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Aerosol Climate Time Series in ESA Aerosol_cci

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Within the ESA Climate Change Initiative (CCI) Aerosol_cci (2010 - 2017) conducts intensive work to improve algorithms for the retrieval of aerosol information from European sensors. Meanwhile, full mission time series of 2 GCOS-required aerosol parameters are completely validated and released: Aerosol Optical Depth (AOD) from dual view ATSR-2 / AATSR radiometers (3 algorithms, 1995 - 2012), and stratospheric extinction profiles from star occultation GOMOS spectrometer (2002 – 2012). Additionally, a 35-year multi-sensor time series of the qualitative Absorbing Aerosol Index (AAI) together with sensitivity information and an AAI model simulator is available. Complementary aerosol properties requested by GCOS are in a “round robin” phase, where various algorithms are inter-compared: fine mode AOD, mineral dust AOD (from the thermal IASI spectrometer, but also from ATSR instruments and the POLDER sensor), absorption information and aerosol layer height. As a quasi-reference for validation in few selected regions with sparse ground-based observations the multi-pixel GRASP algorithm for the POLDER instrument is used.
Validation of first dataset versions (vs. AERONET, MAN) and inter-comparison to other satellite datasets (MODIS, MISR, SeaWIFS) proved the high quality of the available datasets comparable to other satellite retrievals and revealed needs for algorithm improvement (for example for higher AOD values) which were taken into account for a reprocessing. The datasets contain pixel level uncertainty estimates which were also validated and improved in the reprocessing. For the three ATSR algorithms the use of an ensemble method was tested. The paper will summarize and discuss the status of dataset reprocessing and validation. The focus will be on the ATSR, GOMOS and IASI datasets. Pixel level uncertainties validation will be summarized and discussed including unknown components and their potential usefulness and limitations. Opportunities for time series extension with successor instruments of the Sentinel family will be described and the complementarity of the different satellite aerosol products (e.g. dust vs. total AOD, ensembles from different algorithms for the same sensor) will be discussed.