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Saharan dust outbreaks frequently propagate westward over the Atlantic Ocean; accurate quantification of the dust aerosol radiative effects on the surface radiative fluxes (SRF) is fundamental to understanding the sea surface radiation budget. By exploiting large sets of measurements from many ship campaigns in conjunction with reanalysis products, this study characterizes the sensitivity of the SRF and skin Sea-Surface Temperature (SSTskin) to the Saharan dust aerosols using models of the atmospheric radiative transfer, diurnal heating in the ocean, and thermal skin effect. Saharan dust outbreaks can decrease the surface shortwave radiation up to 190 W/m2, and an analysis of the corresponding SSTskin changes suggests dust-induced cooling effects as large as -0.24 K during daytime and a warming effect of up of 0.06 K during daytime and nighttime respectively. Greater physical insight into the radiative transfer through an aerosol-burdened atmosphere and the response thermal response will substantially improve the predictive capabilities of weather and climate studies on a regional basis.
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