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The influence of polar vortex ozone depletion on NH mid-latitude ozone trends in spring

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Abstract. Reverse domain-filling trajectory calculations have been performed for the years 1993, 1995, 1996, 1997, and 2000 to calculate the spreading of ozone depleted air from the polar vortex to midlatitudes in spring. We find that for these years with massive Arctic ozone depletion the zonal mean total ozone column at midlatitudes is reduced with between 7 and 12 DU in the April-May period. The polar vortex and remnants have preferred locations which leads to longitudinal differences in the midlatitude ozone trends. Together with decadal variations in circulation the dilution of ozone depleted air may explain the major fraction of longitudinal differences in midlatitude ozone trends. For the period 1979–1997 the dilution may explain 50% of the longitudinal differences in ozone trends and for the period 1979–2002 it may explain 45%. The dilution also has a significant impact on the zonal mean ozone trends in the April-May period. Although uncertainties are large due to uncertainties in the ozone depletion values and neglect of ozone depletion in other years than 1993, 1995, 1996, 1997, and 2000 we have tried to calculate the size of this effect. We estimate that dilution may explain 29% of the trend in the period 1979–1997 and 33% of the trend in the period 1979–2002 as a lower limit.

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