

Observational evidence of pollutant transport from Indo-Gangetic Plain into the higher Himalaya and Tibetan Plateau through the Kali Gandaki Valley, Nepal

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Convective processes over South Asia and Tibetan Plateau (TP) during deep boundary layer conditions are capable of transporting pollutants into the upper troposphere/lower stratosphere. Satellite images reveal Himalayan valleys as a major transport medium with haze over the Indo-Gangetic Plain (IGP) penetrating into the Himalayan valleys especially during spring/pre-monsoon season. Trans-Himalayan valleys provide open access for air masses originating from IGP to reach the TP. The transport along the valley is facilitated by strong mountain-valley wind systems common to mountainous regions. However there is little observational data from the Himalayan valleys to explore its potential as one of the pathways for long range transport of pollutants to higher elevation.

Here we present observational data (January 2013 - August 2015) of diurnal and seasonal variation in BC concentrations along the Kali Gandaki Valley (KGV), one of the deepest valleys in the world and the most open connection between IGP and TP. Monthly data show lower BC concentrations during monsoon season (June to August). However, the concentration continues to increase post monsoon, reaching the peak during March-May. There are four distinct patterns of BC concentration in the KGV. BC exhibits diurnal as well as seasonal variability. The duration of elevated concentration lasts from a few days to a week when the nighttime concentration remains high compared to other days and the daytime concentrations are 2- to 3-folds higher than other days. The concentration of BC in the valley is influenced by meteorological factors like temperature and wind direction, as these control boundary layer conditions and transport of imported air mass in and through the valley. BC concentration is relatively higher in the valley during colder days and during days when the up-valley flow is dominant. These observations can greatly increase understanding of the role of trans-Himalayan valleys as an integral part of pollutant transport into higher Himalaya and the TP.