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Interactive comment on "Equatorial middle atmospheric chemical composition changes during sudden stratospheric warming events" *by* O. Nath and S. Sridharan

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The paper of Nath and Sridharan reports some changes in atmospheric tracers (H2O, CH4 and O3), recorded by MLS/Aura and MIPAS/Envisat, which developed at equatorial stratospheric latitudes roughly in correspondence with the occurrence of strong SSW events (i.e. 2004, 2009 and 2012) in northern polar regions. In the case of O3 the authors attributed such changes to the weakening of BDC and to chemistry because loss processes for O3 are less efficient at cold temperatures. Moreover, they suggest that the low temperatures favored the shift in the ratio of O3/O toward O3. Then, the reduction of atomic oxygen abundance affected the methane oxidation which resulted in a decreased (increased) water vapor (methane) abundance. Even if the topic is po-

tentially interesting, the present study is too qualitative and still very preliminary. The whole introduction focus on chemical changes occurred at polar regions and no reference (excepted two studies of the same authors) deal with equatorial regions. The analysis shows only some time series of the investigated constituents over the equator under the period of interest and the figures are not well organized (e.g. these results could easily be constrained in 3 figures, one for each SSW). The discussion on the possible mechanisms which cause such changes reduces to few lines and it is not convincing. The temperature dependence of the odd oxygen loss reaction is more effective in upper stratosphere, say around 1-2 hPa (e.g. Stolarski et al., JGR, 2012). For example, the panels 'd' and 'f' of Fig. 1 suggest the occurrence of these changes at about 45 km around DOY 30. Nevertheless the O3 increase at these altitudes seems to last only about a week in both 2009 and 2012 while variability in H2O and CH4 encompasses many weeks. O3 variations at lower altitudes are probably related to dynamics. Therefore, I believe that the potential shift in the ratio of O3/O toward O3 cannot explain such changes. Although the study deals with changes in tracers and the chemical conversion of CH4 to H2O with altitude is supposed to be slow, the authors did not take into account the possibility that such variability could arise also from dynamics (e.g. upwelling). This study cannot disregard this additional element. Moreover, the authors did not discuss the variability of CH4 and H2O in context of their respective satellite climatology preventing the possibility of e.g. to compare such changes with years not affected by SSWs and to assess the actual significance of such variability. In the abstract as well as in the figures, the authors highlight the connection between the SSW occurrence and the chemical changes at low latitudes. However they did not do any attempt to further explore this potential link. Overall, in the present form this study is below the scientific standards of ACP. Therefore, unless you address the above-mentioned weaknesses, I cannot recommend the manuscript for publication.

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