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# An Integrated Picture of Global Aerosol Fields

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We present a technique that allows integration of various datasets of aerosol observations (MODIS, AERONET, ADNET, SKYNET, CSHNET) into a single comprehensive view of the Earth's aerosol system.

Observational datasets, while vital in understanding the aerosol system, suffer from incomplete temporal and spatial sampling. Combination (data fusion) of various datasets allows optimal use of their relative strengths, but is not straightforward due to, again, the different temporal and spatial samplings and the difference in observables (e.g. AOT or LIDAR backscatter profiles). Moreover, some datasets are more reliable than others, and this needs to be taken into account as well. Finally, these observational datasets contain only information on remotely observed parameters, but not on the underlying parameters (aerosol emission strengths) or derived parameters (aerosol radiative forcings).

We have implemented and validated an ensemble Kalman filter that uses various observational datasets to adjust the calculations by a global aerosol transport model (SPRINTARS), consistent with uncertainties in e.g. emission scenarios. The Kalman filter allows us to circumvent the previously mentioned problems in data fusion through the flow-dependent covariant information present in the ensemble of model calculations. The filter retrieves aerosol emissions, and the model calculates aerosol radiative forcings. This results in a integrated global picture of aerosol properties at all times and all locations.

We will discuss the basic methodology of the technique and its validation and show how it substantially improves global aerosol modelling. Future developments are also mentioned.

Keywords: aerosol modelling, ensemble Kalman filter, aerosol observations, aerosol emission, aerosol radiative forcing