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Regional variations in observed dust absorption imply variations in mineral composition.

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Dust aerosols directly impact climate by scattering and absorbing solar and thermal radiation. Laboratory experiments with soils from different regions have shown dust absorption at visible (VIS) wavelengths to vary with the abundance of iron oxides. Yet, it remains unclear the extent to which variations in source mineralogy propagate into the atmosphere, where the mixing of dust plumes from different sources will eventually erase the imprint of regionally varying soil composition and therefore the practical necessity of coupling radiative effects to dust composition in models, which mostly assume globally uniform dust optical properties. We demonstrate that the range of single scattering albedo (in the VIS band) retrieved in AERONET for scenes dominated by dust aerosols is too large to be attributed only to regional variations in particle size; we argue that this range can only be explained by regional variations in aerosol mineral composition. Our model calculations confirm that considering aerosol mineralogy promises better model estimates of regional variations in dust absorption, although poor correlations with observations at specific locations highlight the necessity of more accurate global measurements of mineral abundances in soils.