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Variability and trends of total O₃, Cl_y and F_y in relation to the Montreal Protocol from long-term FTIR observations at the NDACC Primary Station Zugspitze

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A previous study on a possible response of Cl_y in response to the Montreal protocol has shown a stabilization at high levels after 1998 [Rinsland et al., 2003]. We show here our results from an updated study, including ozone and F_y. The goal is to characterize the further trend evolution, i.e., whether a turnover has occurred meanwhile, or not. The results from the Zugspitze FTIR long term series are presented and compared with KASIMA CTM modeling results.

A second aspect of our study is to investigate to which degree extreme low-ozone polar and subtropical air intrusion events contribute to mid-latitude ozone loss. This issue can only be addressed if a quantitative modeling of this type of atmospheric (filament-type) singularities can be achieved. Therefore, selected extreme intrusion events observed by the mid-latitude Zugspitze/Garmisch FTIR measurements were analyzed, and it was investigated to which degree the KASIMA model is able to simulate these singularities. We quantitatively compare Zugspitze FTIR and different version KASIMA results for a polar intrusion to the Zugspitze on 5 March 1996, which was the strongest perturbation of the HF/HCl ratio ever observed at mid-latitudes [Sussmann et al., 1998].

References

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