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The effect of dust absorption on Sahel precipitation

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Absorption of shortwave radiation by dust depends on its iron oxide content. Iron oxides amount to just a few percents of dust mineralogy. In the Sahel, the amount of iron oxide in soils is significantly greater than over the rest of North Africa. Recent measurements from the AER-D campaign have evidenced the presence of large dust particles over Northern African sources, which measurements showed absorb higher shortwave radiation than smaller ones.

I present two 100-years simulations of the earth system model IPSLCM6, one with a detailed description of dust and one without dust. Over the summer months (JJAS), dust absorption amounts to 25 $W.m^{-2}$ over the region. The changes caused by this absorption to the water budget are analyzed. Dust absorption causes an increase of 16% of summer Western Sahel precipitation, whereas in the Eastern Sahel, summer precipitation is increased by 7%. The analysis is extended to evaporation, surface relative humidity, low-level clouds and total cloud liquid water path, all of which show a significant increase caused by absorbing dust.

The water budget over the Sahel is computed over an airshed that covers the region, 16W:36E and 10N:20N from the surface to 200mb, contrasting the water flux with and without aerosol absorption. Dust absorption causes a change in the mean circulation between 1000 and 800mb that induces an increased inflow of moist air at these levels at the western and southern Sahel boundaries during the summer monsoon. Hence, it is important to understand the influence of aerosol absorption when studying the causes of variations in Sahel precipitation.