Understanding the efficacy leading to high concentration of PM2.5 in a changing climate

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We investigate the efficacy leading to high concentration of PM2.5 in a changing climate. To obtain the meteorological variables to the global chemical transport model (GEOS-Chem), we first conduct the historical run (1996-2005) and the four RCP runs (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) in the two periods, 2016-2025 and 2046-2055, using the Community Earth System Model (CESM). With the same emission dataset used in the CESM, the GEOS-Chem assimilated by the meteorological variables from the CESM simulates produces a number of aerosol species in the present climate and future climate. We pay attention to the changes in the PM2.5 concentration simulated by the GEOS-Chem from the present climate (1996-2005) to the future climate (2016-2025 and 2046-2055). It is found that the PM2.5 concentration in the future climate is largely regulated by the emission scenario. Therefore, it is crucial to correctly know the emission scenario to predict the PM2.5 concentration in future climate. And then, we analyze the ratio of emission and concentration of PM2.5 in the present climate and future climate to examine the efficacy leading to high concentration of PM2.5. It is found that the efficacy increases in different RCP scenarios in each period (2016-2025 and 2046-2055) when the La Nina-like SST cooling occurs. The atmospheric conditions associated with a La Nina-like SST cooling provides more favorable condition to increase the efficacy leading to high concentration of PM2.5 in East Asia. We also compared with the two periods (2016-2025 and 2046-2055) in the four RCP scenarios in terms of the efficacy leading to high concentration of PM2.5 and we found that the efficacy for 2046-2055 is higher than that for 2016-2025 in spite of a reduction of emission.

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