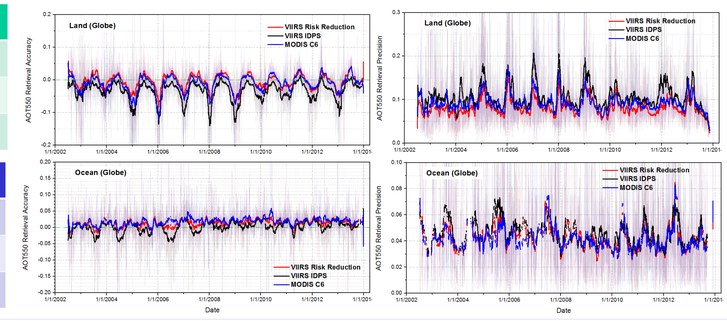
Time series (30-day moving mean) of daily statistics shows VIIRS RR retrieval is comparable with MODIS over land in terms of accuracy but has a higher positive bias over water. Note the significant difference in sampling (more match-ups from VIIRS).



To avoid sampling issue, VIIRS RR and IDPS algorithms (with updated lookup tables and coefficients for the MODIS channels) are applied to the MYD04 (C6) TOA reflectance for the period of 2002-2013 over AERONET match-ups. Performance of VIIRS Risk reduction algorithm is comparable to MODIS.

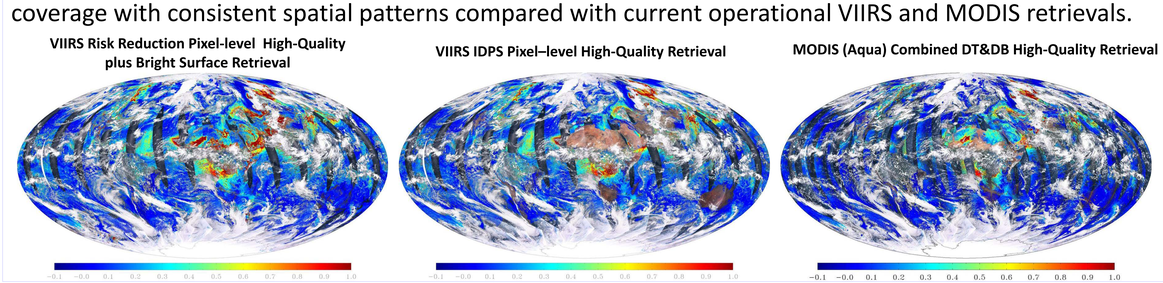
LAND	MODIS	RR	IDPS
Accuracy	-0.002	0.003	-0.024
Precision	0.100	0.091	0.116
Number	63,606	63,261	52,620

WATER	MODIS	RR	IDPS
Accuracy	0.019	0.014	0.004
Precision	0.059	0.059	0.060
Number	10,871	10,868	10,750



4. Global AOT Images

Images of global AOT550 (8/13/2013) show VIIRS risk reduction algorithm produces extended spatial coverage with consistent spatial patterns compared with current operational VIIRS and MODIS retrievals.



5. Conclusion

Evaluation of the risk reduction algorithm shows improvement compared with current IDPS VIIRS retrievals. There are more retrievals due to extended AOT range and updated spectral surface reflectance relationship. Applying the VIIRS RR algorithm to MODIS data shows comparable performance.