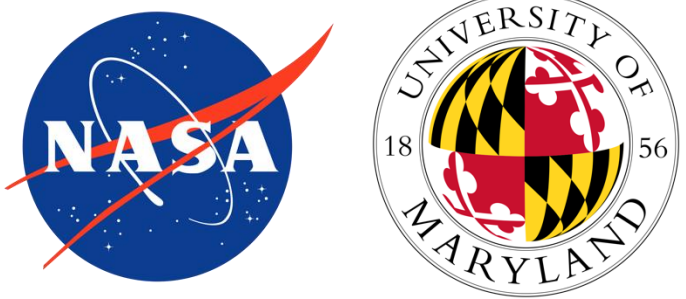# Introduction of GEO-LEO merged Deep Blue Product

W. Vincent Kim[1,2], Jaehwa Lee[1,2], N. Christina Hsu[1], Andrew M. Sayer[1,3], Paolo Veglio[4], Seoyoung Lee[1,3]

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Overview

- With the increased number of sensors and data volume, Deep Blue is preparing multi-sensor products that merge data from both GEO and low earth orbit (LEO) sensors to provide users with a more convenient and comprehensive dataset for aerosol research.

- This presentation introduces multi-sensor (including both GEO and LEO sensors) merged DB products.

New DB products

Product	Sensor	Resolution	Data Period
GEO L2	G16, G17, H08	10km x 10km / 30 min	May 2019 – Apr 2020
GEO L3	G16, G17, H08	1° x 1°/ 30 min, daily, monthly	May 2019 – Apr 2020
Merged L2G	All DB sensors and Merged DB	0.25° x 0.25°/ 30 min	May 2019 – Apr 2020
Merged L3	All DB sensors and Merged DB	1° x 1°/ Daily, monthly	May 2019 – Apr 2020

*Version of Input DB products : SNPP VIIRS V2.0, NOAA20 VIIRS V2.0, MODIS Aqua C6.1, MODIS Terra C6.1, GOES16 ABI V1.0, GOES17 ABI V1.0, Himawari08 AHI V1.0

Error weighted average

- Multi-sensor DB merged products employ an error-weighted average.
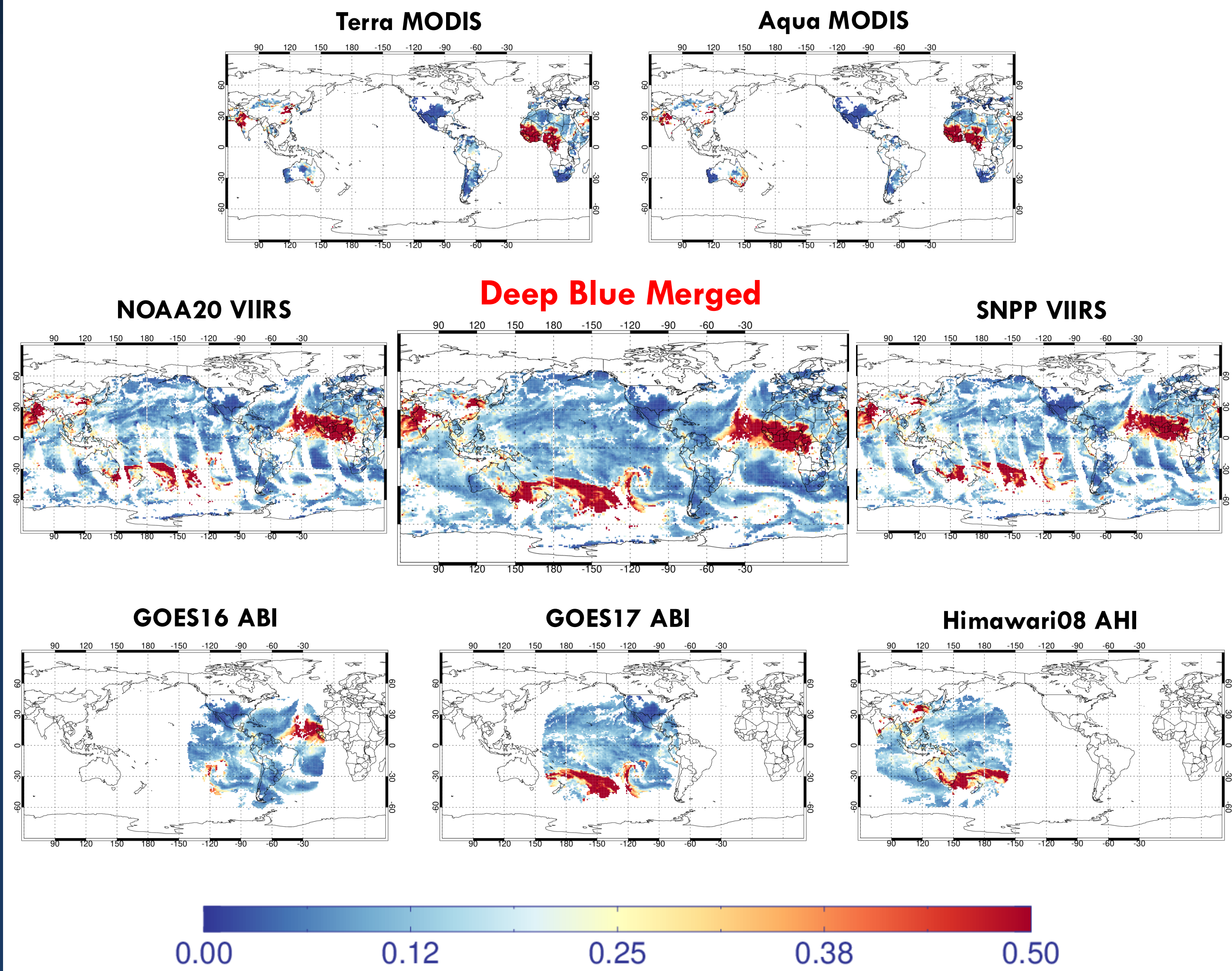
$$M_w = \frac{\sum_i w_i \tau_i}{\sum_i w_i}$$

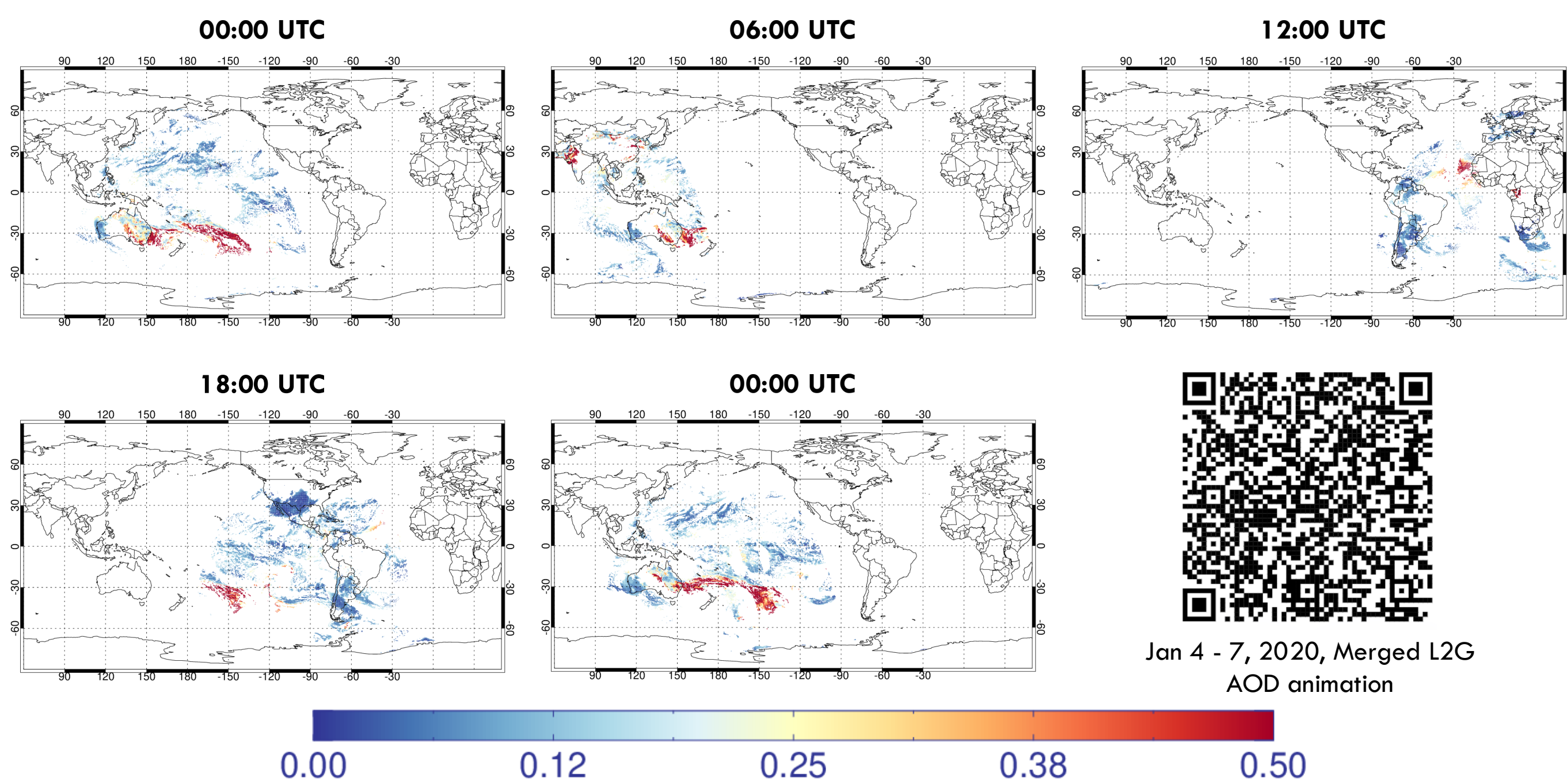w_i = inverse of estimated error
τ_i = gridded AOD

AERONET Validation

- AERONET Version 3 Level 2.0 was used in this study

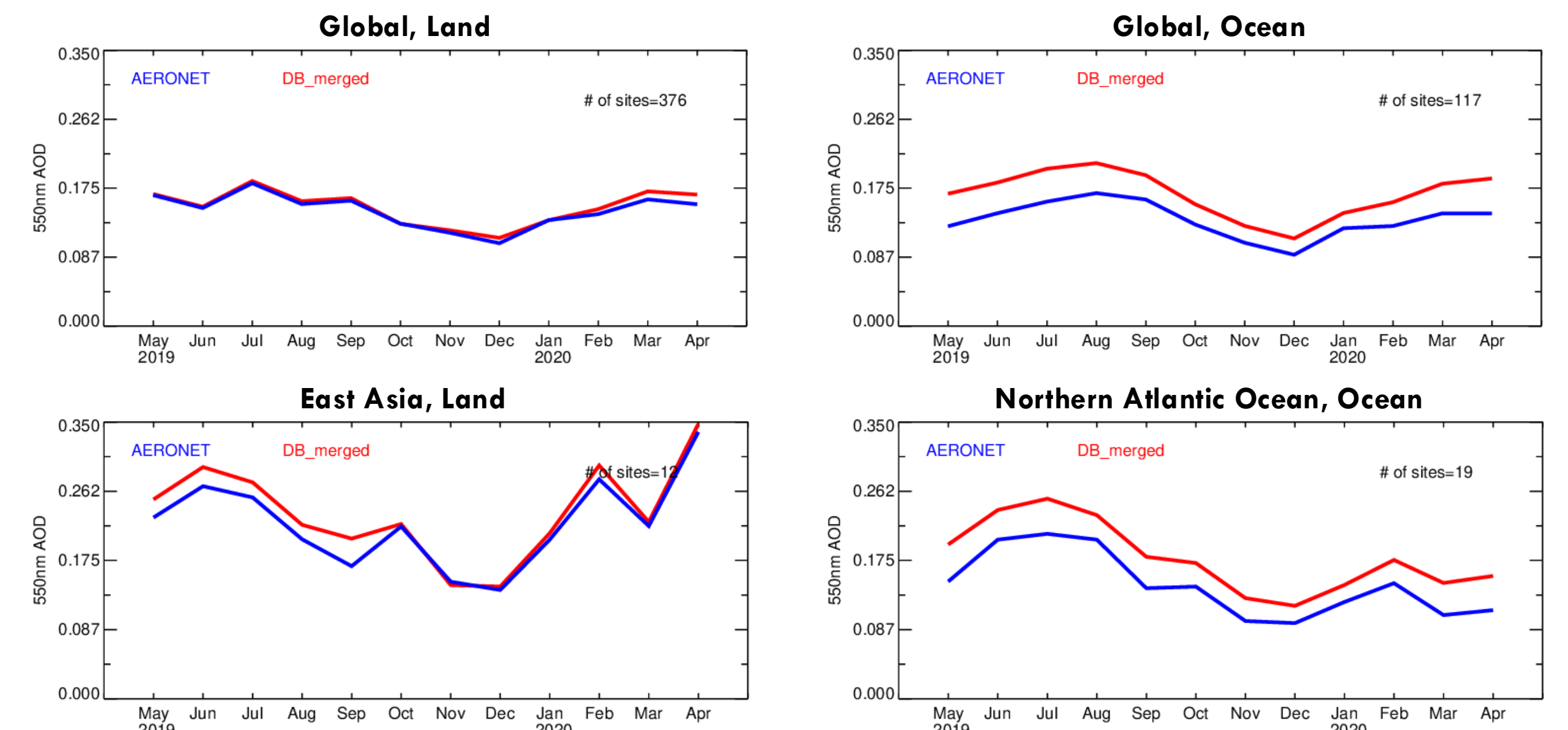- The nearest L2G pixel from AERONET sites was validated with AERONET data within ± 30 min window
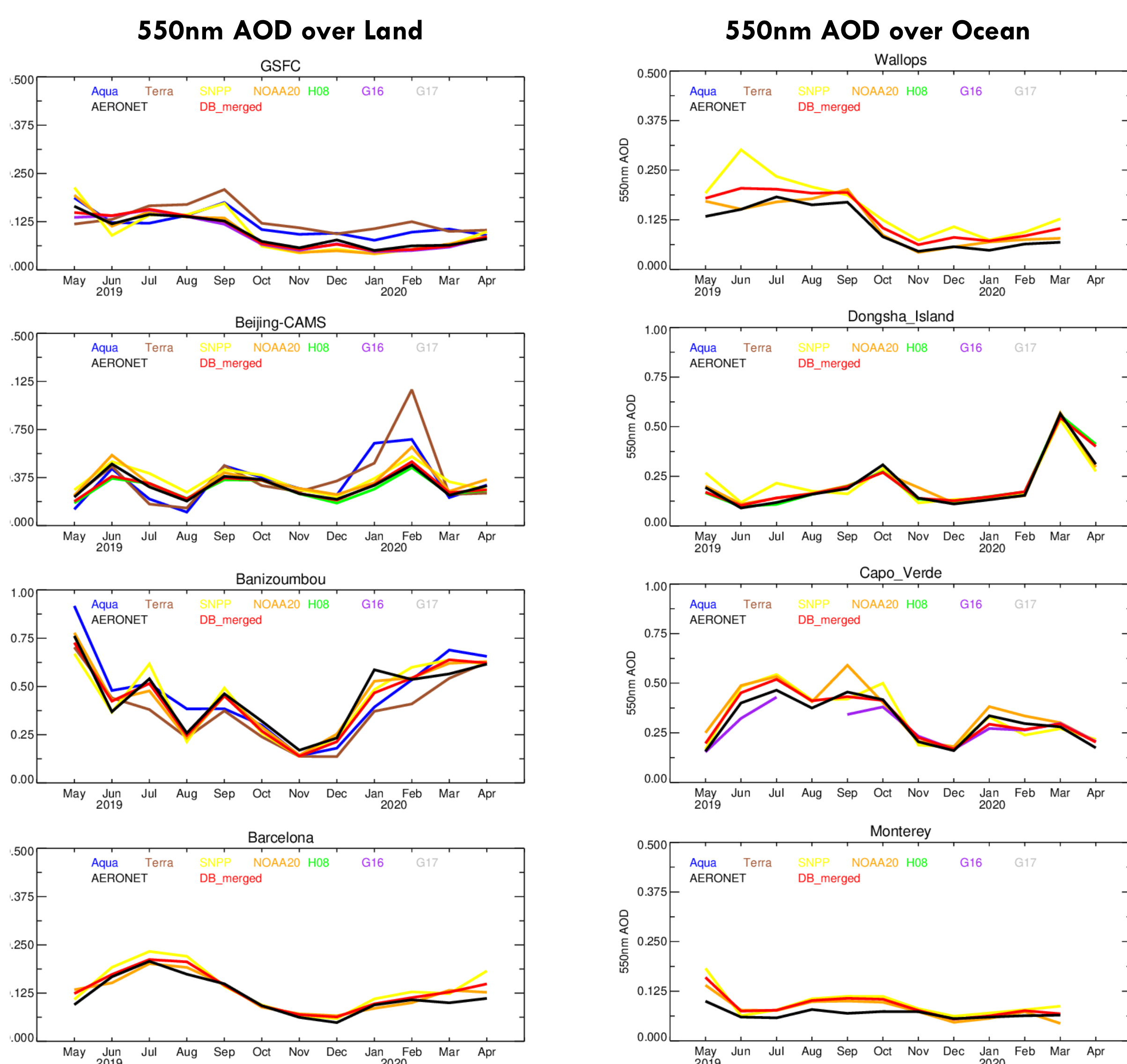
Coverage of DB products

Terra MODIS

Aqua MODIS

NOAA20 VIIRS

Deep Blue Merged

SNPP VIIRS

GOES16 ABI

GOES17 ABI

Himawari08 AHI

0.00   0.12   0.25   0.38   0.50

Diurnal Variation of Merged L2G AOD

00:00 UTC   06:00 UTC   12:00 UTC

18:00 UTC   00:00 UTC

Jan 4 - 7, 2020, Merged L2G AOD animation

0.00   0.12   0.25   0.38   0.50

Regional L2G Monthly Average

Global, Land — AERONET / DB_merged — # of sites=376

Global, Ocean — AERONET / DB_merged — # of sites=117

East Asia, Land — AERONET / DB_merged

Northern Atlantic Ocean, Ocean — AERONET / DB_merged — # of sites=19

Monthly Averaged L2G over AERONET sites

550nm AOD over Land

GSFC

Beijing-CAMS

Banizoumbou

Barcelona

(Aqua, Terra, SNPP, NOAA20, H08, G16, G17, AERONET, DB_merged)

550nm AOD over Ocean

Wallops

Dongsha_Island

Capo_Verde

Monterey

(Aqua, Terra, SNPP, NOAA20, H08, G16, G17, AERONET, DB_merged)

L2G Validation against AERONET

550nm AOD over Land

Global, allseasons
n=195044, R=0.927, Bias=0.00196, RMS=0.0665, %eq=88.3%

EUR, allseasons
n=12960, R=0.806, Bias=0.00377, RMS=0.0569, %eq=65.0%

ENA, allseasons
n=25315, R=0.916, Bias=0.00782, RMS=0.0438, %eq=95.5%

NEA, allseasons
n=7457, R=0.925, Bias=0.00418, RMS=0.0878, %eq=85.0%

IND, allseasons
n=1770, R=0.870, Bias=0.0173, RMS=0.167, %eq=66.4%

SAM, allseasons
n=8645, R=0.955, Bias=0.00717, RMS=0.0605, %eq=88.2%

550nm AOD over Ocean

Global, allseasons
n=28342, R=0.926, Bias=0.0256, RMS=0.0623, %eq=64.9%

EUR, allseasons
n=3463, R=0.905, Bias=0.0254, RMS=0.0551, %eq=65.3%

ENA, allseasons
n=1126, R=0.961, Bias=0.0306, RMS=0.0785, %eq=58.3%

NEA, allseasons
n=4099, R=0.941, Bias=0.0279, RMS=0.0624, %eq=60.0%

S_Pac_O, allseasons
n=1858, R=0.811, Bias=0.0200, RMS=0.0413, %eq=73.7%