

Interactive comment on “On the role of tropopause folds in summertime tropospheric ozone over the eastern Mediterranean and the Middle East” by Dimitris Akritidis et al.

Anonymous Referee #1

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This paper investigates the role of tropopause folds in controlling high tropospheric ozone concentrations that are consistently observed in the eastern Mediterranean and the Middle East (EMME) region. The ECAM model is used to assess the frequency of strong tropopause fold events, the percentage of ozone in this region that has been transported from the stratosphere, and the interannual variability of tropopause folds. The analysis is well presented and, as the global community continues to work to set stringent yet attainable air quality standards, the topic should be of great interest to ACP readers. I believe that there are several issues, described below, that are deserving of more discussion and analysis, but recommend publication following these minor revisions.

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Specific comments: P3, L33 – The T42 resolution (~2.8 degree) is fairly coarse for resolving these events. Finer scale models can show substantial differences in the amount of stratospheric ozone transported to the mid- and lower troposphere (e.g. see Lin et al., 2015 supplementary material). Though this resolution may be necessary for the longer timescale simulation presented in this work, the potential impact should be noted and discussed.

P4, L8-11 – Zhang et al. (2014) showed that diagnosing the stratospheric influence over the United States was strongly dependent on how stratospheric ozone was defined (e.g. ozone produced in the stratosphere or ozone transported from the above the tropopause). It would be good to mention and discuss the implications of this assumption.

P6, L5 – 7 ppb is the mean enhancement for the tropopause fold composite, but what is the range? Since many people may be interested in this work from an air quality perspective, a discussion not just of the mean case but the extremes would be of great interest.

Lin, M., A.M. Fiore, L.W. Horowitz, A.O. Langford, S. J. Oltmans, D. Tarasick, H.E. Reider (2015), Climate variability modulates western US ozone air quality in spring via deep stratospheric intrusions, *Nature Communications*, 6, 7105, doi:10.1038/ncomms8105.

Zhang, L., D. J. Jacob, X. Yue, N. V. Downey, D. A. Wood, and D. Blewitt (2014), Sources contributing to background surface ozone in the US intermountain West, *Atmos. Chem. Phys.*, 14, 5295-5309.

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