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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal variation of ozone and black carbon observed at Paknajol, an urban site in the Kathmandu Valley, Nepal" *by* D. Putero et al.

Anonymous Referee #1

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Review of "Seasonal variation of ozone and black carbon observed at Paknajol, an urban site in the Kathmandu Valley, Nepal" by D. Putero et al. for ACP

The authors present measurements of BC (light absorption), ozone, and aerosol particles (PM1 and PM10) obtained over approximately a year in the Kathmandu Valley. The year is broken up into 4 periods, pre-monsoon, monsoon, post-monsoon, and winter. Diurnal pattern of the quantities measured appear to be typical of that found in many other locations, dominated by the time dependence of emissions, photochemistry, and boundary layer dynamics. There is some dependence of ozone on wind direction and the high ozone season coincides with the season for regional vegetation fires. What

is present appears to be basically correct, though not very exciting because similar features have been seen before and with a limited suite of instruments there is only so much that can be said about cause and affect.

An opportunity that is missed is the determination of relations between ozone, BC, and aerosol particles (accumulation and coarse mode). Correlations between these quantities are presented in Table 2, but because all data is used it is not possible to distinguish chemical effects from boundary layer dynamics. I suggest that this paper could interest a wider audience with a partial repeat of Table 2, limiting the data to convective hours. A very interesting quantity to look for is secondary aerosol production. Insight can be gained by looking at the regression of ozone vs. PM1. Also BC vs. PM1. I'm guessing that relations would be lost by doing regressions on a data subset defined by season or trajectory location. I would do regressions on a day by day basis and see what drops out. Perhaps the slopes of these plots will depend on solar radiation.

I recommend publication with revisions, though I believe the authors would be well served by seeing whether an approach such as given above is productive.

General Comments:

The paper presents many numerical values of concentration in the text. These numbers would be much easier for a reader to find if they were instead reported in a Table. I realize that there is a diversity of time periods and meteorological conditions, such that the number of Table headings could be unwieldy. I would urge the authors to select for a Table as large a subset as makes sense for comparisons and reserve for the text, a discussion of comparisons, etc.

Page 22538, line 21-25. Ratio of daily to hourly standard deviations are an interesting quantity. However, I have not read Chevalier et al (2005) and don't know how to interpret these numbers other than the sweeping statement that daily and hourly variations are both important. A concern is that seasonal variations are clearly affecting BC and to a lesser extent ozone. A different way to look at data would be to use relative stan-

dard deviations that could be defined e.g., for the diurnal case by normalizing a day of measurements by the average of that day and for the daily case, normalizing by the average over a time period which could be a year or could be one of 4 periods defined or could be periods of defined length, such as a month.

Regarding the conclusion that pollutants are mainly of local origin: This is further supported by the ratio of BC to PM1. That ratio is too high to be due to wildland fires.

Significant figures: Aerosol concentrations are given to 0.1 particle per cm3 out of a total of hundreds to more than a thousand. Actual accuracy is of order 10%. The decimal digit should at least be removed for values greater than 100.

Term "correlation coefficient": It appears from the negative values in Table 2 that you have followed correct usage and are reporting r, not r2. It would be useful to have an explicit statement, which could be done as simply as adding (Pearson's r) or even (r) at the point first mentioned.

Specific Comments:

Page 22532 - 22533 Are instrument averaging times for instruments described in bullets 1 to 4 given in text?

page 22532, line 24 "These are referred to the SRP15 reference scale ..." please explain.

page 22533, line 18 coincidence errors Are number concentrations high enough that coincidence errors are a concern? What was the maximum dilution factor used? Dilution flow rate is given but not sample flow rate.

page 22534, line 25 recurrent neural network How does a recurrent neural network take into account the multi-day effects of meteorology? There is a reference but a simple explanation would aid the reader.

page 22535, line 4 meteorological effects usually last for more than one day You are

implicitly defining meteorological effects to exclude diurnal boundary layer cycles.

page 22538, line 26-27. Fig 3 shows the shape of the ozone diurnal cycle was similar during all seasons. I disagree. The pre-monsoon ozone is clearly different in the late afternoon.

page 22541, line 4 "We magnified ..." magnified is not the correct word. perhaps you call attention to something, but it is not made larger

page 22543 line 9, direct pollution What is the meaning of direct in this context? Term not commonly used as a synonym of emitted or primary.

Page 22543 – 22544 Discussion of Fig. 6 hard to follow. Before I accept the conclusion that high ozone at 16:00 is due to dynamical effects (attributed to upper residual ozone in one place and residual ozone and/or horizontal advection in another place), I would want to see a diurnal cycle predicted using only RAD.

page 22546 line 8 much polluted regions please rephrase

Table 9 Time axis. Split into hard-to-visualize intervals. Suggest monthly or bi-monthly tics. A shading scheme in plot C that delineates 4 meteorological periods would help the reader follow text.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 22527, 2015.