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Comparisons between ground-based FTIR and MIPAS N_2O and HNO_3 profiles before and after assimilation in BASCOE

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Abstract. Within the framework of the Network for Detection of Atmospheric Composition Change (NDACC), regular ground-based Fourier transform infrared (FTIR) measurements of many species are performed at several locations. Inversion schemes provide vertical profile information and characterization of the retrieved products which are therefore relevant for contributing to the validation of MIPAS profiles in the stratosphere and upper troposphere. We have focused on the species HNO_3 and N_2O at 5 NDACC-sites distributed in both hemispheres, i.e., Jungfraujoch (46.5° N) and Kiruna (68° N) for the northern hemisphere, and Wollongong (34° S), Lauder (45° S) and Arrival Heights (78° S) for the southern hemisphere. These ground-based data have been compared with MIPAS offline profiles (v4.61) for the year 2003, collocated within 1000 km around the stations, in the lower to middle stratosphere. To get around the spatial collocation problem, comparisons have also been made between the same ground-based FTIR data and the corresponding profiles resulting from the stratospheric 4D-VAR data assimilation system BASCOE constrained by MIPAS data. This paper discusses the results of the comparisons and the usefullness of using BASCOE profiles as proxies for MIPAS data. It shows good agreement between MIPAS and FTIR N_2O partial columns: the biases are below 5% for all the stations and the standard deviations are below 7% for the three mid-latitude stations, and below 10% for the high latitude ones. The comparisons with BASCOE partial columns give standard deviations below 4% for the mid-latitude stations to less than 8% for the high latitude ones. After making some corrections to take into account the known bias due to the use of different spectroscopic parameters, the comparisons of HNO_3 partial columns show biases below 3% and standard deviations below 15% for all the stations except Arrival Heights (bias of 5%, standard deviation of 21%). The results for this species, which has a larger spatial variability, highlight the necessity of defining appropriate collocation criteria and of accounting for the spread of the observed airmasses. BASCOE appears to have more deficiencies in producing proxies

of MIPAS HNO_3 profiles compared to N_2O, but the obtained standard deviation of less than 10% between BASCOE and FTIR is reasonable. Similar results on profiles comparisons are also shown in the paper, in addition to partial column ones.

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