Understanding Long-Term Variability of Dust in Different Parts of the World

GINOUX P, MALYSHEV S AND SHEVLIAKOVA E

paul.ginoux@noaa.gov

Over the last decade dust modeling has made large progress and satisfactory dust forecasting is now being provided operationally by several modeling groups. However, unsatisfactory comparison with observations, especially long-term datasets, indicates limiting factors of dust modeling. One of these factors is related to the dynamic variation of dust sources, which can be observed from satellite data. This is particularly problematic to study dust effects on climate, and feedbacks.

In this presentation, after summarizing the most prominent changes of dust concentration observed in different parts of the world, we will review several modeling approaches which were used to simulate decadal variations of dust. The recent implementation of a dust module within a dynamic land model, which is coupled with atmosphere/ocean/ice models, will be used to understand observed dust variability over the last 60 years and to evaluate the contribution of sea-surface temperature, vegetation and landuse changes to long-term variability of dust. Finally, some additional factors which may affect aeolian dust in the future will be presented.

CCN Relevant Properties of Biomass Burning Aerosol

M. GIORODANO AND AKUA ASA-AWUKU[1*]

[1]University of California, Riverside, Riverside, CA 92521, USA (correspondence akua@engr.ucr.edu)

Biomass burning contributes upto 2-3 Pg C per year to the atmosphere, of which the composition and phase are not well characterized. The oxidation of these emissions can produce additional aerosol downwind from sources that can directly and indirectly modify climate. Controlled burns were conducted at UC-Riverside's CE-CERT facility to understand the influence of aged wood smoke for aerosol cloud formation process. The emissions were diluted and injected into a 12 m3 Teflon environmental chamber. The smoke was allowed to mix in the chamber, and a suite of instrumentation measured changes in aerosol phase chemical and physical properties. The smoke is photochemically active; ultraviolet lights age the wood smoke over a 6-8 hour period and cloud condensation nuclei (CCN) properties are transient. This presentation focuses on the changes in CCN activity due to key factors that are used to quantify and predict hygroscopcity. The kappa-hygroscopicity varies significantly with photochemical age and supersaturation. A high resolution time-of-flight aerosol mass spectrometer is used to analyze aerosol chemical composition. Size distribution and CCN activity are determined with a SMPS and CCN counter.

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