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Atmospheric Chemistry and Physics Discussions

Interactive comment on "MLS measurements of stratospheric hydrogen cyanide during the 2015–16 El Niño event" *by* Hugh C. Pumphrey et al.

Anonymous Referee #1

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This paper "MLS measurements of stratospheric hydrogen cyanide during the 2015-16 El Niño event" by Pumphery et al. shows elevated levels of HCN in the lower stratosphere over the Equatorial Asia (EQAS) region from ground based measurements and satellite observations during 2015-16 El Niño event. The topic of the study is interesting and suitable for the journal. I suggest major revision before its publication.

General comments: Manuscript is very short and lack details

It is known that droughts related to El Niño events are associated with sinking branch of the Walker circulation. Therefore zonal mean plots in Figure-3 (averaged over 12.5N-12.5S) provide poor information about vertical propagation of HCN in the stratosphere. During El – Niño event injection into the stratosphere may be along rising branch of the Walker circulation. This feature gets averaged in the zonal plots. A major concern

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is that the authors state that source of HCN in the lower stratosphere is from Maritime Continent. While during EL-Nino there is subsidence over this region. Therefore tape recorder signal in HCN seen in figure-3 may have the source from another region where rising branch of the Walker circulation is located. It will be good to show a vertical variation of HCN in the lower stratosphere averaged over the region of Maritime Continent. It may show a clear picture of tape-recorder signal in HCN during the years other than El-Nino years. Then use this plot for inter-comparison within satellite measurements.

Specific comments: Authors missed adding information of the Walker circulation in the introduction section. Few details on vertical transport into the upper troposphere and lower stratosphere by the convection would be useful. The abstract does not provide complete information about the manuscript.

Section 2.2: Surface measurements at the Jungfraujoch in Switzerland (46.5âŰęN), Mauna Loa in Hawaii (19.3âŰę 15 N), and Kitt Peak, Arizona (32âŰęN), show higher than normal values during El-Nino. This can be justified by transport from Indonesia. However, vertical transport to the stratosphere from Indonesia may not occur during El Nino due to subsidence over this region.

Page 9, line no 8-13. During the normal years (Not El Nino years) MLS show transport from Asian monsoon region if you take an average over the region 20-40N, 60-120E). This is related to vertical transport by monsoon convection as stated by Randel et al 2010, Ploeger et al., 2017). While during an El Nino year, HCN may not get transported to the stratosphere from this region due to subsidence over this region (see Clim Dny DOI 10.1007/s00382-016-3451-6).

Section 3.4 is very poor. I suggest not drawing conclusions from zonal or meridional average plots. Authors should select one specific region and provide details (e.g., Maritime Continent).

I suggest providing (may be from Reanalysis data) a figure of anomalies (year Elnino-Climatology) of vertical winds and circulations over the selected region. It will be helpful

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in depicting vertical transport into the lower stratosphere.

Technical corrections (1) Page 1 line no 2: greater than other Elniño events or Climatology? (2) It is difficult to read figure 4 due odd y-axis scale

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