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OMI simulated aerosol index: Initial results and verification as part of the Aerosol-CCI project

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As part of the ESA Aerosol-Climate Change Initiative (CCI) work has been carried out using the Ozone Monitoring Instrument (OMI) aerosol index to address two Aerosol-CCI objectives: 1) to create a long-term record of aerosol index data and 2) to evaluate the feasibility of creating a simulated aerosol index. The latter objective is designed to facilitate comparisons between satellite measured aerosol index datasets and information from atmospheric chemical (transport) models or climate models about the presence of aerosols. The simulation of the aerosol index also facilitates the creation of necessary correction and offset factors needed to create a long-term aerosol index dataset based on differences which arise from combining multiple data sources (ie. OMI, GOME, TOMS) which have differing wavelength pairs and overpass times.

A wide range of simulations have been carried out using aerosol properties defined by the Aerosol-CCI group in a common set of aerosol models including strongly and weakly absorbing particles, sea salt and desert dust. The common aerosol model properties for these four aerosol types have been used to carry out radiative transfer simulations using optimal estimation based DISAMAR (Determining Instrument Specifications and Analyzing Methods for Atmospheric Retrieval). This software is used to retrieve surface albedo to calculate the aerosol index based on variations in aerosol layer height, optical thickness, viewing geometry and wavelength pair. The results of these simulations are used to establish dependencies of the aerosol index in these properties including variations in solar zenith angle or wavelength pair. These simulated dependencies are then evaluated using OMI and GOME-2 data. Monthly means have been analyzed for several different seasons and years to test just how realistic the simulation-derived dependencies are. The results from these simulations are also used to build a look-up table for determining aerosol index based on typical aerosol model output parameters. The initial results of the simulations and the OMI to GOME-2 data comparison is presented and discussed.