MLS-related Scientific Publication

Scientific Theme: Atmospheric Chemistry

Comparison of Empirically Derived Ozone Losses in the Arctic Vortex, N. R. P. Harris, M. Rex, F. Goutail, B. M. Knudsen, G. L. Manney, R. Müller, and P. von der Gathen, *J. Geophys. Res.*, **107**, 10.1029 / 2001JD000482, Aug. 2002.

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Summary and MLS Contribution

This paper compares chemical ozone losses in the Arctic polar vortex derived using five different datasets and methods. Separate studies originally published using each of these methods showed qualitative consistency between the patterns of ozone loss, but apparent quantitative discrepancies; however, these studies did not cover the same time periods or calculate losses at the same altitudes, so detailed comparisons were not feasible. In this paper, ozone losses using one method (the "Match" technique, which compares air masses sampled multiple times by a network of ozonesonde balloons) are recalculated for the levels and time periods used in other studies so that more detailed comparisons can be made. This detailed comparison reveals much better quantitative agreement between different methods and datasets that was apparent in the original studies. In particular, studies using MLS data and a model of ozone transport are shown to agree well with the Match results, and with a method that computes ozone losses from vortex-averaged ozonesonde observations, for a number of different time periods.
This work improves our understanding of how well we can quantitatively estimate chemical ozone depletion in the Arctic from existing datasets, and thus helps us to understand the uncertainties remaining in current observations and calculations, and how we may hope to improve on these estimates with future measurements and improved models. This benefits society by improving our understanding of ozone loss amounts and processes.

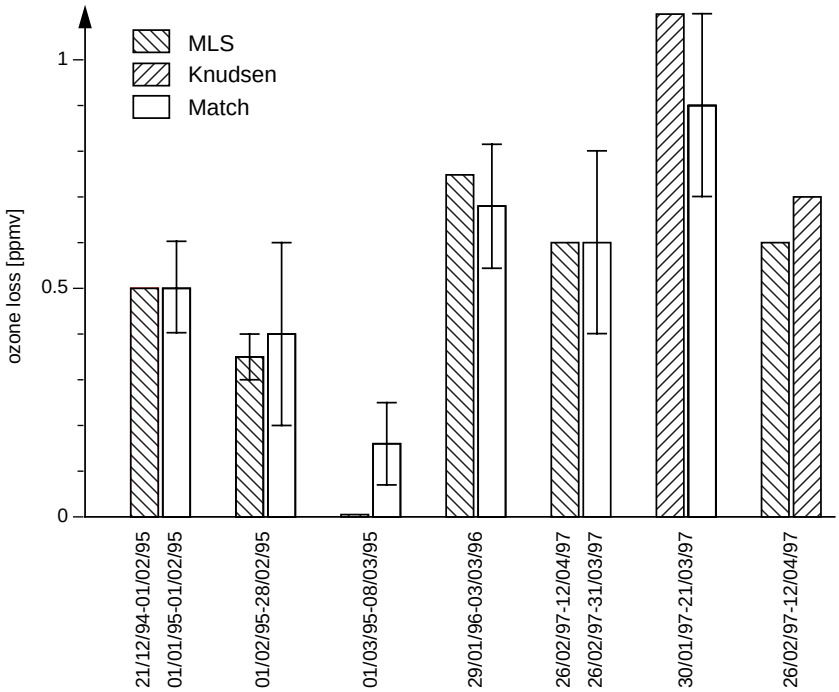

Figure 2. Comparison of accumulated losses in ozone mixing ratio derived from MLS, Match, and a vortex-average approach, at potential temperatures near 475 K (about 19 km altitude). For each comparison with Match, the Match ozone loss rates have been integrated for the same time period and in the same subsiding air mass to allow direct comparisons.