

***Interactive comment on* “Structure, dynamics, and trace gases variability within the Asian summer monsoon anticyclone in extreme El Niño of 2015–16” by Saginela Ravindra Babu et al.**

Anonymous Referee #3

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This paper shows the structure, dynamics, and trace gasses changes within the Asian summer monsoon anticyclone (ASMA) in July and August 2015 during extreme El Niño using satellite measurements and NCEP reanalysis data. The spatial extension of the ASMA was quite larger than the mean during 2005-2014 in July and exhibits a strong southward shift. Intense Rossby wave breaking events along the subtropical westerly jet are also appeared in July. For tracers, carbon monoxide (water vapor) decreased by 30% (20%), the ozone increased by 40% at 100 hPa compared to the long-term (2005-2014) mean in July. In August, the ASMA splits into two and western Pacific mode. Additionally, the tropopause temperature displays positive anomalies within the ASMA in 2015.

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The topic of this study is interesting and the authors have presented the results with sufficient analyses. However, some statements in the paper are not precise. The manuscript could be considered to be published in ACP after the following revision.

Page2 Line 29-31: The last sentence in the abstract is unclear. Please revise this sentence. In the abstract “the spatial extension of the ASMA shows larger than the long-term mean in all the regions except over northeastern Asia”, and the last sentence in the abstract “Overall, warming of the tropopause region due to the increased O₃ weakens the anticyclone”. ... increased ozone weakens the anticyclone?, but the authors mean that the large spatial extension of the ASMA in July 2015 is it contradict?

Page7Line152: About the methodology, the authors selected the long-term mean during the period of 2005-2014, why not include the data in 2015 when calculating the long-term mean? Please clarify.

Page9: For Fig.2, do the authors check the distribution of the GPH using the ERA5 reanalysis data? Based on the results in Nützel et al., 2016, their research shows that only the NCEP reanalysis data show a clear bimodal structure of the ASMA centers compared to other reanalysis data. Curious about the distribution of the GPH from the ERA-Interim/ERA5 data in 2015 and the long-term mean. Additionally, why not calculate the cold point tropopause and the temperature lapse rate tropopause using the same reanalysis data instead of the COSMIC data?

Page15: Fig.6 Black arrows can not be seen.

Page22L393: This sentence should be rewritten. The tropopause within the ASMA is higher than the outside regions at the same latitude.

Page26Line477-480: ...enhanced ozone ...warms around the tropopause region and caused an increase in the UTLS temperature within the ASMA...leads to the weakening of the ASMA in 2015. The statement is not clear. The authors mean enhanced ozone

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warms the tropopause within the ASMA ..and ..leads to the weakening of the ASMA in 2015. If it is true, the results from Figure 3 show that the spatial extension of the ASMA is larger than the long-term mean in all the regions except over northeastern Asia in July 2015 as you mentioned in this manuscript. The authors did not present the connection between the large spatial extension of the Asian summer monsoon anticyclone and the weak monsoon. Enhanced O3 (decrease WV, CO), and positive tropopause temperature anomalies can be seen in July 2015 from your presents, but how the enhanced ozone leads to the weakening of the ASMA in July 2015 can not be seen in the paper.

Citation corrections: Page12Line44: The reference Hossaini et al., 2015 is missing. Randerl et al., 2010→Randel et al., 2010

Page13Line50: ... be found in Santee et al (2017)→... be found in Santee et al. (2017)

Page22L389, L396: Ratnam et al., 2016 is missing, or is it Venkat Ratnam et al., 2016?

Page30Line603: Li J. et al., 2008 and Li and Bian 2015 are missing in the main text. ...

The citation and references need to be edited thoroughly.

Page9Line188: Fig. 2a and 2b (Fig. 2c and 2d)→Figs. 2a and 2b (Fig. 2c and 2d)

Page14 Line266: 10⁻⁶ kg- im^{2s}-2K, correct it.

Page14 Line274-275: Even→even, 04August → 4August

Page17 Line314: Fig. 7a-c (Fig. 7d-f) show →Fig. 7a-c (Fig. 7d-f) shows

Page22 Line404: Fig. 10a-b (Fig. 10c-d) show→Fig. 10a-b (Fig. 10c-d) shows

Page25 Line447: Fig. 3 and 4→Figs. 3 and 4 ...

Suggest that the authors should read their final manuscript carefully, or find a proof-reader before the paper was submitted.

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