



## **Role of aerosols on the Indian Summer Monsoon variability, as simulated by state-of-the-art global climate models**

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Recent observational and modeling analyses have explored the interaction between aerosols and the Indian summer monsoon precipitation on seasonal-to-interannual time scales. By using global scale climate model simulations, we show that when increased aerosol loading is found on the Himalayas slopes in the premonsoon period (April–May), intensification of early monsoon rainfall over India and increased low-level westerly flow follow, in agreement with the elevated-heat-pump (EHP) mechanism. The increase in rainfall during the early monsoon season has a cooling effect on the land surface that may also be amplified through solar dimming (SD) by more cloudiness and aerosol loading with subsequent reduction in monsoon rainfall over India. We extend this analyses to a subset of CMIP5 climate model simulations. Our results suggest that 1) absorbing aerosols, by influencing the seasonal variability of the Indian summer monsoon with the discussed time-lag, may act as a source of predictability for the Indian Summer Monsoon and 2) if the EHP and SD effects are operating also in a number of state-of-the-art climate models, their inclusion could potentially improve seasonal forecasts.