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Variation of Aerosol Chemistry with Strengthening of South West Monsoon Using Individual Particle Analysis: A Case Study with Airborne Samples

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Variations in internal mixing and chemical composition of airborne aerosols are illustrated here during dry to wet transition of the south west monsoon flow. In this study, aerosol samples were collected from cloud base and above, over the rain shadow regions of Western Ghats, Indian peninsula, as part of the Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX) campaign conducted during July 2015. Aerosol particles were analysed using High Resolution Transmission Electron Microscopy (HR-TEM) coupled with Energy-Dispersive X-ray spectroscopy (EDS) and selected area diffraction patterns to semi quantify the constituent chemical species and to determine their morphology, crystallinity and mixing state in aggregate and non-aggregate forms. Analysed particles were grouped into Metal particles, Sea Salts, Silicates and Carbonaceous particles based on their morphology and chemical composition. The transition period was dominated by silicates from African landmass, and once the monsoon became active higher concentration of sea salts was observed. Aerosol and Cloud Condensation Nuclei (CCN) analyses indicate probable marine origins for precipitating monsoon clouds over the rain shadow region. Spatial and temporal heterogeneity and associated internal mixing state of aerosols are coupled with in-situ aircraft observation to understand the effect of monsoon flow on atmospheric species.

Keywords: airborne aerosols, monsoon, individual particle analysis, TEM