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Study of short-lived climate forcers atmospheric variability at Kathmandu and at the WMO/GAW Global Station "Nepal Climate Observatory-Pyramid" (5079 m a.s.l.) in the Himalayas

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Aerosols and tropospheric ozone play a key role in the climate system, since they are short-lived climate forcers (SLCFs). South Asia represents a "hot-spot" in terms of climate change, since a vast region extending from the Indian Ocean to the Himalayas appears to be affected by large amounts of aerosols and pollutant gases (the so-called Atmospheric Brown Cloud).
In the framework of the SusKat – ABC field campaign, a new measurement station has been installed in Pakanajol, Kathmandu (Nepal) on January 2013. This station is representative of the severe polluted conditions of the Kathmandu valley. Continuous measurements of equivalent black carbon (eqBC), surface ozone (O_3), aerosol number concentration and size distribution, on-line PM10-PM1, as well as meteorological parameters, are carried out at this sampling site. In the high Himalayas (150 km north-east from Kathmandu), continuous atmospheric composition measurements are performed at the WMO/GAW Global Station Nepal Climate Observatory-Pyramid (NCO-P, 5079 m a.s.l.) in the Southern Himalayas. This measurement site is representative of the background conditions of the Himalayan ridge and measurements of eqBC, O_3, aerosol number size distribution and meteorological parameters are continuously carried out since March 2006.
The aim of this work is to compare the variability of atmospheric composition between the two sampling sites, with a particular emphasis on SLCFs, thus providing two complementary perspectives about the Atmospheric Brown Cloud phenomenon. Moreover, hints about the possible role of vertical air-mass transport of SLCFs from the foothills to the high Himalayas will be provided.
The seasonal trend of eqBC at Pakanajol is characterized by a decreasing behavior from winter to monsoon, while at NCO-P it is characterized by a clear pre-monsoon maximum. On the other hand, at both sampling sites, O_3 and particle number (accumulation and coarse) showed highest values during the pre-monsoon (April-May), even if at NCO-P significantly lower levels of eqBC and aerosol particle number (ratio 7% for eqBC, 29% for accumulation and 12% for coarse particles) were observed in respect to Kathmandu. Moreover, case studies concerning simultaneous events of eqBC and O_3 increases in Kathmandu and in the high Himalayas will be investigated.