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Evaluation of VIIRS, GOCI, and MODIS Collection 6 AOD retrievals against ground sunphotometer observations over East Asia

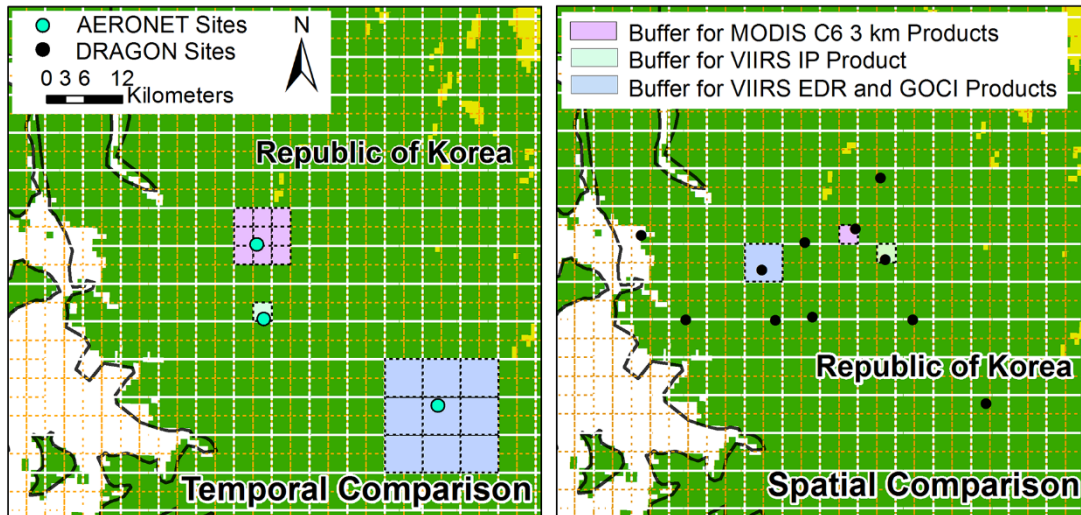
Q. Xiao et al.

Correspondence to: Y. Liu (yang.liu@emory.edu)

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1 Text S1.
2 The Microtop II handheld sunphotometer AOD measurements were compared against
3 AERONET measurements within 6 km of the handheld sunphotometer measuring
4 sites. The slope, intercept, and R^2 of the linear regression between Microtop II
5 measurements and average hourly AERONET measurements during the satellite
6 overpass time (1:00 pm-2:00 pm) were 0.95, 0.16, and 0.64, respectively (N=74).

1 Figure S1. Buffers used in the temporal and spatial comparisons for each satellite
2 aerosol product. The yellow dashed line denotes the 3 km grid and the white dashed
3 line denotes the 6 km grid. The temporal comparison figure (left) shows the 3 x 3 grid
4 cells buffer for MODIS (pink), VIIRS EDR and GOCI products (blue), as well as the
5 1 grid cell buffer for VIIRS IP product (green); the spatial comparison figure (right)
6 shows the 1 grid cell buffer for each sensor.



1 Table S1. Statistics of normality tests of residuals from linear regressions for temporal
 2 comparisons between satellite retrievals and ground AOD measurements at 550 nm
 3 over Japan-South Korea region.

Satellite	Original		Log-transformed	
	Skewness	Kolmogorov-Smirnov p-value	Skewness	Kolmogorov-Smirnov p-value
VIIRS EDR	0.72	<0.01	-0.43	<0.01
VIIRS IP	1.31	<0.01	0.10	<0.01
GOCI	0.81	<0.01	-2.40	<0.01
GOCI all obs.	0.63	<0.01	-1.75	<0.01
Aqua MODIS C6 3 km	1.85	<0.01	0.25	<0.01
Terra MODIS C6 3 km	1.24	<0.01	0.76	<0.01

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- 1 Table S2. Percent coverage of satellite aerosol products relative to AERONET stations
 2 in Beijing and over East Asia.

Product	% coverage in Beijing	% coverage over East Asia
VIIRS_EDR	41	63
VIIRS_IP	42	50
GOCI	73	74
GOCI all obs.	60	27
Aqua MODIS C6 3 km	38	24
Terra MODIS C6 3 km	40	26

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1 Table S3. Statistics of the temporal comparison between satellite retrievals and
 2 AERONET AOD at 550 nm over East Asia, including all the coincident satellite-
 3 ground AOD pairs.

	N	R ²	Slope	Intercept	Bias	%EE
VIIRS EDR	800	0.69	0.94	0.08	0.07	61
VIIRS IP	615	0.47	1.00	0.17	0.17	35
GOCI	442	0.77	1.03	0.03	0.04	54
GOCI all obs.	3524	0.80	1.01	0.01	0.01	60
MODIS Aqua C6	308	0.71	1.03	0.07	0.08	55
MODIS Terra C6	351	0.65	1.04	0.14	0.15	41

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1 Table S4. Statistics of comparisons between VIIRS IP retrievals with both high and
2 degraded quality against ground AOD measurements over the Japan-South Korea
3 region.

Ground Measurements	N	R ²	Slope	Intercept	Bias	%EE
AERONET	654	0.42	0.99	0.20	0.20	30
DRAGON	271	0.48	0.98	0.31	0.30	27

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- 1 Table S5. Statistics of the temporal comparison between GOCI retrievals and
- 2 AERONET AOD measurements over East Asia, stratified by time.

Local Time	N	R ²	Slope	Intercept	Bias	%EE
9:00	402	0.82	1.00	0.00	-0.002	68
10:00	342	0.82	1.05	0.01	0.024	69
11:00	307	0.80	1.02	0.02	0.031	64
12:00	286	0.78	0.98	0.04	0.029	62
13:00	317	0.80	1.02	0.04	0.045	61
14:00	328	0.83	1.03	0.02	0.033	64
15:00	317	0.88	1.06	-0.02	-0.004	72
16:00	248	0.87	0.97	-0.03	-0.043	68

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1 Table S6. Statistics of the temporal comparison between eight GOCI hourly retrievals
 2 with various quality against AERONET AOD measurements over the Japan-South
 3 Korea region.

Quality criteria	Coverage	N	R ²	Slope	Intercept	Bias	%EE
Quality Flag=3	27%	2547	0.82	1.02	0.01	0.02	66
Quality Flag=2,3	38%	3677	0.74	1.02	0.02	0.03	59
Quality Flag=1,2,3	42%	4058	0.71	1.01	0.04	0.04	57
Quality Flag=0,1,2,3	51%	4923	0.54	0.93	0.11	0.08	48

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1 Table S7. Statistics of the temporal comparisons between satellite retrievals and ground
 2 AOD measurements at 550 nm over Japan-South Korea region, with and without log-
 3 transformation.

	Original			Log-transformed			
	N	R ²	Slope	Intercept	R ²	Slope	Intercept
VIIRS EDR	600	0.74	0.96	0.06	0.60	0.77	-0.07
VIIRS IP	424	0.55	1.03	0.14	0.50	0.69	-0.01
GOCI	317	0.80	1.02	0.04	0.66	0.91	-0.01
GOCI all obs.	2547	0.82	1.02	0.01	0.66	1.00	-0.01
Aqua MODIS C6 3 km	179	0.71	1.00	0.08	0.68	0.90	0.03
Terra MODIS C6 3 km	197	0.70	1.06	0.14	0.60	0.74	0.03

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