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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.

**Anonymous Referee #3**

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General comments:

This manuscript describes the ozone concentration levels at Ieodo Station, located in the middle of Yellow Sea/East China Sea region. Temporal variations including diurnal, seasonal, and interannual variations, and the dependencies on the air mass origins were discussed. A major conclusion, as expected, is that the Chinese emissions strongly influenced. The multi-year ozone concentration data shown here for the first time are regionally representative and thus are important for evaluation of regional/global model simulations. The contents are suitable for ACP and logically sound. However, in certain parts, especially the interpretation of the leveling-off trend after

2009, attributed simply to stagnation of NOx emission in China, needs more consideration. After some more clarification on the following specific points, the manuscript is recommended for publication.

Specific points:

1. It is meaningful to compare the annual or monthly averages with those at Cheju (33°18'N, 126°10'E, EANET data, http://www.eanet.asia/jpn/docea_f.html) and at Fukue Island (32.75N, 128.68E, Kanaya et al., AAQR 2015, Appendix), both of which are located in the Yellow Sea/East China Sea. Comparison to data at Oki Island (36°17'N, 133°11'E, EANET), experiencing more aged air, may also be important. The comparison must be more important than those shown in Figure 3, where data at more distant locations were only used. In relation, in line 26 of page 6751, the statement that the ozone concentrations decreased with increased distance from China may not be valid when including the nearby stations, given that the ozone production continues for several days and maximum concentration could occur at somewhat distant locations (e.g., Oki Island) with more aging.

2. Abstract Page 16748, line 9. The concept of "fractional contribution" is difficult to understand. Can the authors simply state that different levels of ozone concentrations were found for six well distinguished air masses?

3. Page 16749, line 3. Photochemical loss of ozone (O1D + H2O etc) needs to be mentioned as well.

4. Page 16749, line 28. Which time is the reference for the increase by 5-7 ppb in spring 2006?

5. Page 15750, line 4. Change a semicolon to comma.

6. Page 15750, line 25. How good was the slope of the correlation?

7. Page 15751, lines 12-13. Parrish et al. (2012) reported that the increase in ozone in Europe has slowed down or even decreases were found at some sites during 2000-



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2010. The authors should mention that such trend in the hemispheric baseline could also affect the trend at Ieodo.

8. Page 16751, line 22. Add latitude and longitude information for Trinidad Head, as the site is not included in Figure 1.

9. Page 16752, line 8. The stated ozone destruction is actually observed at Minamitorishima (Figure 3a). This should be mentioned here.

10. Page 16752, line 26. Better to rephrase "all measured species were divided into five seasons"

11. Page 16753, line 14. Do the authors mean Mar-April by spring, specifically?

12. Page 16753, line 21. Levy II (in the reference list also)

13. Page 16754, line 3. Five-day must be incorrect, as 40 h is mentioned later twice. Were the backward trajectories calculated for the whole period of the ozone observation?

14. Page 16754, line 23. What is the typical altitude of the trajectory for the six cases? Can the difference in altitude among the cases affect the ozone climatology analysis?

15. Page 16755, line 16. NW1 was more frequent than N (page 16754, line 24).

16. Page 16756, line 12. Interpretation of the cluster N as stagnant needs more explanation. From Figures 7 and 8, most of the trajectories passed over the Korean Peninsula. What is the influence from the emissions in the Peninsula? Why can the authors mention that "Chinese influence is implicit in N" in line 3, page 16757?

17. Page 16758, line 4. Actually Itahashi et al. (2014) showed that NO2 over China again increased in 2010, while O3 at Ieodo decreased in 2010. Some more careful statement is necessary here, and also in page 16751.

18. Figure 8. Is the unit ppb?



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