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Aerosol induced reduction in modeled precipitation in China in the late twentieth century

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We examine ensembles of transient (1870 - 2005) sensitivity experiments with the global climate model ECHAM5-HAM with particular focus on aerosol induced reduction of precipitation in eastern China in the late twentieth century. In the model employed, the microphysics of stratiform clouds directly couples to aerosols, but not the microphysics of convective clouds. Increasing anthropogenic aerosol emissions in the model result in a reduction of precipitation that is mostly stronger than what is observed. Only in summer increasing aerosol emissions can improve the agreement between modeled and observed trends. The modeled drying is dominated by a decrease in convective precipitation. For the fraction of convective to total precipitation we find a decrease of about 4% to 6% per decade (2% for stratiform precipitation). These percentages are robust against model resolution. Not robust against model resolution are trends of precipitation anomalies (total, convective, or stratiform), which tend to be stronger for lower model resolution. Regarding the relative importance of different aerosols, our simulations suggest sulfate to be more relevant for the precipitation reduction than black and organic carbon.