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The impact of mid-latitude intrusions into the polar vortex on ozone loss estimates

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Abstract. Current stratospheric chemical model simulations underestimate substantially the large ozone loss rates that are derived for the Arctic from ozone sondes for January of some years. Until now, no explanation for this discrepancy has been found. Here, we examine the influence of intrusions of mid-latitude air into the polar vortex on these ozone loss estimates. This study focuses on the winter 1991/92, because during this winter the discrepancy between simulated and experimentally derived ozone loss rates is reported to be the largest. Also during the considered period the vortex was disturbed by a strong warming event with large-scale intrusions of mid-latitude air into the polar vortex, which is quite unusual for this time of the year. The study is based on simulations performed with the Chemical Lagrangian Model of the Stratosphere (CLaMS). Two methods for determination the ozone loss are investigated, the so-called vortex average approach and the Match method. The simulations for January 1992 show that the intrusions induce a reduction of vortex average ozone mixing ratio corresponding to a systematic offset of the ozone loss rate of about 12 ppb per day. This should be corrected for in the vortex average method. The simulations further suggest, that these intrusions do not cause a significant bias for the Match method due to effective quality control measures in the Match technique.

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