TESTING AND REFINING AN OPTICAL MODEL USED TO PREDICT THE LIGHT SCATTERING CHARACTERISTICS OF MARINE AND VOLCANIC AEROSOLS

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Abstract

Three sea salt and four volcanic aerosol samples were collected from a research site (Lat. 21°21.85'N, Lon. 157°42.61'W) on Oahu, Hawai'i, using a Micro Orifice Uniform Deposit Impactor (MOUDI). Ion chromatography (IC) identified approximately 90% of the sea salt aerosol mass while identifying only about 50% of the volcanic aerosol mass. The size-resolved aerosol chemistry determined via IC was used as input to an optical model used to predict the light scattering properties of these aerosols. The model results indicated that during tradewind conditions, coarse mode sea salt aerosols dominate the optical extinction caused by light scattering aerosols. During times when the tradewinds have died and volcanic aerosols have been blown to Oahu from the island of Hawaii, accumulation mode volcanic aerosols dominate the optical extinction caused by light scattering aerosols.

During one tradewind sample two integrating nephelometers measured aerosol light scattering, a Differential Mobility Analyzer (DMA) and an Atmospheric Particle Sizer (APS) measured the size-resolved aerosol number concentration from 0.05 to 20 microns, and a MOUDI collected aerosols for subsequent chemical analysis. The measured number distribution was substituted for the aerosol number distribution estimated by the model from MOUDI results . The results of the optical model with and without using the measured number distribution as input were then compared to nephelometer results. This indicated that the optical model originally over-estimated the light scattering by about 130%, while over-estimating the light scattering by around 60% when the measured number distribution was used as model input.