Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Observation and analysis of spatio-temporal characteristics of surface ozone and carbon monoxide at multiple sites in the Kathmandu Valley, Nepal" *by* Khadak Singh Mahata et al.

Khadak Singh Mahata et al.

khadak.mahata@iass-potsdam.de

The comment was uploaded in the form of a supplement:
https://www.atmos-chem-phys-discuss.net/acp-2017-709/acp-2017-709-AC1-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-709, 2017.
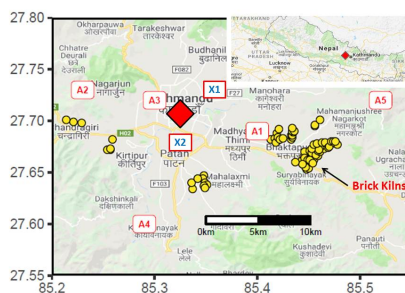
Figure 1. Observation sites in the SusKat-ABC international air pollution campaign during 2013-2014 in the Kathmandu Valley. A1 = Bode, A3 = Paknajol, and A4 = Naikhandi were selected within the valley floor and A2 = Bhimdhunga and A5 = Nagarkot on the mountain ridge. Naikhandi site is also near the Bagmati River outlet. Past study sites, Bouddha (X1) and Pulchowk (X2), which are referred in the manuscript, are also shown in the Figure. Source: Google Earth.
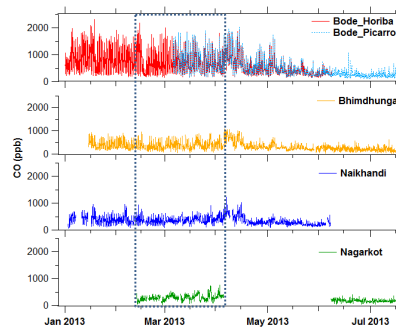
Fig. 1.

Figure 2. Hourly average CO mixing ratios observed at supersite (Bode) and three satellite sites (Bhimdhunga, Naikhandi and Nagarkot) of the SusKat-ABC international air pollution measurement campaign during January to July 2013 in the Kathmandu Valley. The dotted box represents a period (13 February - 03 April, 2013) during which data for all four sites were available.
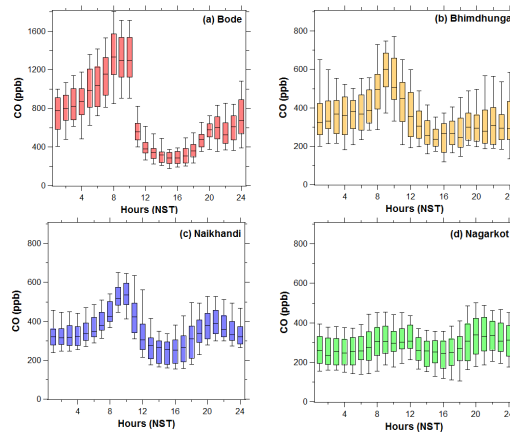
Fig. 2.

C3

Figure 3. Diurnal variations of hourly average CO mixing ratios during the common observation period (13 February–03 April, 2013) at Bode, Bhimdhunga, Naikhandi and Nagarkot. The lower end and upper end of the whisker represents 10th and 90th percentile, respectively; the lower end and upper end of each box represents the 25th and 75th percentile, respectively, and the black horizontal line in the middle of each box is the median for each month. Note: the y-axis scale of Bode is twice that of the other three sites.
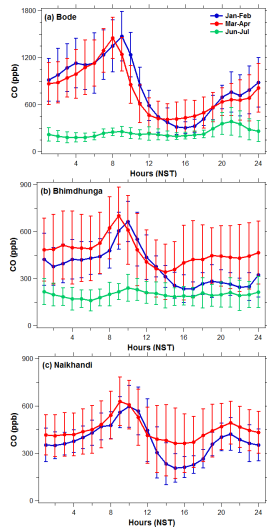
Fig. 3.

Figure 4. Comparison of diurnal variation of hourly average CO mixing ratios for four seasons at Bode, Bhimdhunga and Naikhandi. Due to the lack of continuous data at some sites, data of one month in each season were taken for comparison as representative of the winter (16 Jan – 15 Feb), pre-monsoon (16 Mar – 15 Apr) and monsoon (16 Jun – 15 Jul) season of 2013. Note: y-axis scale of the top panel (Bode) is double than lower two panels (Bhimdhunga and Naikhandi).
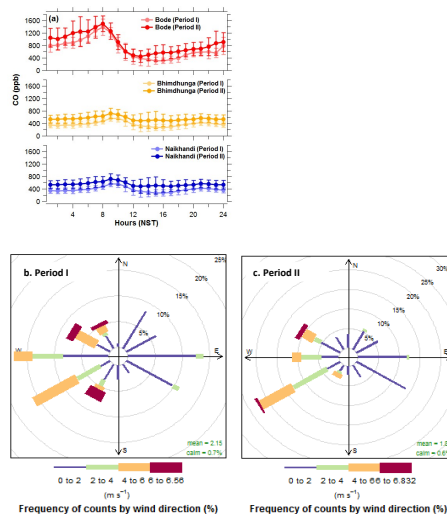
Fig. 4.

C5

Figure 5. Comparison of hourly average CO mixing ratios during normal days (March 16-30), labelled as period I (faint color) and episode days (April 1-15), labelled as period II (dark color) in 2013 at (a) Bode, Bhimdhunga and Naikhandi in the Kathmandu Valley. The wind roses at Bode corresponding to two periods are also plotted (b) period I and (c) period II respectively.
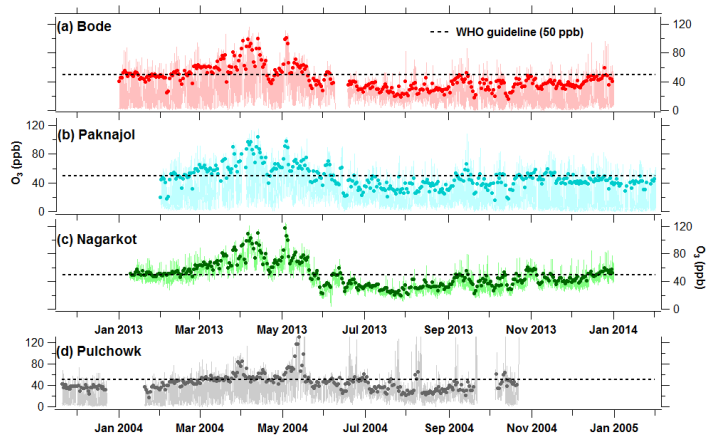
Fig. 5.

C6

Figure 6. Time series of hourly average (faint colored line) and daily maximum 8-hr average (solid colored circle) O_3 mixing ratio at (a) Bode (semi-urban), (b) Paknajol (urban) and (c) Nagarkot (hilltop) observed during 2013-2014, and (d) Pulchowk (urban) observed during November 2003-October 2004 in the Kathmandu Valley. Black dotted line represents WHO guideline (50 ppb) for daily maximum 8-hour average of O_3.
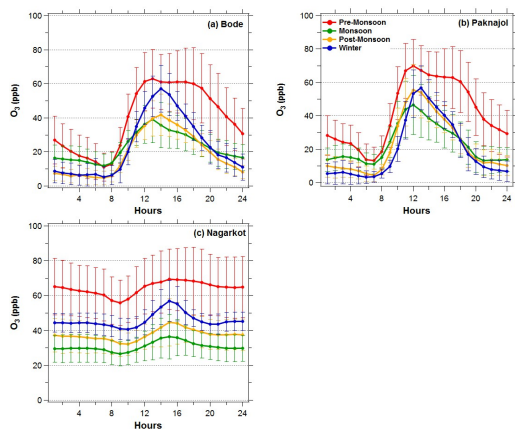
Fig. 6.

C7

Figure 7. Diurnal pattern of hourly average O_3 mixing ratio for different seasons during January 2013-January 2014 at (a) Bode, (b) Paknajol, and (c) Nagarkot in the Kathmandu Valley. The four seasons (described in the text) are defined as: pre-monsoon (Mar-May), monsoon (Jun-Sep), post-monsoon (Oct-Nov), winter (Dec-Feb).
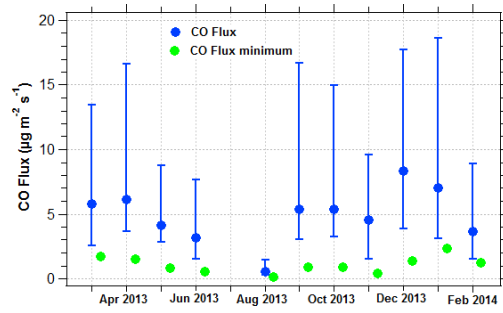
Fig. 7.

C8

Figure 8. The estimated monthly average CO emission flux, which is based on the mean diurnal cycle of CO mixing ratios of each month for two conditions: (i) with data of all days (CO Flux) (blue dot) with lower and upper ends of the bar representing 25th and 75th percentile respectively, and (ii) with data of morning hours (CO Flux minimum (green dot) in which zero emission is assumed for the other hours of the day. The fluxes for July were not estimated as there were insufficient (less than 15 days) of concurrent CO and mixing layer height data. It is expected that the F_{CO} and $F_{COmin.}$ for July should fall between values for June and August 2013.

Fig. 8.

C9