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Uncertainty in effects of anthropogenic aerosols on Sahel precipitation

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An increase in European and North American anthropogenic aerosol emissions in the 1970s and 1980s led to a decrease in Sahel precipitation during the same time. Although significant, the effect of anthropogenic aerosols on Sahel precipitation is uncertain across a set of CMIP6 single-forcing simulations. However, understanding the cause of this uncertainty in simulated effects of anthropogenic aerosols on West African precipitation in CMIP6 models is difficult, largely due to the relatively small number of large-ensembles with single-forcing simulations. Here, we use a single-model ensemble that spans much of the range in anthropogenic aerosol effective radiative forcing from the CMIP5 and CMIP6 multi-model ensembles. The simulations are performed with HadGEM3-GC3.1 and the different forcings are achieved by scaling emissions in anthropogenic aerosols. We show that changes in anthropogenic aerosols have strong effects on the drivers of the West African monsoon, and on precipitation extremes. Further, we show that the magnitude and even the occurrence of the West African drought (1970s-1980s) strongly depend on the simulated effective anthropogenic aerosol radiative forcing in the model simulations. Our results show that a better understanding of the effects of anthropogenic aerosols on climate is necessary to improve predictions of decadal trends in Sahel precipitation.