



Sequential and Four-Dimensional Variational Assimilation of MIPAS Observations: Comparison and Evaluation of Long-Term Results

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The OI (optimum interpolation) method is a well established technique for sequentially assimilating chemical species as observed by remote sensing instruments over extensive time periods. However, its practical implementations are in general not optimal with respect to data assimilation theory. 4Dvar (four-dimensional variational analysis), on the other hand, can give fully consistent analysis of the atmospheric chemical state, but still requires huge computing power. At DLR the ROSE and the SACADA chemistry-transport models are applied to assimilate ENVISAT data operationally. Both assimilation systems cover the stratosphere and lower mesosphere using comparable chemistry. In this paper we will present the 4Dvar SACADA system and compare results to OI ROSE. Additional comparisons will be made to HALOE and ground based stations. We will use the standard MIPAS-ESA data set covering 2002-2004 to investigate the pros and cons of OI and 4Dvar with respect to the MIPAS base species O₃, H₂O, HNO₃, CH₄, N₂O and NO₂. As an additional consistency check for data assimilation, chi squared parameters and observation minus first-guess errors will be discussed in detail.