



Trends in the Vertical Distribution of Ozone in the Lower and Middle Stratosphere

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We developed a new statistical method allowing to reconstruct the vertical distribution of ozone from total ozone measurements by using meteorological information on adiabatic air transport derived from ERA-40 analyses and the fact that ozone column amounts are sensitive to air mass excursions at the different isentropic layers. These two sources of information were combined using a data assimilation approach based on Kalman filtering. The method was applied to TOMS and GOME total ozone observations of the period 1979-2003 carefully homogenized by the National Institute for Water and Air research of New Zealand (NIWA) to establish a 3D data set of ozone volume mixing ratios with daily and global coverage. A standard multiple linear regression model was applied which includes explanatory variables describing the influence of the solar cycle, the QBO, volcanic eruptions, the strength of the Brewer-Dobson circulation, and Arctic ozone depletion. Here we will focus on the analysis of Northern Hemisphere ozone trends and will address the question how mid-latitude ozone variability and trends are influenced by these factors. This study complements the analysis of ozone sonde profile measurements which are measured for sufficiently long periods only at a few sites and of satellite profile measurements of SBUV and SAGE which either have a limited accuracy in the lower stratosphere (SBUV) or have a significantly reduced temporal coverage compared to total ozone observations (SAGE) impeding the analysis of long-term trends.