Abstract – Meloe Kacenelenbogen

Spaceborne Remote Sensing of Aerosol Type: Global Distribution, Model Evaluation and Translation into Chemical Speciation

It is essential to evaluate and refine aerosol classification methods applied to passive satellite remote sensing. We have developed an aerosol classification algorithm (called Specified Clustering and Mahalanobis Classification, SCMC) that assigns an aerosol type to multi-parameter retrievals by spaceborne, airborne or ground-based passive remote sensing instruments [1]. The aerosol types identified by our scheme are pure dust, polluted dust, urban-industrial/developed economy, urban-industrial/developing economy, dark biomass smoke, light biomass smoke and pure marine. We apply the SCMC method to inversions from the ground-based AErosol RObotic NETwork (AERONET [2]) and retrievals from the space-borne Polarization and Directionality of Earth's Reflectances instrument (POLDER, [3]). The POLDER retrievals that we use differ from the standard POLDER retrievals [4] as they make full use of multi-angle, multispectral polarimetric data [5]. We analyze agreement in the aerosol types inferred from both AERONET and POLDER and evaluate GEOS-Chem [6] simulations over the globe. Finally, we use in-situ observations from the SEAC4RS airborne field experiment to bridge the gap between remote sensing-inferred qualitative SCMC aerosol types and their corresponding quantitative chemical speciation. We apply the SCMC method to airborne in-situ observations from the NASA Langley Aerosol Research Group Experiment (LARGE, [7]) and the Differential Aerosol Sizing and Hygroscopicity Spectrometer Probe (DASH-SP, [8]) instruments; we then relate each coarsely defined SCMC type to a sum of percentage of individual aerosol species, using in-situ observations from the Particle Analysis by Laser Mass Spectrometry (PALMS, [9]), the Soluble Acidic Gases and Aerosol (SAGA, [10]), and the High - Resolution Time - of - Flight Aerosol Mass Spectrometer (HR ToF AMS, [11]).