Regional differences in aerosol effects on cloud properties and precipitation using historical long-term satellite records

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Aerosols, specifically those resulting from biomass burning, are one of the most important but poorly understood factors that influence global climate change, either directly by interaction with radiation or indirectly through interaction with clouds. We investigate changes in cloud properties and precipitation amount related to biomass burning events using multiple satellite data records spanning nearly 30 years. Due to the global variations in biomass burning events, both spatial (area burned) and temporal (decadal, annual and interannual), it is necessary to investigate aerosol effects on a regional basis. In this study we focus on four main regions including western Africa, China and South East Asia, Australia, and South America.

The analysis uses TOMS and OMI aerosol optical depths to identify periods of intense burning along with MODIS fire counts, cloud properties from ISCCP, and NCEP/NCAR reanalysis data to characterize cloud properties and meteorological conditions. Aerosol-cloud interactions are investigated by analyzing inter-annual, decadal variability, and long-term trend of biomass burning generated aerosols and the corresponding long term trends in cloud properties and precipitation. Regions are compared and differences are investigated.