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remote sensing data combinations – global AOD maps

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More accurate and more complete measurement-based data-sets are needed to constrain the freedom of global modeling and raise confidence in model predictions. In remote sensing, different methods and sensors frequently yield estimates for the same (or a strongly related) atmospheric property. For maximum benefit to data-users (e.g. input or evaluation data to modeling) - in the context of differences in sensor capabilities and retrieval limitations - there is a desire to combine the strengths of these individual data sources for superior products. In a demonstration, different multi-annual global monthly maps for aerosol optical depth (AOD) from satellite remote sensing been compared and scored against local quality reference data from ground remote sensing. The regionally best performing satellite data-sets have been combined into global monthly AOD maps. As expected, this satellite composite scores better than any individual satellite retrieval. Further improvements are achieved by merging statistics of ground remote sensing into the composite. The global average mid-visible AOD of this remote sensing composite is near 0.13 annually, with lower values during northern hemispheric fall and winter (0.12) and larger values during northern hemispheric spring and summer (0.14). This measurement based data composite also reveals characteristic deficiencies in global modeling: Modeling tends to overestimates AOD over the northern mid-latitudes and to underestimate AOD over tropical and sub-tropical land regions. Also noteworthy are AOD underestimates by modeling in remote oceanic regions, though only in relative sense as AOD values in that region as small. The AOD remote sensing data composite is far from perfect, but it demonstrates the extra value of data-combinations.