

Interactive comment on “Significant increase of surface ozone at a regional background station in the eastern China” by Z. Q. Ma et al.

Anonymous Referee #1

Received and published: 9 December 2015

The authors have presented a concise study of the observed ozone trend at the Shang-dianzi station in northern China and have used statistical methods to separate the trend due to emissions from the trend due to meteorology. If such an analysis were presented for a single station in the US or Europe where ozone is well understood the paper would not warrant publication in ACP. But because this study gives the research community a rare look at rapidly changing ozone levels in China, a region that is basically driving atmospheric chemistry in the northern hemisphere, the paper is appropriate for ACP. I recommend that the paper be published after a major revision as described below.

MAJOR COMMENTS 1) The standard of English in the manuscript needs to be greatly improved. The paper has too many grammatical and word-choice errors for me to correct and I recommend that the authors either find a colleague with excellent English

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Interactive Discussion

Discussion Paper



skills to edit the grammar line-by-line, or employ the assistance of an ACP journal copy-editor.

2) Please be clear regarding what you mean when you use the term "background ozone", which is a model construct. In contrast, "baseline ozone" is the observed ozone that flows into a region before it is impacted by local emissions. See the description and implications of these two quantities in: Cooper, O. R., A. O. Langford, D. D. Parrish and D. W. Fahey (2015), Challenges of a lowered U.S. ozone standard, *Science*, 348, 1096-1097. On page 31953 line 16 you mention increasing background ozone. Do you mean to say baseline ozone? If so, where is this increase in baseline ozone observed (and please provide references)? Similarly, on line 18 you mention researchers attributing the increase in background (baseline?) ozone to China. Who is making these claims? Please provide references.

3) According to the ACP data policy, the underlying chemical observations used in the analysis should be publicly available, as described here:

Statement on the availability of underlying data: http://www.atmospheric-chemistry-and-physics.net/about/data_policy.html#data_availability "Authors are required to provide a statement on how their underlying research data can be accessed. This must be placed as the section "Data availability" at the end of the manuscript before the acknowledgements."

This paper contains no data availability statement and the authors need to provide one. I am bringing this up because there is great interest within the atmospheric chemistry community regarding the quantity of ozone produced in East Asia as well as the ozone produced by East Asian emissions once the pollutants have been exported from the continent. With ozone pollution decreasing in North America and Europe, East Asia is the main driving force behind any increase in tropospheric ozone. By having access to the ozone and ozone precursor observations described in this paper the scientific community can further its understanding of the global

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tropospheric ozone budget. It would be a great service to the community if the authors of this paper can make available the ozone data presented in the paper. Because Shangdianzi is a WMO GAW site the data should be available from the World Data Center for Greenhouse Gases. But when I visit their webpage all I can find for Shangdianzi are CO, CO₂ and CH₄: http://ds.data.jma.go.jp/gmd/wdcgg/cgi-bin/wdcgg/accessdata.cgi?cntry=China&index=SDZ240N00-CMA_NOAA¶=CO2&select=inventory

4) Please provide more description of the Shangdianzi station and its surroundings. How far is it from urban areas? Is it elevated? Is it surrounded by forest or farmland? Are mountains nearby? A map showing the location of the station in relation to urban areas and mountains would be very helpful.

MINOR COMMENTS

Change the title to: "Significant increase of surface ozone at a regional background station in eastern China" There is also the problem regarding what you mean by background. Seeing as background refers to modelled ozone when a particular source is switched off, a better title would be: "Significant increase of surface ozone at a rural regional monitoring station in eastern China"

Page 31952 line 19 Radiative forcing due to ozone is not just observed at the surface, it impacts the entire troposphere

The Introduction needs references that are up to date: 1) when referencing IPCC, use the 2013 report, not the outdated 2007 report. 2) when describing basic chemical and dynamic processes that impact ozone use references like Cooper et al., 2014, and

Monks, P. S., A.T. Archibald, A. Colette, O. Cooper, M. Coyle, R. Derwent, D. Fowler, C. Granier, K.S. Law, G.E. Mills, D.S. Stevenson, O. Tarasova, V. Thouret, E. von Schneidemesser, R. Sommariva, O. Wild, and M.L. Williams (2015), Tropospheric ozone and its precursors from the urban to the global scale from air quality to short-lived climate

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2015

Interactive
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3) when describing ozone trends use reference like: Cooper et al., 2014 and Oltmans SJ, Lefohn AS, Shadwick D, Harris JM, Scheel HE, et al. 2013. Recent tropospheric ozone changes – A pattern dominated by slow or no growth. *Atmos. Environ.* 67: 331–351. and Parrish DD, Law KS, Staehelin J, Derwent R, Cooper OR, et al. 2012. Long-term changes in lower tropospheric baseline ozone concentrations at northern mid-latitudes. *Atmos. Chem. Phys.* 12: 11485–11504. doi:10.5194/acp-12-11485-2012

4) Why use the outdated study of Streets et al 2001 when much more recent studies are available?

Page 31958 line 19 A better reference for the impact of temperature on ozone is: Pusede et al., (2015), Temperature and recent trends in the chemistry of continental surface ozone, *Chem. Rev.*, 115, 3898–3918.

Page 31953 line 27 Please define TOR

Page 31958 line 28 White noise is a very vague term and not one that specifically applies to atmospheric chemistry. Please find a different, more descriptive term.

Figure 8 Be specific in the figure caption as to how these data were smoothed. Does the ozone correspond to Figure 2d?

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 31951, 2015.

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