

Near-real Time Validation of ABI Aerosol Products

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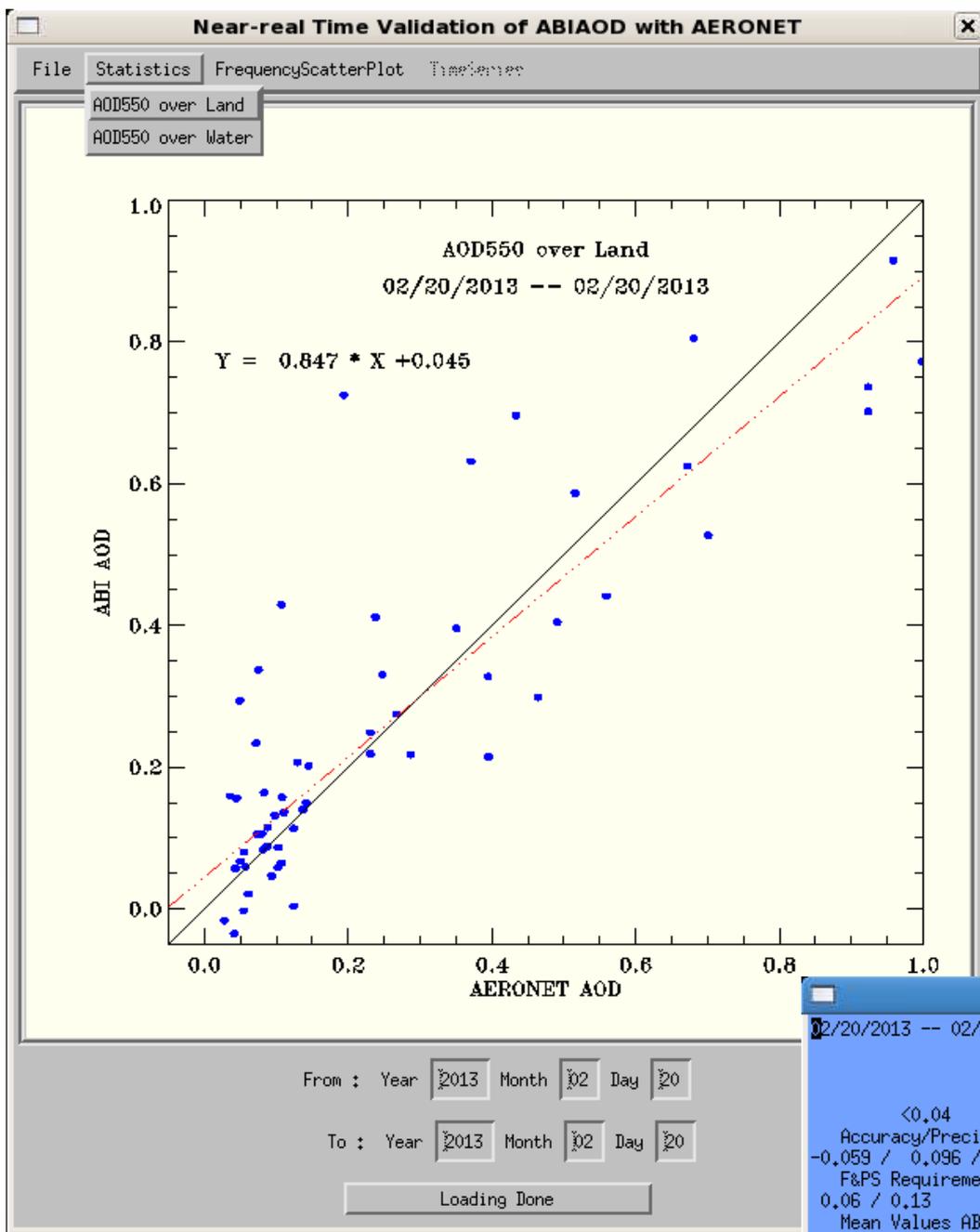
Introduction

- Aerosol optical depth (AOD) from the GOES-R series of NOAA geostationary meteorological satellites
 - has many important real-time applications , that
 - requires monitoring of data quality (validation) in a timely manner.
 - A near-real time validation system was developed for this purpose.
- The Aerosol Robotic Network (AERONET) provides the “ground truth” for satellite product validation
 - level 2.0 data: widely used, but the time lag can be several months or longer;
 - level 1.5 data: automatically cloud-cleared, time lag of one or two days, has the potential for near-real time validation.

Q: Is AERONET level 1.5 good enough for AOD validation?

Near-real Time Validation System

- Run the ABI aerosol algorithm with near-real time MODIS reflectance as proxy;
- Collect and co-locate ABI and AERONET level 1.5 AODs;
 - download and process the daily AERONET level 1.5 data
 - match AERONET (within 1-hour window) and ABI (50x50-km box) AODs temporally and spatially
- Apply the validation interface for analysis and visualization.
 - routinely generate daily scatter-plot and statistics
 - capability developed for users to perform analysis
 - to compute statistics for specified time period
 - to generate scatter-plot/frequency scatter-plot with linear regression for specified time period
 - to generate time series for specified time period and AERONET station



Results

- As of 02/26/2013, AERONET level 1.5 and MODIS Terra data are available until 02/25/2013, but MODIS Aqua are only until 02/20/2013.
- Example results for day 02/20/2013 over land are shown on the left.
- Users can specify validation period.
- The “Statistics” pull-down menu allows users to generate the scatter-plot and the metrics to characterize the AOD product accuracy and precision.

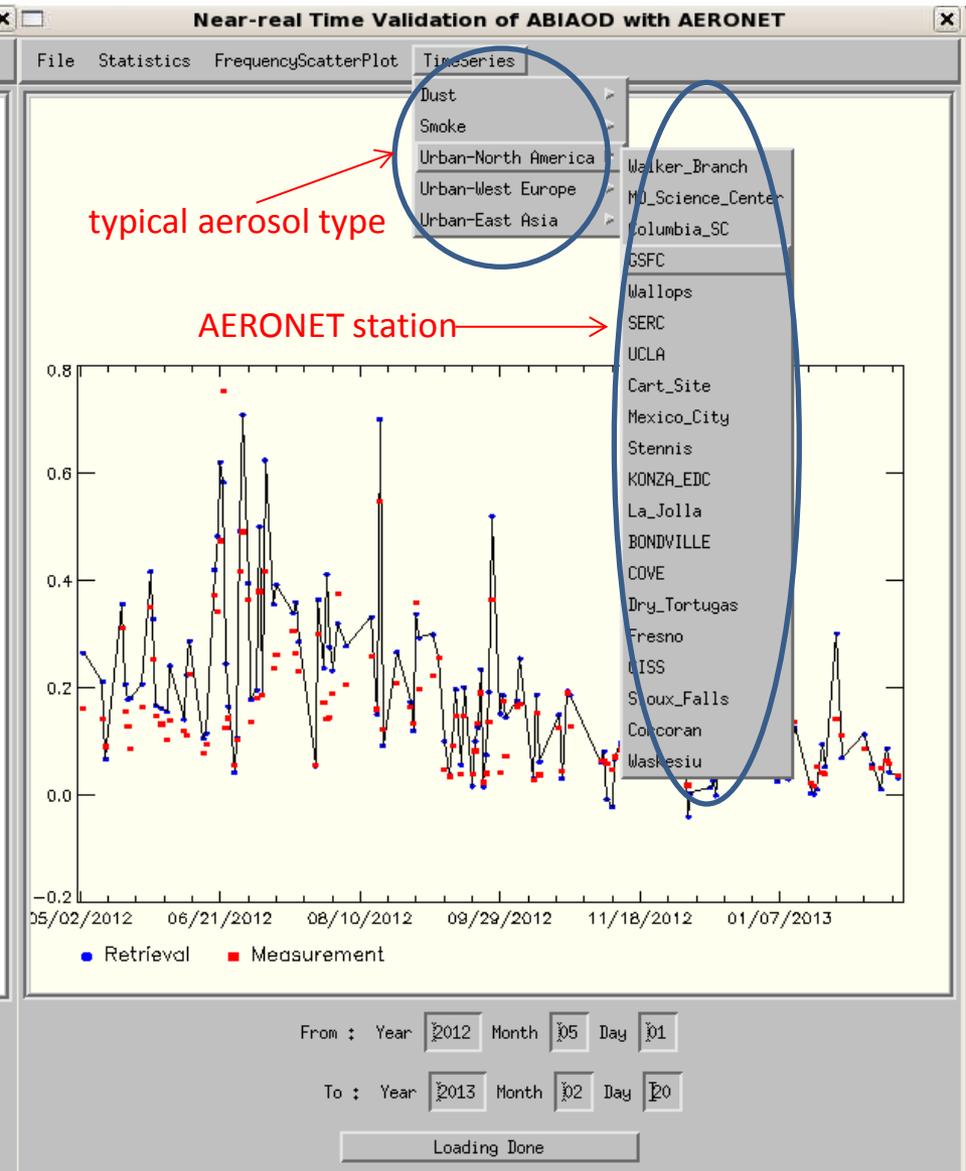
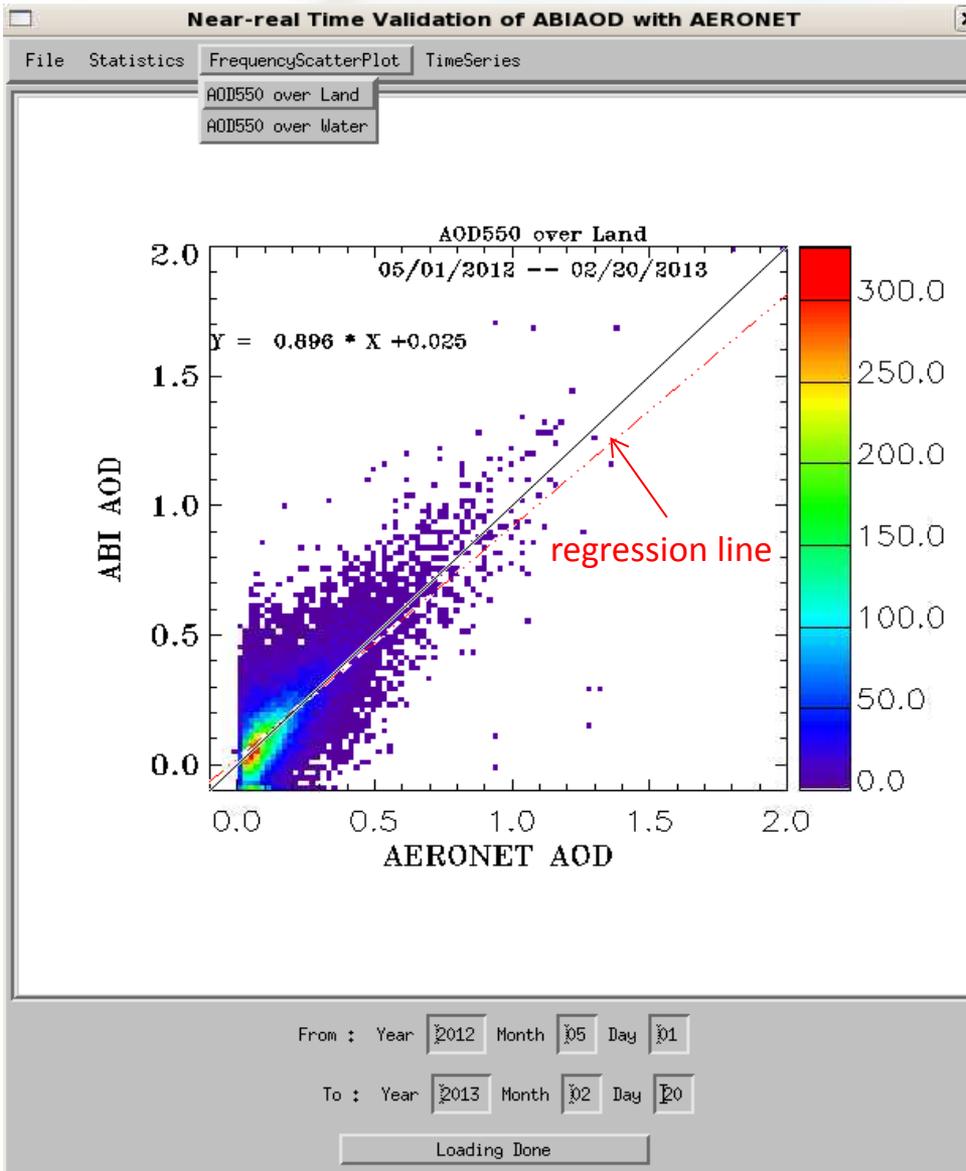
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02/20/2013 -- 02/20/2013

	Land [0.04,0.8]	>0.8
Accuracy/Precision/# of matchups	0.031 / 0.134 / 52	-0.168 / 0.086 / 4
F&PS Requirement	0.04 / 0.25	0.12 / 0.35
Mean Values ABI /AERONET	0.233 / 0.203	0.783 / 0.951
	<0.04	
	-0.059 / 0.096 / 6	
	0.06 / 0.13	
	-0.033 / 0.026	

Frequency Scatter-plot Menu

Time Series Menu



Example of frequency scatter-plot

Example of time series plot

AERONET Level 1.5 vs. Level 2.0

Validating ABI AODs for year 2010

level 1.5

Range	Land				Ocean			
	AOD	Accuracy	Precision	# of points	AOD	Accuracy	Precision	# of points
Low	<0.04	0.05	0.14	4,942	<0.4	0.01	0.07	6,616
Medium	0.04 - 0.8	0.02	0.14	25,827				
High	> 0.8	-0.23	0.70	819	>0.4	-0.06	0.19	453

level 2.0

Range	Land				Ocean			
	AOD	Accuracy	Precision	# of points	AOD	Accuracy	Precision	# of points
Low	<0.04	0.06	0.14	4,552	<0.4	0.02	0.06	5,842
Medium	0.04 - 0.8	0.03	0.14	22,372				
High	> 0.8	-0.05	0.32	658	>0.4	-0.04	0.16	399

Note the large differences between L1.5 and L2.0 statistics

Is AERONET level 1.5 good enough for AOD validation?

- Over land, statistics using AERONET L1.5 and L2.0 data are comparable for low and medium AOD ranges, which account for 98% land retrievals.
- Over ocean, the statistics are comparable for both low and high AOD ranges of ocean retrievals.
- The result suggests **the feasibility to set up a near-real time validation** of ABI aerosols using AERONET L1.5 data.
- At high AOD range over land, ABI AODs are noticeably lower compared to AERONET L1.5 AODs, which will need to be further validated when AERONET L2.0 data become available.

Possible Path to Operations

- Deliver to operation:
 - scripts and codes to process and co-locate the ABI and AERONET data
 - validation tool for statistical analysis and visualization, developed using Interactive Data Language (IDL)-based graphical user interfaces (GUI), providing users with the interface of manipulation
- Serving results – scenarios:
 - Make “standard” set of results and graphics available daily to users on Internet, and/or
 - Make data available daily to users and provide software (IDL codes) so users can perform analysis at their sites.

Future Plans

- Explore the use of the near-real time validation system to detect possible problems and to trigger deep-dive validation.