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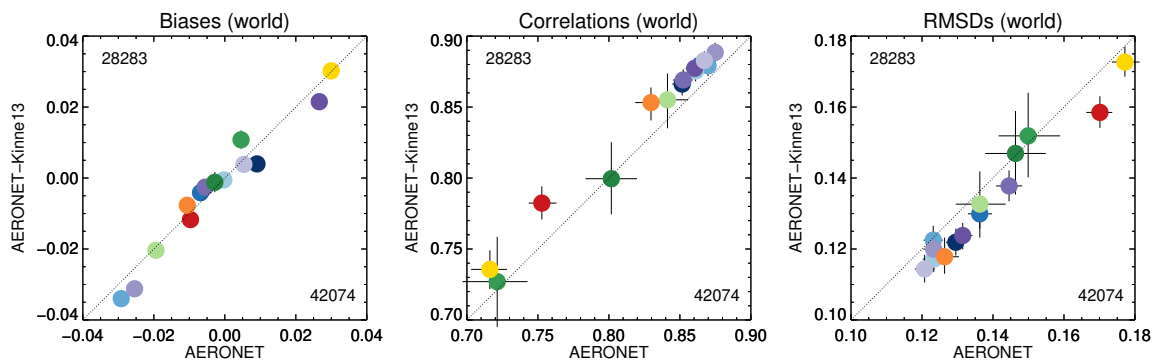
*Supplement of*

## **An AeroCom–AeroSat study: intercomparison of satellite AOD datasets for aerosol model evaluation**

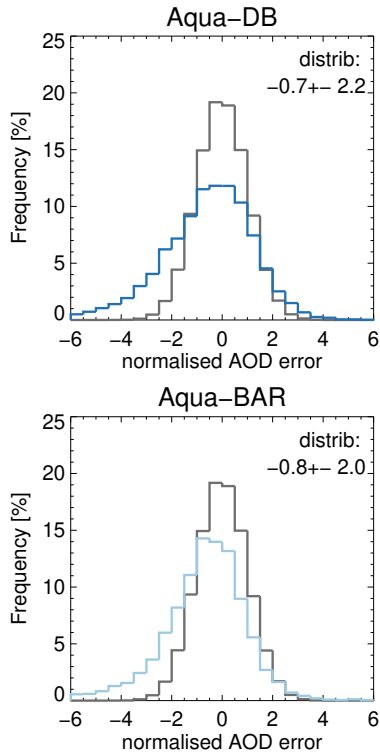
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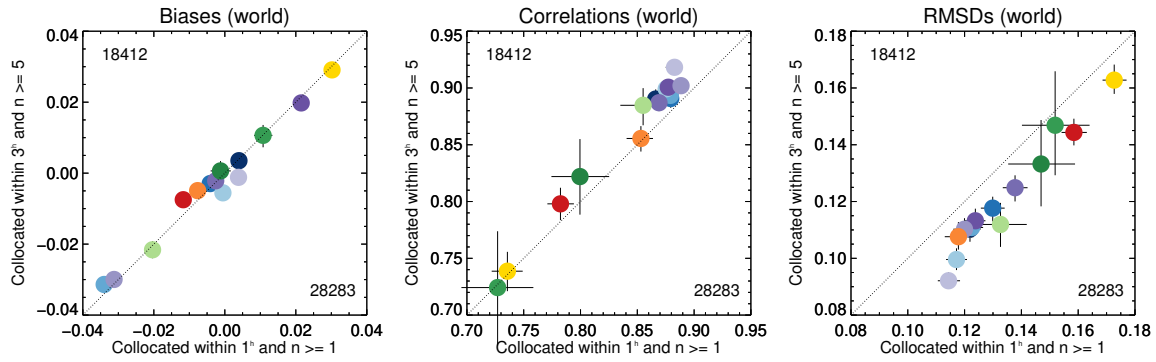
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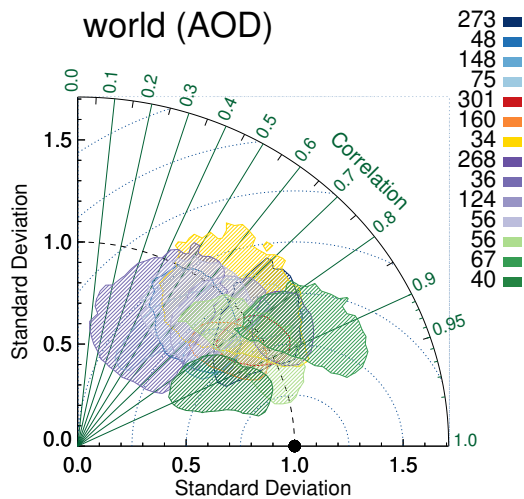
**Figure S1.** Comparison of the evaluation of satellite products for different selections of AERONET sites. Horizontal axis: results using all AERONET sites; vertical axis: using the Kinne et al. 2013 selection. Colours indicate satellite product, see also Fig 1. Numbers in upper left and lower right corner indicate amount of collocated data, averaged over all products. Collocation of individual datasets with AERONET within 1 hour. Error bars indicate 5-95% uncertainty range based on a bootstrap analysis of sample size 1000.



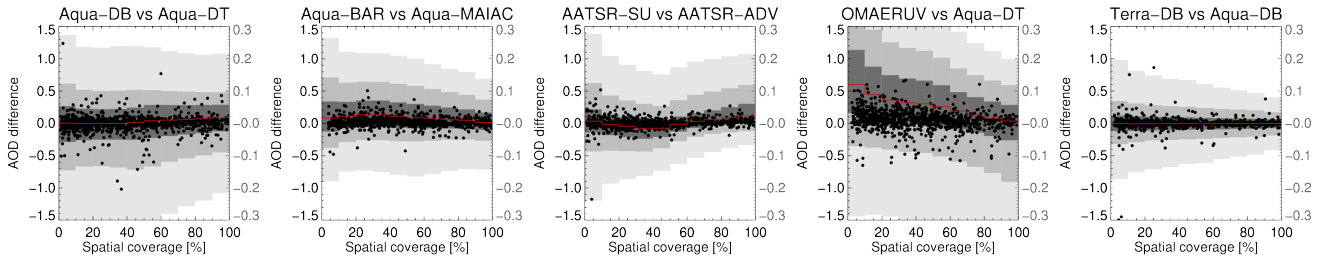
**Figure S2.** The normalized satellite AOD error  $\epsilon_{\text{norm}} = (\tau_{\text{sat}} - \tau_{\text{A}}) / \sqrt{\sigma_{\text{A}}^2 + \sigma_{\tau}^2}$ , for the Aqua-DeepBlue and BAR products (in blue), for cases where the spatial coverage  $\geq 80\%$ . A Gaussian distribution with zero mean and standard deviation of 1 is shown in black. The normalized error appears to be significantly larger than the squared sum of the representation error and AERONET observation error, suggesting that satellite observation errors dominate. The values in the top-right corner are mean and standard deviation of the normalized error. Products were individually collocated with AERONET (Kinne et al. 2013 selection, pruned) within 1 hour.



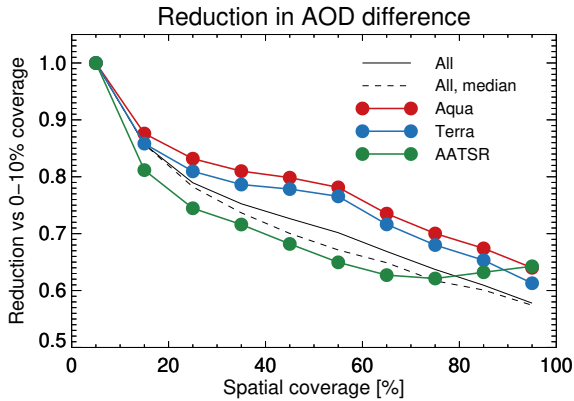
**Figure S3.** Comparison of the evaluation of satellite products depending on collocation criterium. Horizontal axis: results using at least one AERONET observation within 1 hour; vertical axis: using at least 5 AERONET observations within 3 hours. Colours indicate satellite product, see also Fig 1. Numbers in upper left and lower right corner indicate amount of collocated data, averaged over all products. Individual collocation of datasets with AERONET (Kinne et al. 2013 subset, pruned) within 1 hour. Error bars indicate 5-95% uncertainty range based on a bootstrap analysis of sample size 1000.



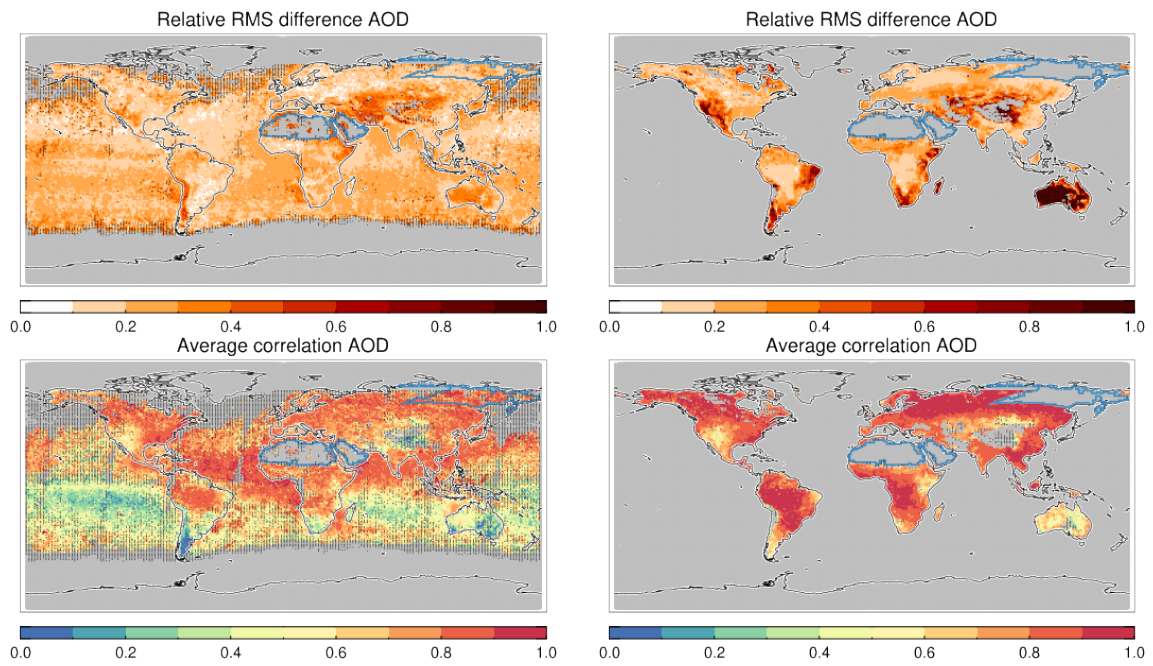
**Figure S4.** Taylor diagram for satellite products evaluated with MAN. Same as Fig. 3 except regions indicate 5 – 95% uncertainty range in correlation and standard deviation from a bootstrap analysis of sample size 10000.



**Figure S5.** AOD difference between super-observations for selected products as a function of spatial coverage (here the average of the two products). Individual data are shown as black dots (using left axis) while distributions per coverage bin are shown as grey scales (2, 9, 25, 75, 91 and 98% quantiles, using right-hand axis). Products were pair-wise collocated within 1 hour.



**Figure S6.** Reduction in AOD difference between satellite pairs as a function of spatial coverage. The difference of a pair of satellite products is defined as the averaged sign-less AOD difference for a certain spatial coverage bin. The reduction is calculated by dividing this difference by the difference at 0-10% spatial coverage. The final value is calculated by taking the mean (or median) over all or a subset of product pairs. Products were pair-wise collocated within 1 hour.



**Figure S7.** Same as Figure 20 but different selections of satellite products . Morning AATSR (left) and afternoon Aqua (right) products were collocated within 3 hours.