



Investigating the sensitivity of the onset and withdrawal of the south Asian summer monsoon system to changes in anthropogenic emissions using a climate model

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While the monsoon onset is recognized as a rapid, substantial, and sustained increase in rainfall over large parts of south Asia, the withdrawal marks the return to dry conditions. Normally, the south Asian summer monsoon onset occurs around 1st June over extreme south of peninsular India, which gradually advances to extreme northwest of India by around 15th July. The withdrawal starts from northwest India from around 1st September and from extreme south peninsular India by around 30th September. The determinations of the onset and withdrawal dates of monsoon have great economic significance for this region as they influence many agriculture and water resource management decisions in one of the most highly populated regions of the world. Several studies involving global model simulations have shown that changing aerosol emissions could result in significant changes in the seasonal mean precipitation distribution over India. A few studies also show that presence of absorbing aerosols in the foothills of Himalayas and over the Tibetan plateau could increase the moisture convergence over India thereby causing an advancement and intensification of the monsoon precipitation. However, most of the previous studies, which investigated the impact of anthropogenic emissions on the monsoon, are limited to understanding the impact of various emission changes on the seasonal mean monsoon characteristics. In the present study, we try to understand the sensitivity of the onset and withdrawal period of the south Asian summer monsoon system to changes in anthropogenic emissions using a climate model (CESM1.2). We diagnose the onset and withdrawal of the south Asian monsoon by analyzing the variability in vertically integrated moisture transport (VIMT) over the south Asian region and following the definition of hydrologic onset and withdrawal index (HOWI) defined by Fasullo et al. (2002). We examined the effect of changing emissions anthropogenic aerosol, greenhouse gases and both on the onset and withdrawal of the south Asian summer monsoon system. Our preliminary results suggest that increases in the emissions of aerosols and greenhouse gases from anthropogenic sources from pre-industrial to present day could possibly result in significant delay in the onset and advancement in withdrawal of the south Asian summer monsoon system thereby shortening the length of the monsoon season. More results with greater detail will be presented.