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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variations of surface ozone at Ieodo Ocean Research Station in the East China Sea and influence of Asian outflows" *by* J. Han et al.

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Thank you for your constructive comments for the manuscript acp-2015-338. The response for each comment is given below and manuscript was revised accordingly.

1 Overall Comments

1. While the analysis of air mass trajectories was appropriate and interesting, I was disappointed to see very little mention of any other meteorological factors, despite their availability. Were the influences of the other meteorological observations taken at the

IORS station (listed in the methodology section) examined along with wind speeds? What about weather conditions at other stations upwind? As it stands, only the effects of precipitation are directly described at all, and then only in a qualitative fashion. Whether or not other meteorological factors prove to be important here, I would expect at the very least some more substantial discussion of their significance (or lack thereof).

2. The figures in general show varying degrees of polish and clarity, and some of them are in need of attention. Unifying colors between figures, matching colorbar scales, and lining up axes within multipanel figures would go a long way towards improving their overall effectiveness (see specifics below).

2 Specific Comments

1. Abstract, page 16748, line 15: The phrase "of which extent was apt to be changed by" is awkward. I suggest "the extent of which was affected by".

It was modified like "of which extent was dependent on meteorological state".

2. Introduction, page 16749, lines 2-3: This sentence implies that deposition is the dominant sink of tropospheric ozone, which I do not believe is the case. Please support and clarify this statement.

This part is to give a general view of tropospheric O3, which is primarily transported from the stratosphere, recycled/produced through photochemical reactions, and some of it is deposited to the earth surface. The relevant part was rewritten as follows.

Tropospheric O3 is primarily transported from the stratosphere upon tropopause folding and produced by in situ photochemical reactions involving carbon monoxide (CO) and hydrocarbons in the presence of nitrogen oxides (NOx) (Brasseur et al., 1999). Ozone is also lost by photochemical reactions and deposition to the Earth's surface.

3. Section 3, page 16752, line 9: I believe "IORS including other remote sites" should read "IORS and other remote sites".

It was corrected.

4. Section 3, page 16752, lines 13-20: There seems to be some redundancy here, with two pairs of sentences essentially saying the same thing: “highest O3 concentrations were mostly observed in spring with an apparent minimum in summer” and “this is a typical pattern” vs. “monthly averaged O3 concentrations were the highest in April and October and lowest in July” and “This accords with what has been observed”. Consolidate or further differentiate the repeated statements.

This paragraph gets shortened as follows.

At IORS, the monthly averaged O3 concentrations were the highest in April and October (62 ppbv) and lowest in August (37 ppbv) (Fig. 3c). The O3 concentrations remained high during March $\sim$ May, resulting in a broad spring peak which was in contrast to a sharp fall peak. This is in accordance with a typical pattern that has been observed in other remote sites over Northeast Asia during the past decades (Chan et al., 2002; Jaffe et al., 1996; Kanaya et al., 2015; Kondo et al., 2008; Oltmans and Levy II, 1994; Tanimoto et al., 2005; Tanimoto et al., 2009; Watanabe et al., 2005; Weiss-Penzias et al., 2004).

5. Section 3, page 16752, lines 22-23: Here there is a hint of temperature dependence, but no explanation of what the data show or whether the temperature/ozone relationship matches up with expectations. Is there a positive temperature correlation during clear days?

The lines 21-25 and relevant part was rewritten as follows. In summer, the study region is under influence of Asian monsoon system which brings moist air from the Pacific Ocean. Meteorological parameters including relative humidity, wind speed, and visibility indicate a clear shift in air mass from pre-monsoon to monsoon season (Fig. 4b). At IORS, O3 concentration was noticeably decreased during summer, even though temperature was high. Likewise, the O3 level of Gosan was reduced down to the minimum in summer, when the levels of precursors were the lowest with heavy rainfall. We have

rainfall data only for the first couple of years and no criteria to tell if it was clear or not. The following figure presents all O3 measurements against temperature in July, where no correlation was found between the two.

6. Section 4.1, page 16754, line 3: Fix typo (“1500ma.s.l.w.e.re calculated”).

This part (the first paragraph) was move to “2. Methodology” section. Typo was corrected.

7. Section 4.3, page 16756, lines 20-21: Please clarify the sentence “It is not certain for a higher and lower frequency of NW2 and W in 2004 than in other years.” I am not sure what it means.

It was to state a big change in the frequency of the cluster NW2 and W from 2004 to 2005. Because it doesn’t deliver any meaning, it was removed in the revised manuscript.

8. Figure 4b: I think including (essentially) 4 y-axes is a bit much. These would be much clearer separated out into 4 vertically-stacked panels.

Figure 4b was modified.

9. Figure 5a-e: Colorbars are all of varying scale, reducing the effectiveness of seasonal comparison. I recommend unifying the scales under a single colorbar and (if possible) getting rid of any tiny, extraneous text that is cluttering up individual panels.

Figure 5a-e were remade with the same color scale.

10. Figure 5f: The meaning of the stacked bar plots is difficult to interpret as presented. I recommend turning them into a set of simple polar plots, such as those produced by the windRose function of the openair package.

Figure 5f was to provide a seasonal characteristic of winds in a simple way. Considering the importance of winds in this study, it was replaced with windrose plot shown below.

11. Figure 6: I was distracted by the unaligned axes in the panels of this figure. Clean up placement.

Figure 6 was remade, in which all plots have the same scale.

12. Figures 9 and 10: Unifying the color scheme used here with that of Figure 7 would greatly improve the clarity of all three, making it easier to flip back and forth between them.

Colors and symbols are all modified so that they represent the same trajectory in Figure 7, 9, and 10.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C8159/2015/acpd-15-C8159-2015-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 16747, 2015.