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An analysis of aeolian dust in climate models

Amato Evan (1,2), Cyrille Flamant (2), Stephanie Fiedler (3), and Owen Doherty (1)

(1) Scripps Institution of Oceanography, University of California San Diego, La Jolla, California, USA, (2) Laboratoire Atmosphères, Milieux, Observations Spatiales, CNRS and Université Pierre et Marie Curie, Paris, France, (3) Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany

Aeolian dust is a key aspect of the climate system. Dust can modify the Earth's energy budget, provide long-range transport of nutrients, and influence land surface processes via erosion. Consequently, effective modeling of the climate system, particularly at regional scales, requires a reasonably accurate representation of dust emission, transport, and deposition. Here we evaluate African dust in 23 state-of-the-art global climate models used in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. We find that all models fail to reproduce basic aspects of dust emission and transport over the second half of the 20th century. The models systematically underestimate dust emission, transport and optical depth, and year-to-year changes in these properties bear little resemblance to observations. Our findings cast doubt on the ability of these models to simulate the regional climate and the response of African dust to future climate change.