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Unequivocal detection of ozone recovery in the Antarctic Ozone Hole through significant increases in atmospheric layers with minimum ozone

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An important new landmark in present day ozone research is presented through MLS satellite observations of significant ozone increases during the ozone hole season that are attributed unequivocally to declining ozone depleting substances.

For many decades the Antarctic ozone hole has been the prime example of both the detrimental effects of human activities on our environment as well as how to construct effective and successful environmental policies.

Nowadays atmospheric concentrations of ozone depleting substances are on the decline and first signs of recovery of stratospheric ozone and ozone in the Antarctic ozone hole have been observed. The claimed detection of significant recovery, however, is still subject of debate.

In this talk we will discuss first current uncertainties in the assessment of ozone recovery in the Antarctic ozone hole by using multi-variate regression methods, and, secondly present an alternative approach to identify ozone hole recovery unequivocally.

Even though multi-variate regression methods help to reduce uncertainties in estimates of ozone recovery, great care has to be taken in their application due to the existence of uncertainties and degrees of freedom in the choice of independent variables. We show that taking all uncertainties into account in the regressions the formal recovery of ozone in the Antarctic ozone hole cannot be established yet, though is likely before the end of the decade (before 2020).

Rather than focusing on time and area averages of total ozone columns or ozone profiles, we argue that the time evolution of the probability distribution of vertically resolved ozone in the Antarctic ozone hole contains a better fingerprint for the detection of ozone recovery in the Antarctic ozone hole. The advantages of this method over more tradition methods of trend analyses based on spatio-temporal average ozone are discussed.

The 10-year record of MLS satellite measurements of ozone in the Antarctic ozone hole shows a significant change in the distribution of ozone. The occurrence of extremely low ozone (near 100% ozone depletion) has been declining significantly in favor of the occurrence of low ozone (80-90% ozone depletion).

Finally the potential for continuation of this attribution method in the light of the currently available and future planned satellite remote sensing capacity will be shortly addressed.