Geophysical Research Abstracts
Vol. 20, EGU2018-3981, 2018
EGU General Assembly 2018

Composition and mixing states of brown haze particle over the Himalayas along two transboundary south-north transects

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Pollutants that are usually transported from southern Asia to the Tibetan Plateau deposit on the Plateau surface, change snow albedo and thereby surface radiative flux. This results numerous climatic implications like as erratic monsoon, perturbation in hydrological cycle, etc. However, the accurate estimation of these climatic implications is not well understood, because the atmospheric pollution is a heterogeneous mixture of various particle types. Therefore, this part of climate research requires a detailed investigation of physical and chemical properties of atmospheric pollutants. This study aimed to examine the physical and chemical properties of atmospheric pollutants across the Himalayan regions along two transboundary south-north transects. The information of individual-particles was obtained using microscopy-based techniques that comprises transmission electron microscope (TEM) and Energy-dispersive X-ray spectrometer (EDX). Study capture the signatures of various types of atmospheric species such as black carbon (BC), mineral dust, fly ash, organic matter, sulfate, nitrite, ammonium, and NaCl. Microscopy-based techniques confirm that these particles were generally in mixing state, for example salt-coated particles accounting for 25 to 56% of the total particles in sampled locations. Our analysis shows that urban and rural locations are characterized with atmospheric particles which sourced from anthropogenic activities, whereas remote locations with those released from natural crustal. However, the relative contributions of anthropogenic particles were higher than that of particles released from natural crustal. The presence of such particles over remote locations of Himalayan region provides an evidence of prevailing atmospheric transport processes, which further need to be well understood. It is expected that this work would be helpful in understanding the regional atmospheric conditions and the transboundary transport process of haze particles. As these informations are of great importance in modeling studies, which further lead to improve understanding of haze particles climate effects.