

A Review of “Unusual chlorine partitioning in the 2015/16 Arctic winter lowermost stratosphere: Observations and simulations” by S. Johansson et al.

<General Comments>

This paper describes the observations of chlorine species (HCl, ClONO₂, ClO, and CH₃Cl), O₃, and HNO₃ by satellites (MLS and ACE-FTS) and airborne limb-imager GLORIA, and compared the results with two models (CLaMS and EMAC) in the Arctic winter 2015/16. This winter was characterized by cold stratospheric temperatures, and the study especially focused on the temporal evolutions of relevant trace gases in the lowermost stratosphere (LMS) over the course of the winter. The manuscript is generally well written, well organized, and succeeded to describe some new findings especially related to chlorine deactivation processes in the LMS region. The paper also describes some problems in the current model simulations which are desired to be improved in near future. I feel that the paper is almost ready to be published in ACP, after some modifications of minor points which are described below.

<Minor Comments/Typos>

- 1) P.6, L.1: CALIPSO satellite was launched 2006 --> CALIPSO satellite was launched in 2006
- 2) P.6, L.6: McKenna et al., 2002b, a --> McKenna et al., 2002a, b
- 3) P.6, L.8: initialized 1 November 2015 --> initialized on 1 November 2015
- 4) P.6, L.18: comparison of CLaMS results to GLORIA and MLS --> comparison of CLaMS results with GLORIA and MLS
- 5) P.7, L.1: analyses has been initialized 1 July 2015 --> analyses has been initialized on 1 July 2015
- 6) P.17, Figure 8 caption: Colorbars --> Color bars
- 7) P.17, Figure 8 caption: colorbar --> color bar
- 8) P.24, L.15: Fig. 12a1 --> Fig. 12(a1)
- 9) P.24, L.15: Fig. 12b1 --> Fig. 12(b1)
- 10) P.27, L.17: Fig. 12b2 --> Fig. 12(b2)
- 11) P.27, L.19: Fig. 12e2 --> Fig. 12(e2)
- 12) P.28, L.11: which is nearly all ClO at this time --> which consists of ClO and Cl₂O₂ at this time