Cross-evaluation of the MODIS aerosol optical properties along the northeastern United States coastal region

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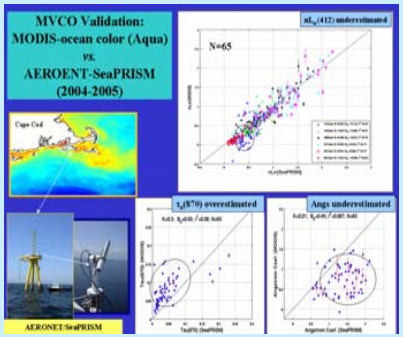
1. Review of satellite aerosol and ocean color product validation over ocean



References.	Validation details	Satellite product Resolution	Validation Resolution	Results
Global validation				
Remer et al. 2005	MODIS-Atmos τ_a@470-870nm vs. AEROENT	10x10 km^2	50km^2 (±30min)	• Excellent agreement
Wang et al, 2005	SeaWiFS:τ_a@443-865nm vs. multi *in-situ*	1 x 1 km^2	5 km^2 (±3h)	• Slight overestimate of τ_a(865)
Myhe et al., 2005	AVHRR/SeaWiFS, MISR MODIS-Atmos: τ_a@550nm vs. AERONET	Mission-dependent multi scales	1 deg^2 (monthly)	• Significant discrepancy among different satellite retrievals
Site/regional validation				
Melin et al, 2003	SeaWiFS: τ_a@443-865nm at AAOT in the N. Adriatic Sea	1km^2	3km^2 (±1h)	• Very good on AOT
Levy et al., 2003	MODIS-Atmos: CLAMS project	10km^2	50km^2 (±30min)	• Good agreement
Feng et al., 2006	MODIS-OC vs. SeaPRISM at MVCO	1km^2	2x3km^2 (±1h)	• Significant overestimate of τ_a(870nm)

2.1. MVCO MODIS validation summary

- #1: MODIS-OC nLw @488, 531, and 551nm performs well.
- #2 MODIS-OC τ_a(870) is overestimated and MODIS-OC α(531) is underestimated
- #3 MODIS-OC nL_w(412) is underestimated significantly MODIS-OC nLw(443) is underestimated somewhat

2.2. Motivations and objectives

A) Does #2 always happen along the US northeastern coast ? this is the objective for this poster work

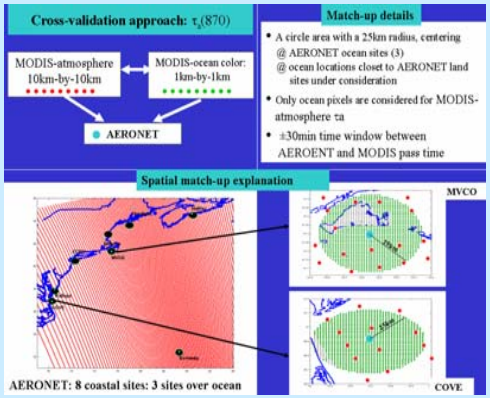
B) Is there a linkage between #2 and #3 ? Are #2 and #3 from a same root cause?

C) How /why, and any work-around solution ?

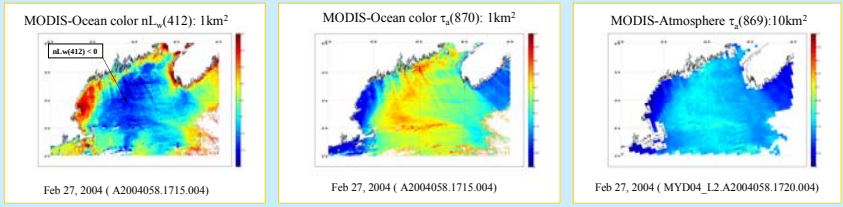
3. Validation Approach

MODIS-Aqua and in-situ aerosol data

	MODIS-OC (Ocean Color team algorithm)	MODIS-Atmos (Atmosphere team algorithm)	AERONET (in-situ)
Measure-ments	1km x 1km	250mx250m & 500m x 500m	Ground-Point
Retrievals	1km x 1km	10km x10km	
Spectral channels for aerosol optical thickness $\tau_a(\lambda)$	412, 443, 488, 531, 551, 667, 748, 869nm	470, 550, 660, 870, 1243, 1610 2130 nm	340, 380, 440, 500, 550, 670, 870, 1020, 1650 nm
Processing version	Reprocessing v1.1	Collection 04 MYD04	Level 2
Period	2004-2005		

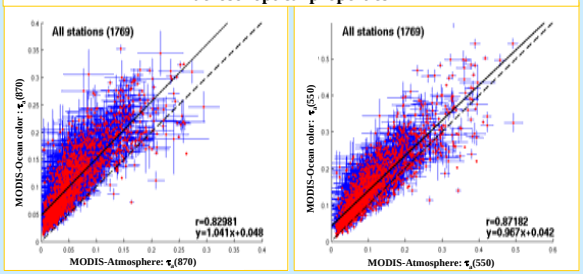


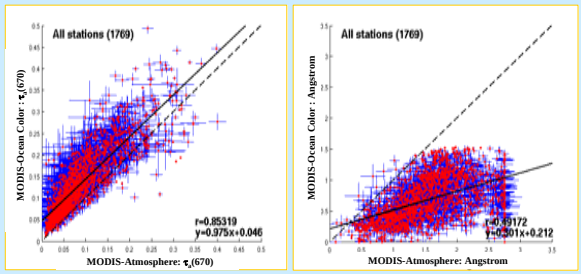
An example : A MODIS cross-algorithm comparison in the Gulf of Maine region



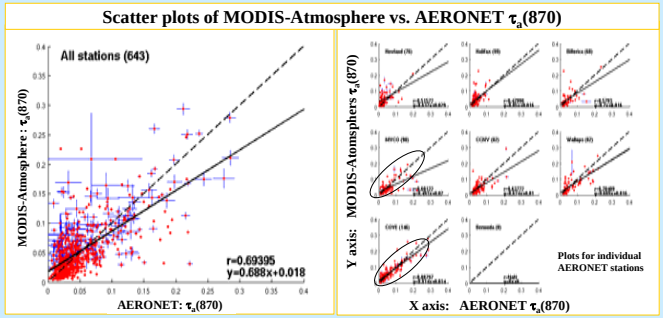
4. Results

Scatter plots of MODIS-Ocean Color vs. MODIS-Atmosphere for aerosol optical properties

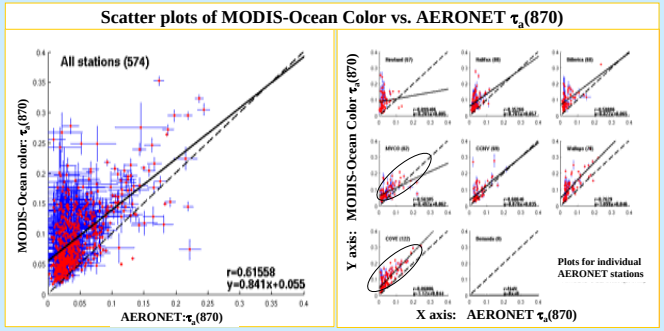




Scatter plots of MODIS-Atmosphere vs. AERONET τ_a(870)



Scatter plots of MODIS-Ocean Color vs. AERONET τ_a(870)



5. Summary

- **MODIS-Ocean Color vs. MODIS-Atmosphere: τ_a**
  - MODIS-OC τ_a(870) are highly correlated with MODIS-Atmos. (r>0.8)
  - MODIS-OC τ_a(870) is systematically overestimated against MODIS-Atmos.(+0.05)
  - Similar statistics of τ_a comparisons is observed at 550 and 670nm
  - MODIS-OC Angstrom coefficient is systematically underestimated against MODIS-Atmosphere's
- **MODIS-Ocean Color and MODIS-Atmosphere vs. AERONET: τ_a**
  - For MODIS-Atmos. τ_a(870), there is lower bias and moderate correlation (~0.68):
  - For MODIS-OC τ_a(870), there appear systematical positive bias (0.045 or higher) with moderate correlations
  - High correlations appears at the oceanic AERONET sites (COVE, MVCO); Low correlations appear at the land AERONET sites, possibly attributed to the fact that oceanic locations under consideration are far from AERONET sites

References

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Acknowledgements

This work was supported partially by a NASA MODIS Instrument Team Contract (NNG04HZ37C , J. Campbell, P.I.) and by the UNH/NOAA Center for Coastal Ocean Observation and Analysis (NA16OC2740, Coastal Carbon Time Series Project, Doug Vandemark, P.I.). We also thank AERONET site PIs and personnel for contributing to the aerosol database.

MODIS Science Team Meeting, Adelphi, Maryland, October 31-November 02, 2006