

Research Highlight

Desert dust affects Earth's radiation balance, cloud formation and biogeochemical trace nutrient cycling. Including mineralogy of dust in climate models is important to understand these effects. Researchers, including a Department of Energy scientist at Pacific Northwest National Laboratory, found that ability to correctly include the mineralogy of dust in climate models is hindered by its spatial and temporal variability as well as insufficient global in situ observations, incomplete and uncertain source mineralogies and the uncertainties associated with data retrieved from remote sensing methods.

The research simulated dust radiative forcing as a function of both mineral composition and size at the global scale and compared them to available observations of mineral atmospheric distribution and deposition along with observations of clear-sky radiative forcing efficiency. They used mineral soil maps to estimate emissions, and with externally mixed mineral aerosols in the bulk aerosol module in the Community Atmosphere Model version 4 (CAM4) and internally mixed mineral aerosols in the modal aerosol module in the Community Atmosphere Model version 5.1 (CAM5) embedded in the Community Earth System Model version 1.0.5 (CESM), the components were speciated into common mineral components in place of total dust.

The research found that distinguishing mineralogy of dust affected the estimated impact of dust on the Earth energy balance due to aerosol-radiation interactions, but the effect depends on the dust optical properties assumed in the simulations without mineralogy. More importantly, the treatment of dust mineralogy lays a foundation for representing dust impacts on processes with much stronger composition dependence, such as heterogeneous ice nucleation and fertilization of marine biology.

Reference(s)

Scanza R, N Mahowald, S Ghan, CS Zender, JF Kok, Y Zhang, and S Albani. 2015. "Modeling dust as component minerals in the Community Atmosphere Model: development of framework and impact on radiative forcing." *Atmospheric Chemistry and Physics*, 15, doi:10.5194/acp-15-537-2015.

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Working Group(s)

Cloud-Aerosol-Precipitation Interactions