

## Impact of air pollutants on East Asian summer monsoon over China-Korea-Japan under SSP2 and RCP8.5 scenario

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We have compared two long-term simulations of SSP2 and RCP8.5 scenarios conducted using the Community Earth System Model (CESM), focusing on the changes in East Asian summer monsoon. The SSP2 scenario was applied to only China-Korea-Japan region in order to explore the impact of air pollutants on the monsoon rainfall and circulations. Results show that in the early 21<sup>st</sup> century the surface warming over the Asian continent was greater than over the North Pacific Ocean, providing greater land-sea thermal contrast in the SSP2 compared to the RCP8.5; which may intensify the East Asian monsoon system. The location of major rainfall region shifts to the north with a reduction in East Asia and an increase in subtropics. Notice that the land-sea thermal contrast has decreased in the late 21<sup>st</sup> century and the associated rainfall anomalies between the SSP2 and RCP8.5 also become reverse compared to the early 21<sup>st</sup> century. This is consistent with the reduction of 10% of CO<sub>2</sub> concentration and two fold increase of atmospheric aerosols over the China-Korea area in the SSP2 relative to the RCP scenario. Physical mechanisms are discussed based on the diabatic heating, adiabatic heating, and associated secondary circulation around the jet stream.

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