

## ***Interactive comment on “Springtime variability of lower tropospheric ozone over Eastern Asia: contributions of cyclonic activity and pollution as observed from space with IASI” by G. Dufour et al.***

**Anonymous Referee #2**

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This manuscript studied the impact of synoptic weather on vertical structure of ozone together with its precursor CO in East Asia based on IASI satellite retrievals. Generally speaking, this is an interesting paper. It showed that the IASI satellite data can well capture the vertical structure and transport pathway of ozone and precursors, and confirmed some previous findings based on in-situ and modeling studies. This referee would like recommend the publication of this paper on Atmos. Chem. Phys. if the following key points are appropriately addressed.

Major comments:

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1) In Section 4 and 5, the authors tried to describe the evolution and change of vertical distribution from one synoptic process to the other. There are too many details but lack of key points, which make the paper a bad readability. So I suggest the authors restructure the two sections into two parts. The first part could demonstrate that the IASI satellite data could well-capture the vertical structure of O<sub>3</sub> and CO based on correlation analysis with PV or other available data. The secondary part could explain the transport mechanisms for different processes, such as stratospheric intrusion and warm conveyor belt associated with cyclones. The authors should clearly demonstrate what are the unique advantages in using IASI satellite data in understand these processes, and whether there are anything new or anything disagreeing with the existing understanding?

2) The vertical sections show some useful information about the structure, which is in fact one of the main unique advantages of satellite data. The authors showed some results in Figure 5 and Figure 11. However, the both figures were show along specific latitudes, and they should also show results along specific longitudes. In fact, most of works related to stratospheric intrusions prefer to a figure along a specific longitude (e.g. Ding and Wang, 2006), which could demonstrate the tropopause folding more clearly.

Minor comments:

1. The word of “variability” in the title: the paper was not really talk about “variability” but some specific processes. “Variability” is a term related to climatology. The current title will mislead the readers that the cyclonic activity influenced the variability of springtime ozone from year to year. 2. P9205, L5-7, P9209, L5-8: the authors pointed out “May is typically the largest tropospheric ozone along the year”. This is not true in East Asia. For example, ozone peaks in June in the NCP and western China and peaks in October in South China (Wang et al., 2009; Ding et al., 2008; Zhu et al., 2004). The reason of selecting May could be that late spring is one of the season having rather high ozone concentration and frequent cyclone/front activities. 3) Figure 2 and Figure

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3: the figures are composed with many small figures. The figure captions are different from the label shows in the figures. For example, (a-c) vs. (a-i) in Figure 2. (a-d) vs. (a-l) in Figure 3. Please make corrections to these figures or captions, and also check the text. 4) A latest work by Ding K. et al. (2015) discussed similar processes using MOZAIC aircraft measurement and MOPITT CO data. Please make a comparison with that paper in the discussion part. 5) English need to be edited by a native speaker.

References:

Ding A., and T. Wang, Influence of stratosphere-troposphere exchange on seasonal cycle of surface ozone at Mount Waliguan in western China, *Geophys. Res. Lett.*, 33, L03803, 2006.

Ding, K. et al., Uplifting of carbon monoxide from biomass burning and anthropogenic sources to the free troposphere in East Asia, *Atmos. Chem. Phys.*, 15, 2843-2866, 2015.

Wang T. et al., Increasing surface ozone concentrations in the background atmosphere of Southern China, 1994-2007, *Atmos. Chem. Phys.*, 9 16, 6217-6227, 2008

Zhu B. et al., Why does surface ozone peak in summertime at Waliguan? *Geophys. Res. Lett.* 31, L17104, 2004.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 9203, 2015.