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Supplement of

Aerosol single-scattering albedo derived by merging OMI/POLDER satellite products and AERONET ground observations

Yueming Dong et al.

Correspondence to: Jing Li (jing-li@pku.edu.cn)

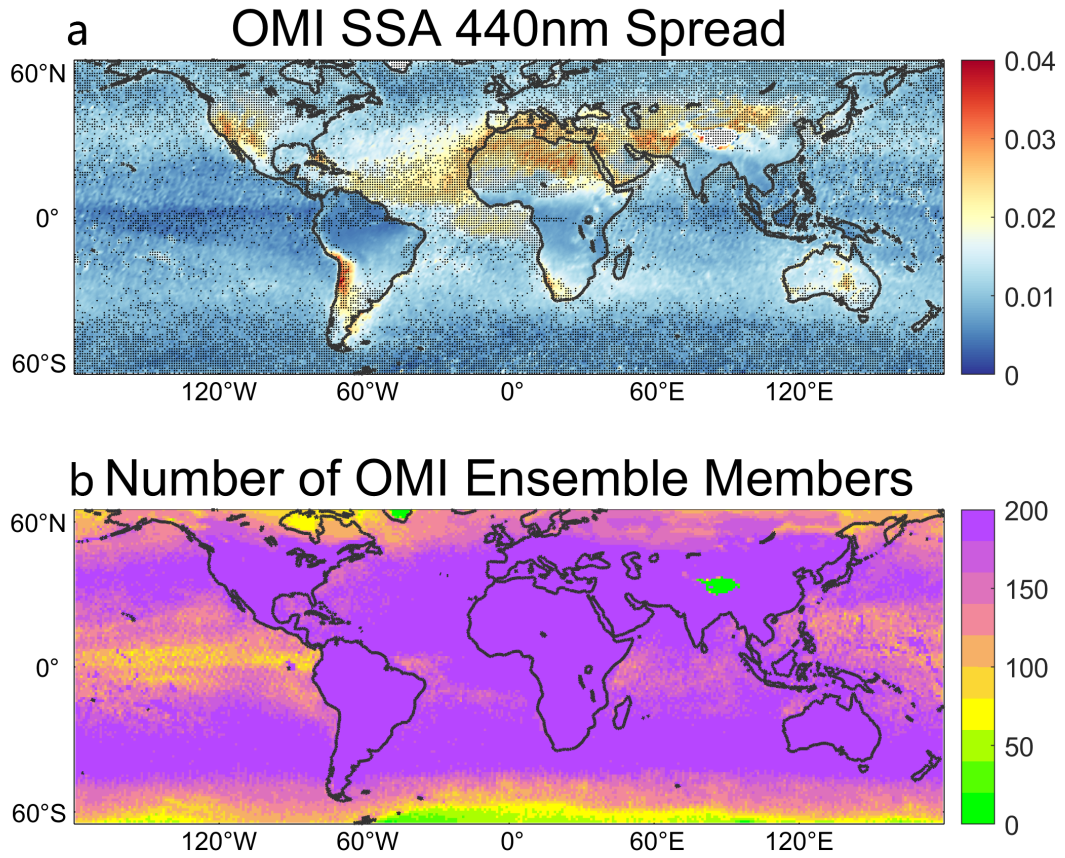

Figure S1. a) Spread of the global OMI-based ensemble (calculated as the standard deviation of the samples at each grid box), b) number of the ensemble members at each grid box. Area with black dots in a) represents that the samples at these grid boxes pass the Kolmogorov-Smirnov test for normal distribution at 95% significance level. Note that only the grid boxes with no less than 30 ensemble members are used in the EnKF data synergy.

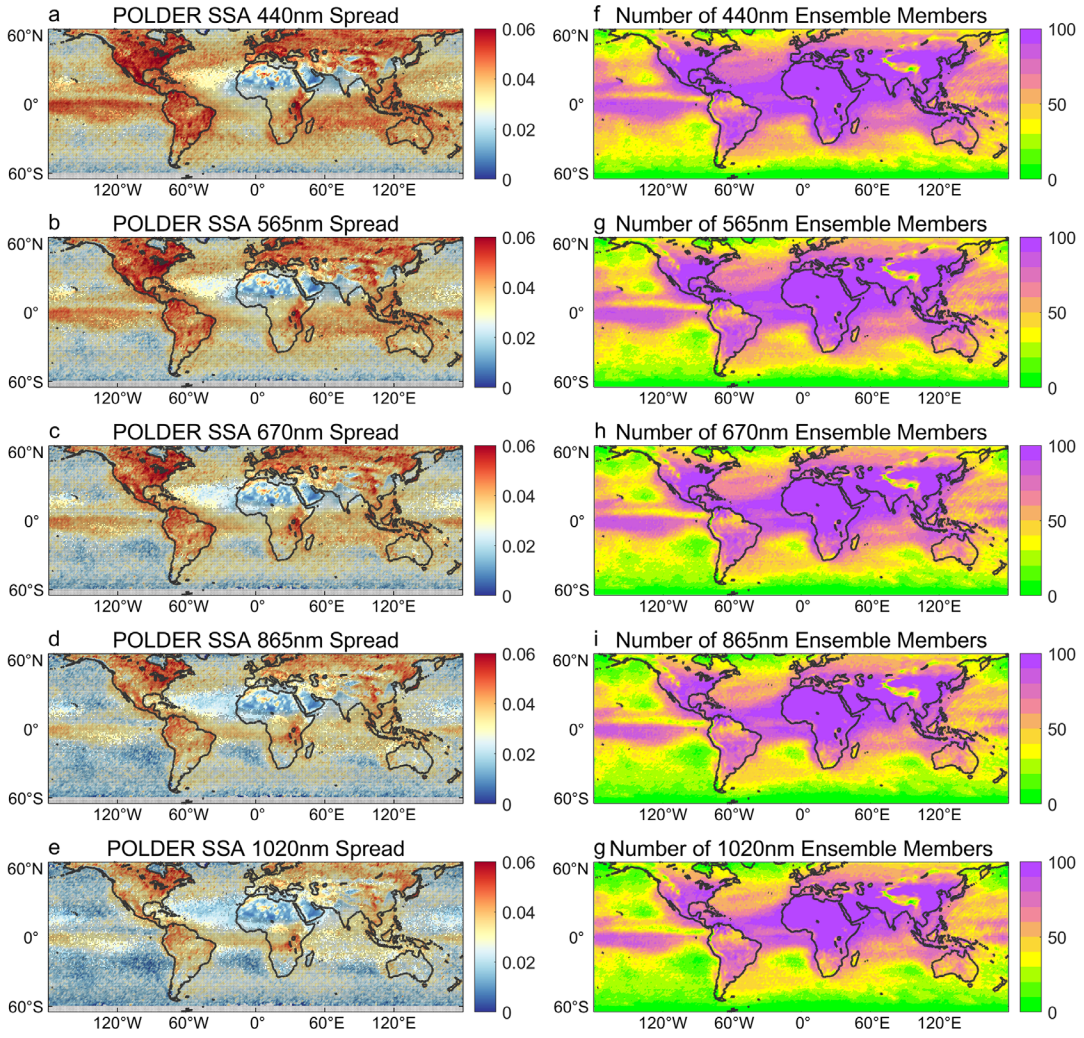

Figure S2. The same figure as Figure S1, but for the global POLDER-based ensemble.

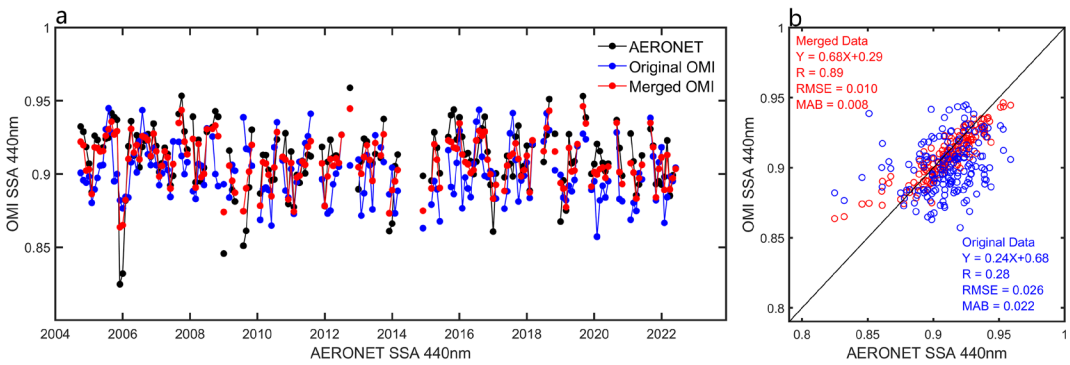

Figure S3. The same figure as Figure 1, but for OMI SSA at 440 nm.

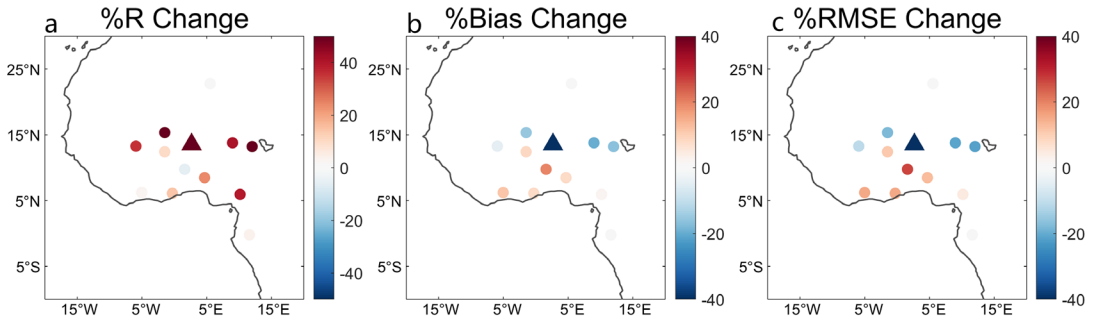

Figure S4. The same figure as Figure 2, but for OMI SSA at 440 nm relative to AERONET sites in the Sahel.

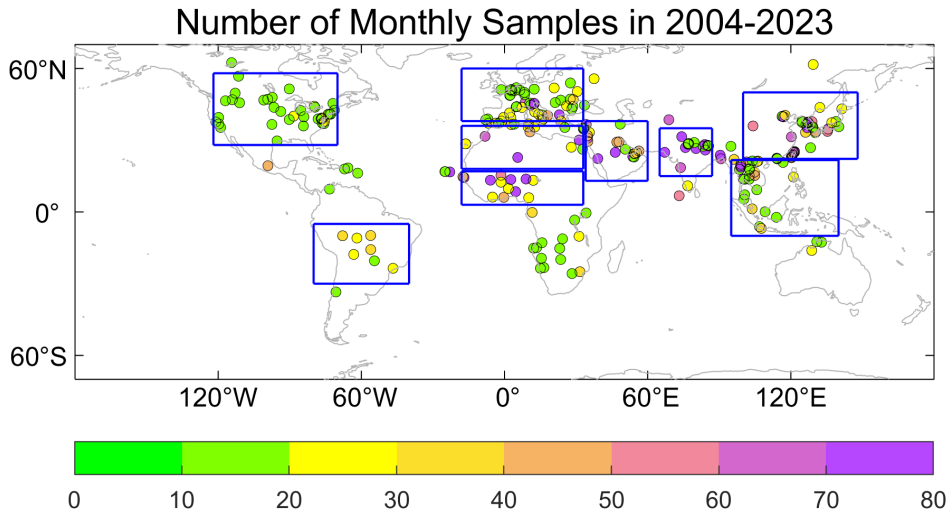

Figure S5. Number of the monthly mean AERONET SSA samples at each station during OMI period in 2004~2023. The map marks all the sites used for the Merged-OMI dataset but only sites with more than 20 samples are used for two CV schemes. The blue rectangles show the nine regions with more than three effective sites used in the CV.

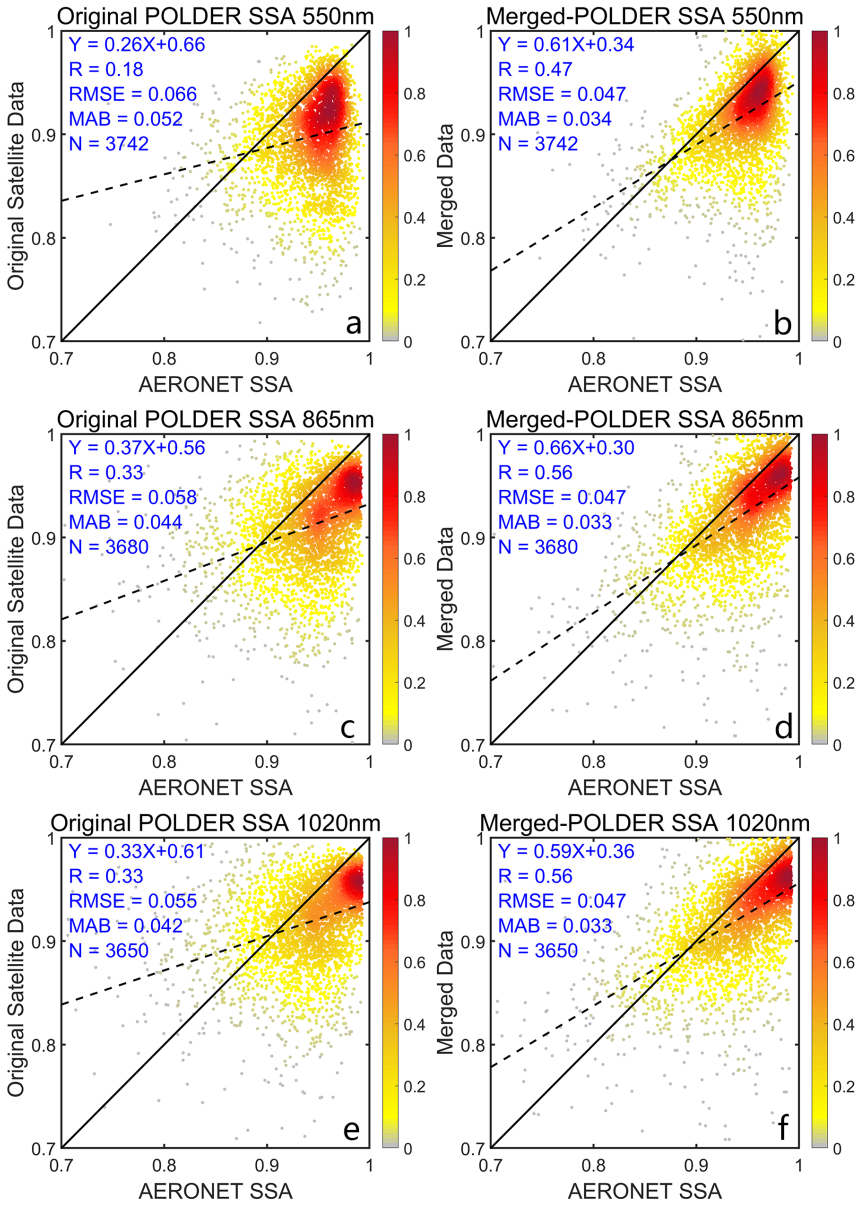

Figure S6. The same figure as Figure 9 but for the original and the merged SSA based on POLDER at 550, 865, and 1020 nm.

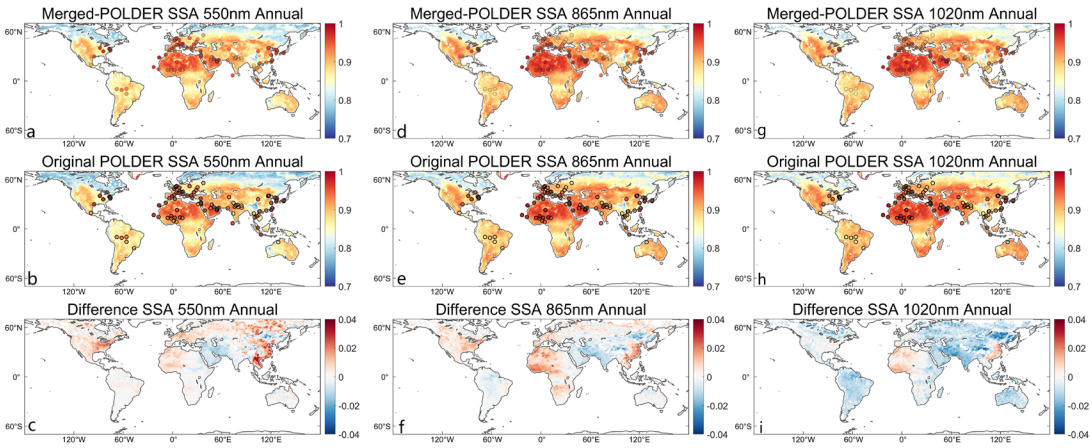

Figure S7. The same figure as Figure 10 but for the original and the merged SSA based on POLDER at 550, 865, and 1020 nm.

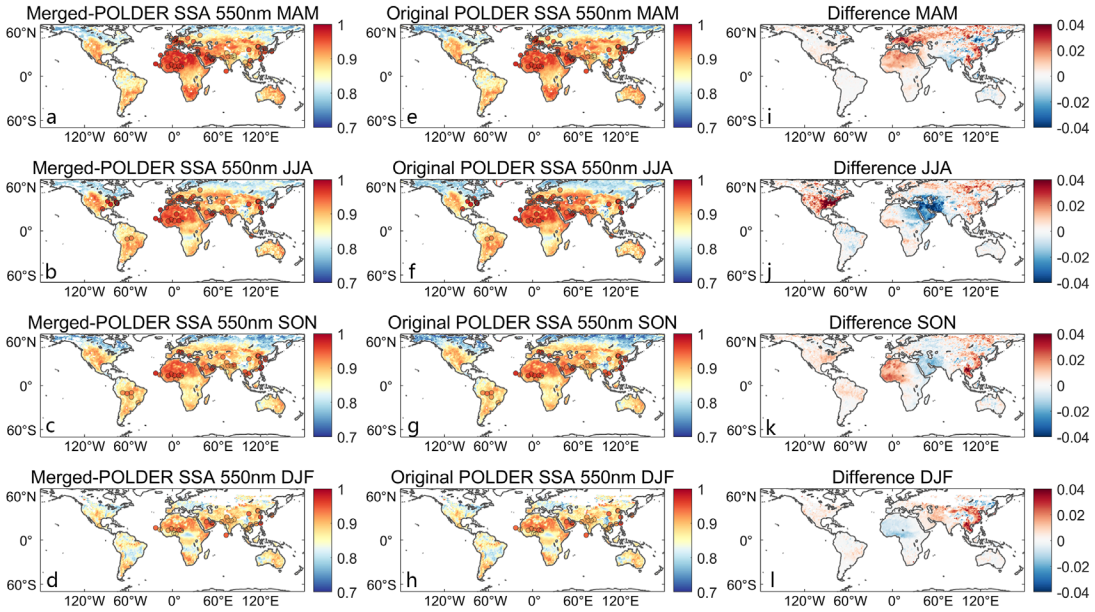

Figure S8. The same figure as Figure 11, but for the original and the merged SSA based on POLDER at 550 nm.

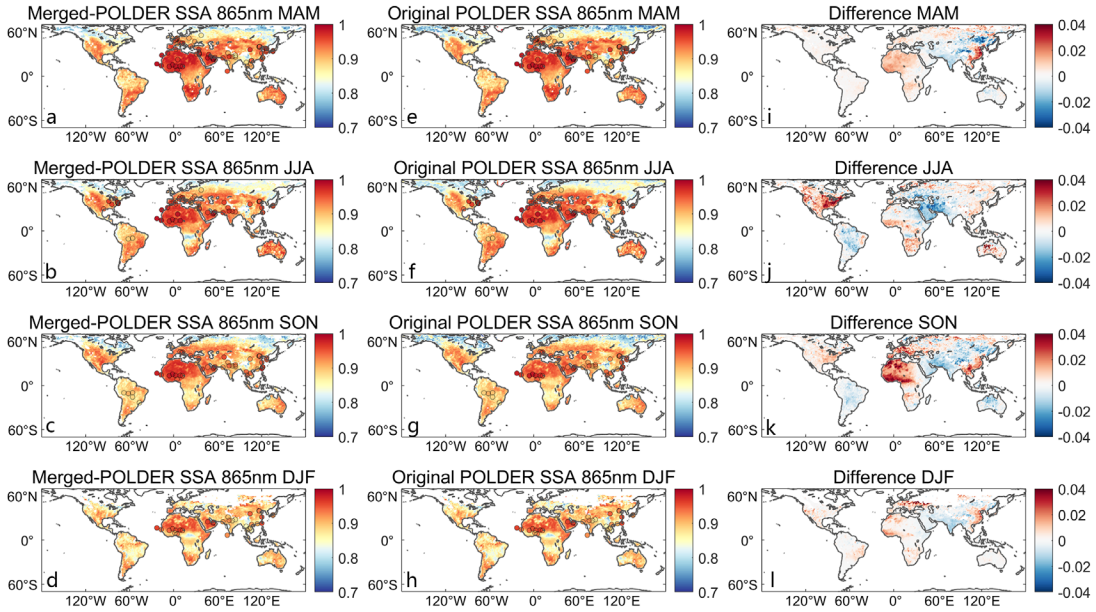

Figure S9. The same figure as Figure 11, but for the original and the merged SSA based on POLDER at 865 nm.

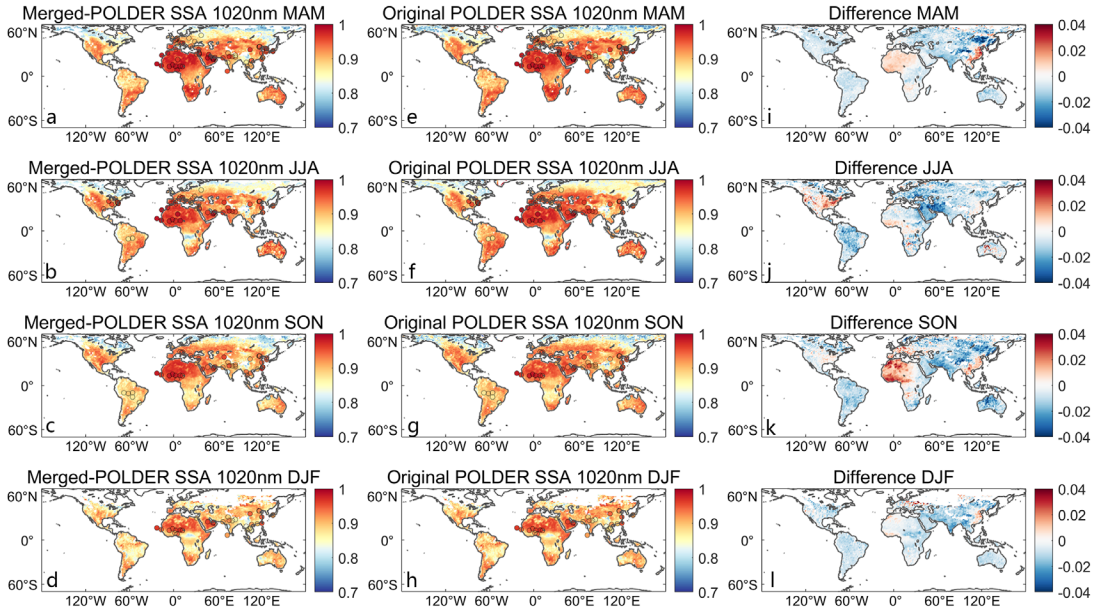

Figure S10. The same figure as Figure 11, but for the original and the merged SSA based on POLDER at 1020 nm.

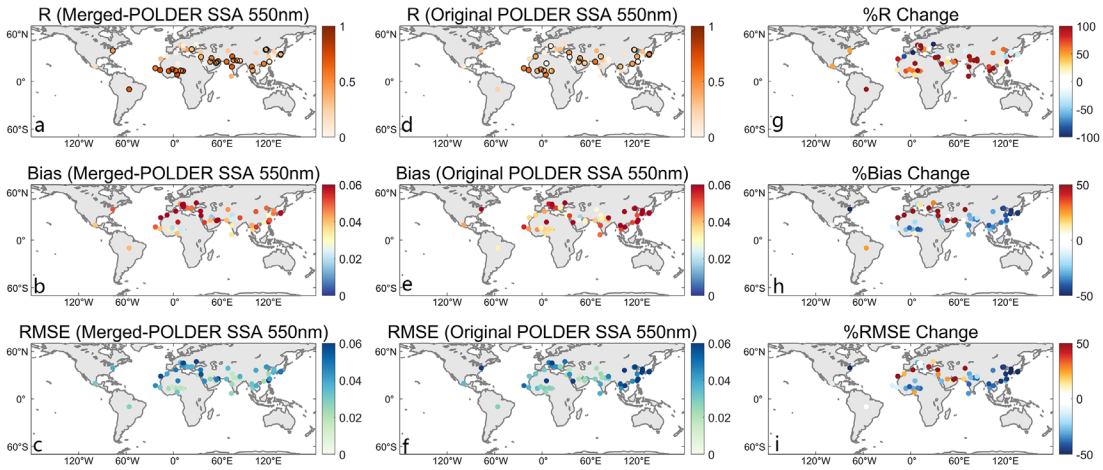

Figure S11. The same figure as Figure 13, but for the original and the merged SSA based on POLDER at 550 nm.

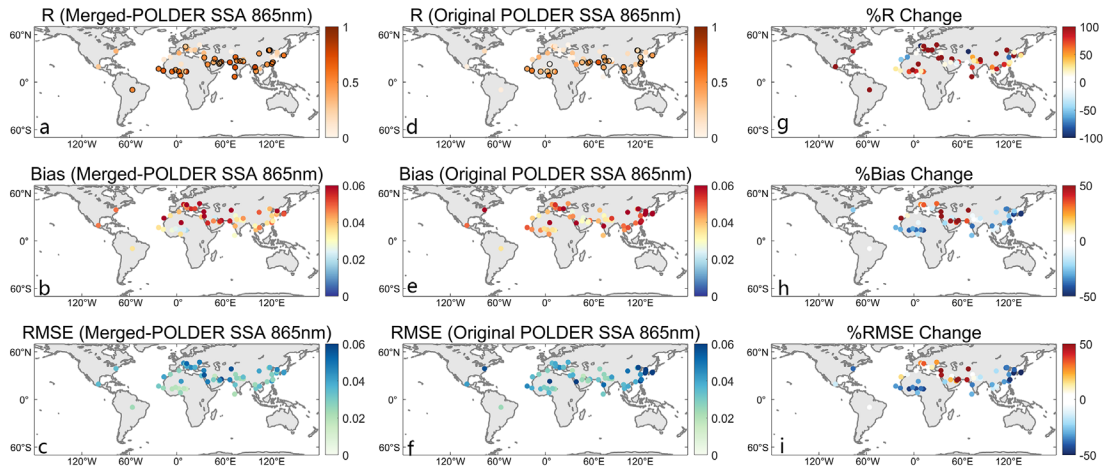

Figure S12. The same figure as Figure 13, but for the original and the merged SSA based on POLDER at 865 nm.

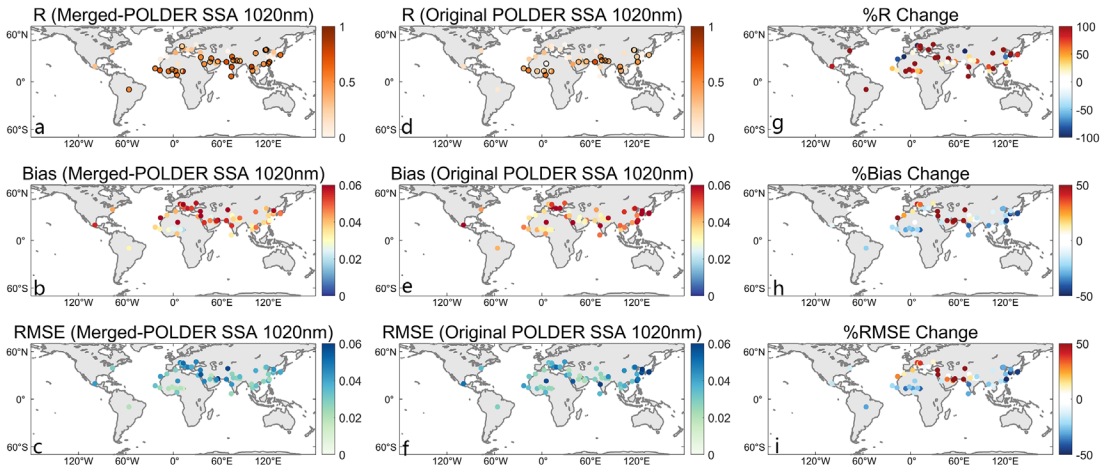

Figure S13. The same figure as Figure 13, but for the original and the merged SSA based on POLDER at 1020 nm.

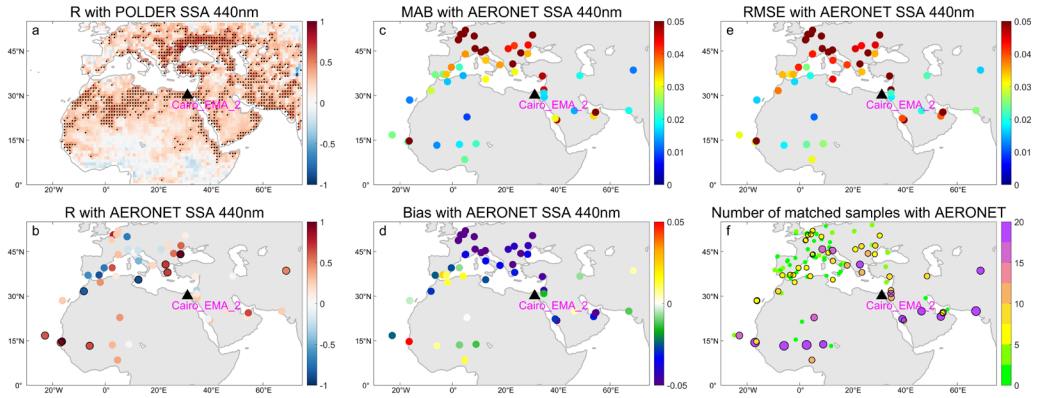

Figure S14. For Cairo_EMA_2 site, a) Correlation with POLDER SSA, b) MAB with nearby AERONET sites, c) RMSE with nearby AERONET sites, d) correlation with nearby AERONET sites, e) bias with nearby AERONET sites, and f) number of matched samples with nearby AERONET sites. Note that only the nearby sites with no less than 5 matched samples are used for b)~e). Black dots and circled marks in a) and d) indicate significance at the 95% confidence level.

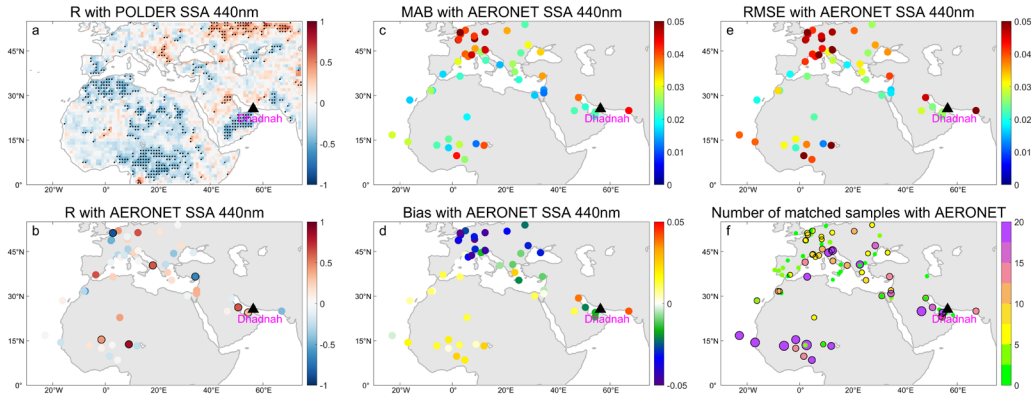

Figure S15. The same figure as Figure S14, but for Dhadnah site.

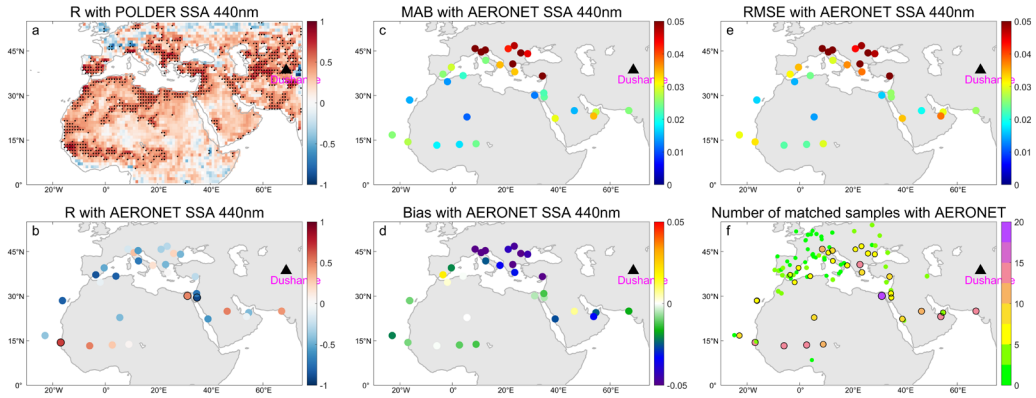

Figure S16. The same figure as Figure S14, but for Dushanbe site.

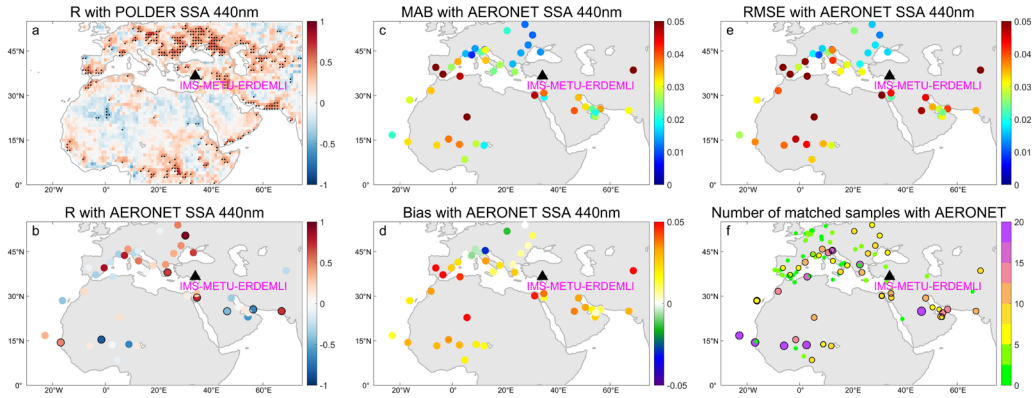

Figure S17. The same figure as Figure S14, but for IMS-METU-ERDEMLI site.

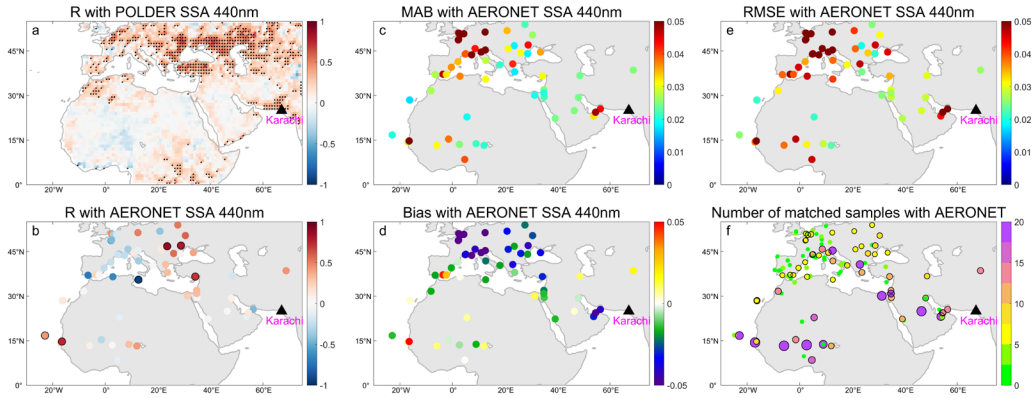

Figure S18. The same figure as Figure S14, but for Karachi site.

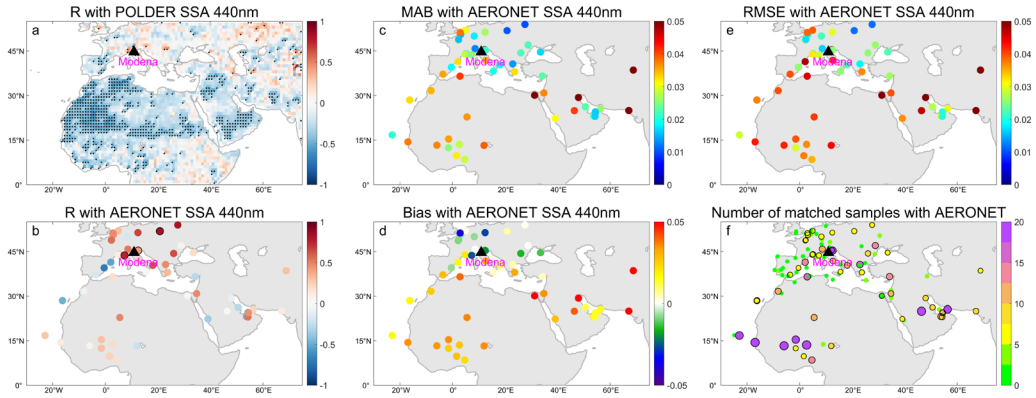

Figure S19. The same figure as Figure S14, but for Modena site.

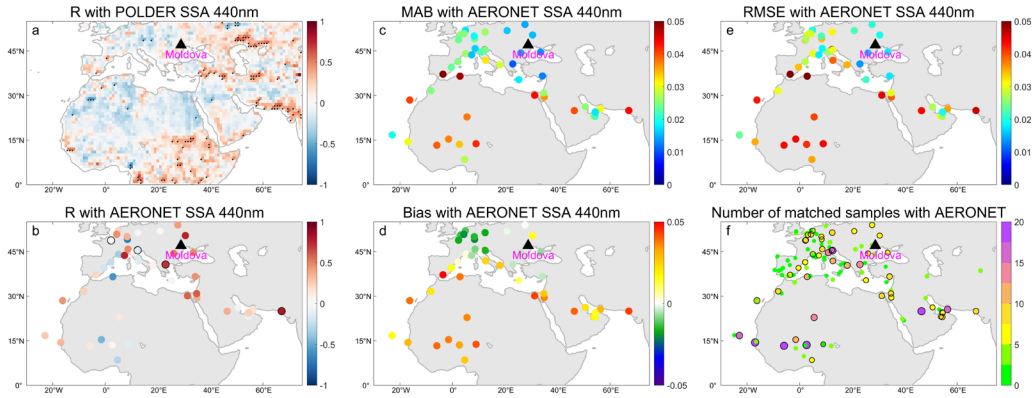

Figure S20. The same figure as Figure S14, but for Moldova site.

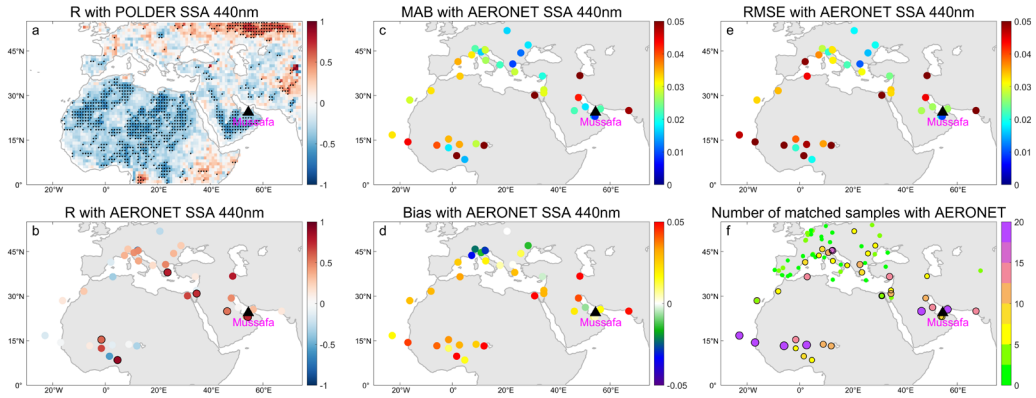

Figure S21. The same figure as Figure S14, but for Mussafa site.

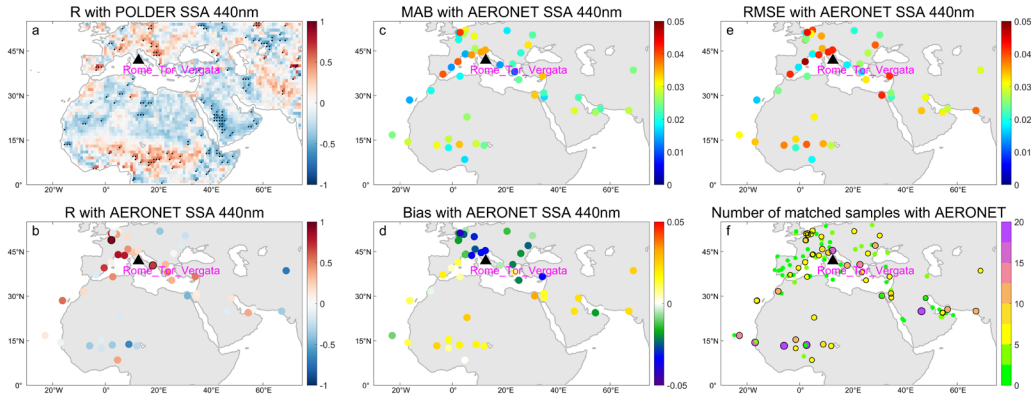

Figure S22. The same figure as Figure S14, but for Rome_Tor_Vergata site.

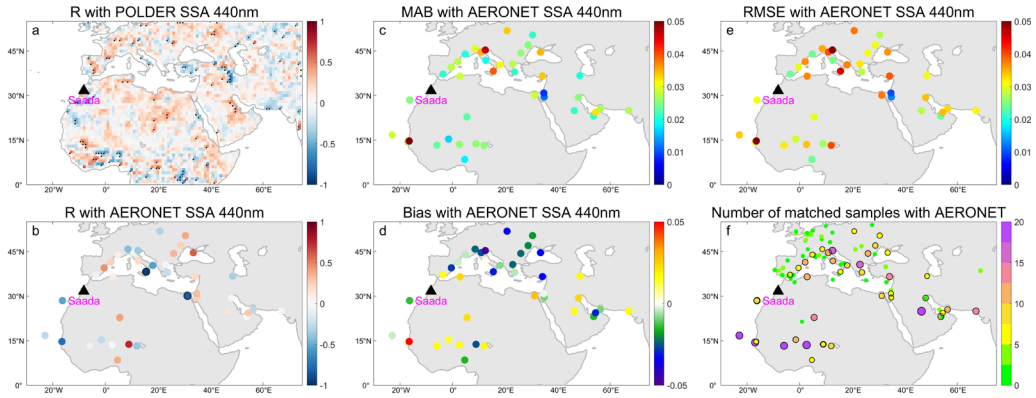

Figure S23. The same figure as Figure S14, but for Saada Site.

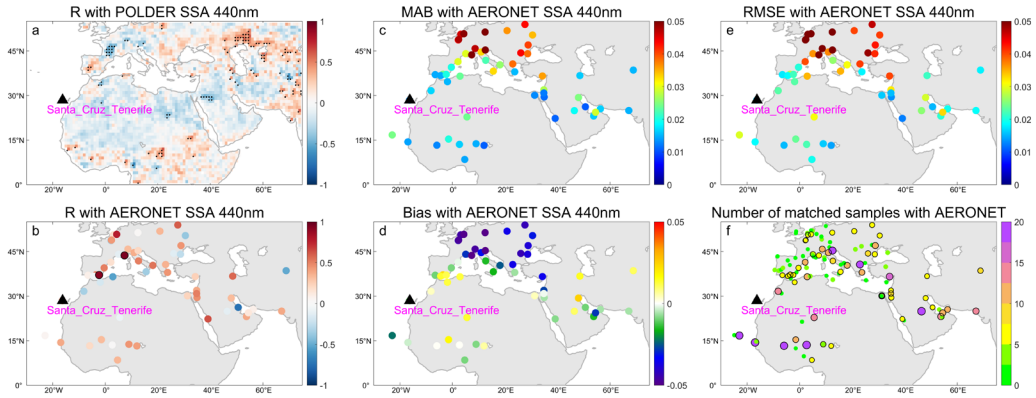

Figure S24. The same figure as Figure S14, but for Santa_Cruz_Tenerife site.

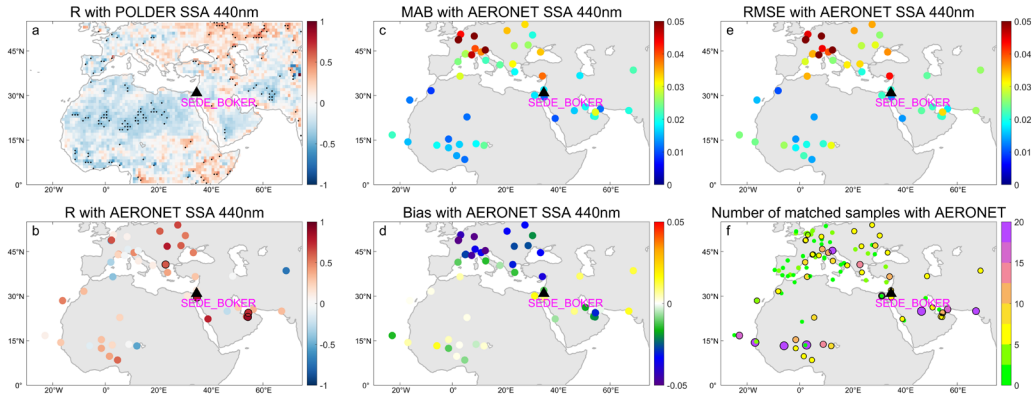

Figure S25. The same figure as Figure S14, but for SEDE_BOKER site.

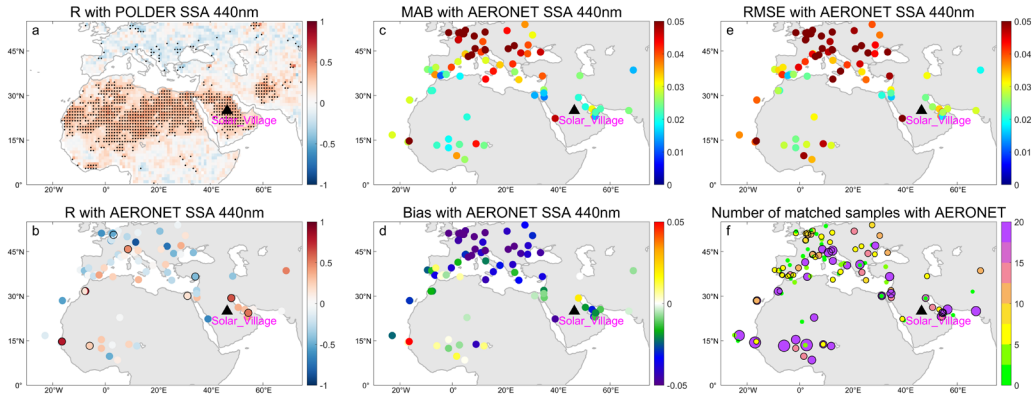

Figure S26. The same figure as Figure S14, but for Solar_Village site.

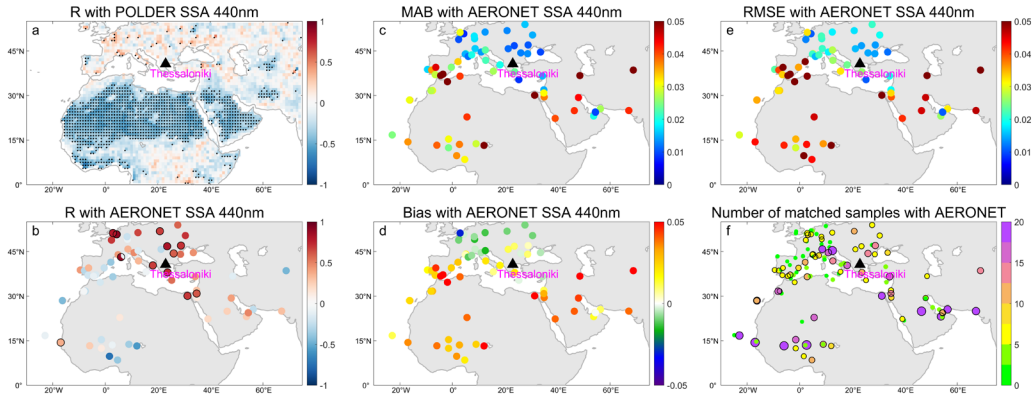

Figure S27. The same figure as Figure S14, but for Thessaloniki site.

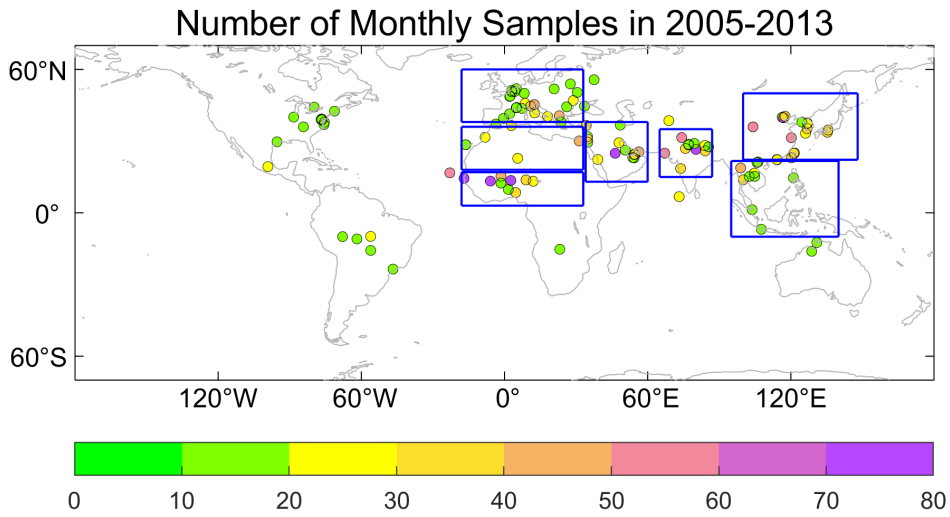

Figure S28. The same figure as Figure S5, but for the POLDER period in 2005~2013.

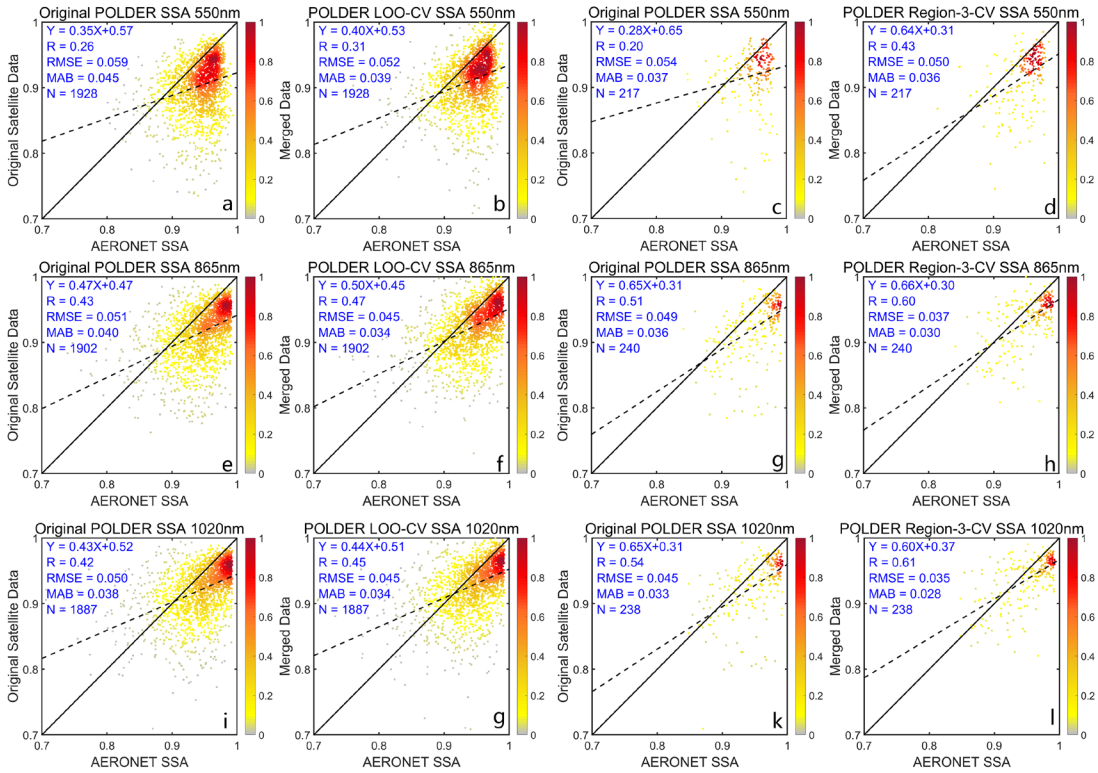

Figure S29. The same figure as Figure 15, but for POLDER SSA at 550, 865, and 1020 nm.

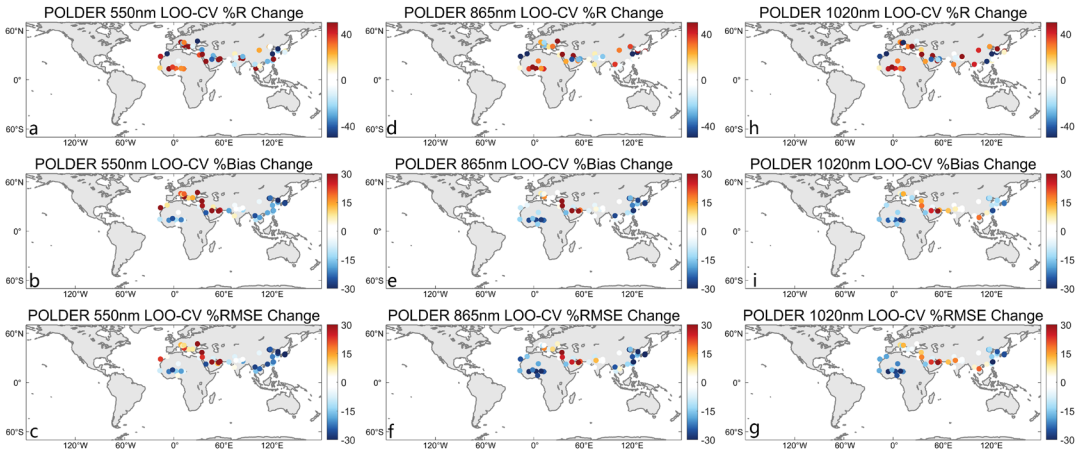

Figure S30. The same figure as Figure 16, but for POLDER SSA at 550, 865, and 1020 nm.

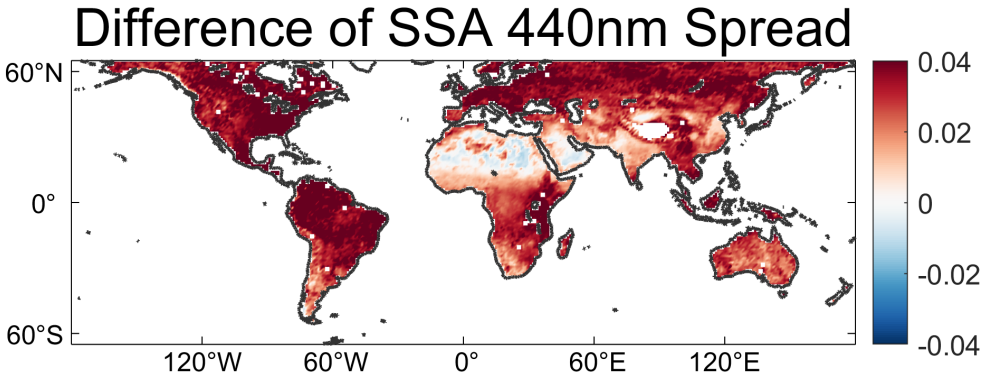

Figure S31. The difference between POLDER and OMI SSA spread at 440 nm.

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