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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Small-scale transport structures in the Arctic winter 2009/2010" *by* C. Kalicinsky et al.

Anonymous Referee #1

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The paper of Kalicinsky et al. describes a case study of mixing in the high northern latitudes on the basis of measurements during the RECONCILE campaign. Geophysica M-55 measurements of the cryogenic limb sounder CRISTA-NF (Cryogenic Infrared Spectrometer and Telescope for the atmosphere limb sounder) are presented , which allow to deduce vertically resolved cross sections of CFC-11, O3, and ClONO2. These observations indicate a complex mixing event of stratospheric and mid latitudinal air masses. Additional analyses with the CLAMS model using artificial tracers show, that a former sudden warming during December 2009 has led to a contribution of 45% of mid latitude air into the vortex air masses. The paper is well written and the methods are well documented. The approach, though being a case study, yields quantitative estimates of the involved air masses. It highlights the importance of sudden stratospheric

warmings for constituent mixing within the reformed vortex. I therefore recommend the paper for soon publication after the following point has been addressed.

Major point: p.10479-10480: How sensitive are the calculated fractions to the date of initialisation (1 December) and how robust are the numbers in general? They are not quantitatively motivated by discrepancies between observations and the results for initialisations on 15 January. If one just goes back in time long enough, the mid latitude fraction would become even larger. Does the estimate makes sense? Finally: If the filament around 14 km , 12:15 is of vortex origin for air masses initialized at 15 January, then this should also be the case for 'December, 1st-air'. Otherwise the results indicate, that the midlatitude air masses (from 1 December) didn't really mix after the vortex split, because they do not contribute to the vortex fraction initialized on January?

Technical: All Figures: Please use the same vertical axis origin (e.g. starting at 10 km), which facilitates comparison of plots and patterns.

Table 2: Use the greek symbol 'Theta' for potential temperature

p.10470, l.11: fulfils

p.10475: Check mixing ratio units

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