Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-96-AC1, 2016

Atmospheric Measurement Techniques Discussions

Interactive comment on "Effects of polar stratospheric clouds in the Nimbus-7 LIMS version 6 data set" *by* Ellis Remsberg and V. Lynn Harvey

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Received and published: 6 June 2016

See attached file

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-96, 2016.

Reply (large font) to comments of Referee, John Austin (smaller font):

Thank you, John, for your careful and constructive review of our manuscript, which is essentially an update of your original and important paper in GRL (1986).

General remarks:

1. It is common and convenient to refer to pressure-altitude as an altitude in km based on pressure and a nominal temperature profile. However, much of the paper has pressure (correctly) as the vertical coordinate so regularly referring to it as "pressure-altitude" is confusing.

1—The terminology was changed in each instance.

2. The paper is a bit woolly in identifying the extent of the denitrification due to PSCs. I think this could be strengthened by using the information in the last few figures. For example, could the authors not set up a linear correlation between PV and HNO3 as a function of equivalent latitude? In the case of the later it should be possible to identify a 2 ppbv or so loss in HNO3 by the end of January encompassing the major PSC period. (Thereafter the seasonal change in sunlight may be interfering) The point is that the regression would give the loss of HNO3 with some uncertainty limits.

2—Simple linear correlations between nitric acid and PV are not so straightforward to interpret. For example, in original Figure 15 there are increases in PV at the end of January and also just after mid-February (note that the tic marks on original Figures 15 and 16 refer to the middle of a month). Those PV increases correspond to the effects of diabatic descent of higher PV within the vortex as a response to the stratospheric warming activity. Figure 16 shows decreases in HNO_3 at those same times that are a result of the associated descent of lower values of HNO_3 to the 550 K surface.

We have replaced original Figure 13 with new Figures 13 and 14 (see attached). Our best quantitative evidence for a local uptake of gas phase HNO_3 comes now from the data of 1-20 January (see also Figure 11). We separated the points of Figs. 11 and 13 into successive 5-day periods for Figure 14, after first removing those points that have corresponding values of $O_3 > 6$ ppmv. The centroids of each 5-day, cluster of points show declining HNO_3 values with time, indicating an uptake of the order of 1-3 ppbv. The MLM averages of HNO_3 in original Figure 16 also indicate an uptake of HNO_3 from 15-17 January and between equivalent latitudes of 80 and 90°N, where PV was increasing in Figure 15 and where there is a temporary, average decrease of HNO_3 of about 1 ppbv (orange to yellow in Figure 16). That amount of uptake is considered a lower limit, however, because it is the MLM average around the PV contour. Nonetheless, that result is consistent with the visual findings of a local dip in HNO_3 to less than 10 ppbv for 14-15 January in Figure 11. These interpretations are now part of the discussion in Sections 7 and 8 of the revised text.

3. I suppose it's still journal policy, but I must say that the format of the paper for review was a challenge. In this day and age of limiting the amount of printing, I like to review

Fig. 1.