University of California, Los Angeles

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Department of
Atmospheric and Oceanic Sciences
Seminar
AOS270

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"The Global Atmospheric Loading of Desert Dust: Implications for Climate and Human Health"

ABSTRACT:

Desert dust is the most ubiquitous atmospheric aerosol specie by mass, yet its impacts on human health and global climate remain highly uncertain. A key factor underlying this uncertainty is the large spread in climate model results of the amount of dust in the atmosphere and its size distribution. Here we use an integrative analysis of the size-resolved atmospheric dust loading to constrain dust effects on human health and global climate. Using a combination of observational, experimental, and model data, we find that atmospheric dust is more abundant and substantially coarser than represented in current climate models. We combine these constraints on the size-resolved global dust loading with epidemiological exposure-response functions to constrain the global mortality due to dust inhalation to 380 (220 – 600) thousand premature deaths per year. Furthermore, because coarse dust warms the climate, we find that the dust direct radiative effect (DRE) is ~0.25 W/m^2 more positive than estimated by current models. Dust effects on clouds are similarly sensitive to aerosol size, and our results indicate further biases in model calculations of dust-cloud-climate interactions. Taken together, our findings suggest that dust cools the climate system less than calculated by current models, and raise the possibility that dust is actually net warming the planet.

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