Atmos. Chem. Phys. Discuss., 4, S268–S269, 2004
www.atmos-chem-phys.org/acpd/4/S268/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The impact of anthropogenic chlorine, stratospheric ozone change and chemical feedbacks on stratospheric water" *by* T. Röckmann et al.

Anonymous Referee #1

Received and published: 17 March 2004

This paper presents a study of various chemical influences on methane in the upper stratosphere, and the resulting influences on stratospheric water vapor. The authors consider the direct effects of changes in chlorine, stratospheric ozone and OH (associated with water vapor changes). The direct influence on methane, and resulting changes in upper stratospheric water vapor, are calculated for different time periods, and compared to HALOE observations for 1992-1997. The main result is that these chemical influences can contribute sizeable amounts of methane and water vapor changes in the upper stratosphere during the past 20 years (when chlorine and ozone exhibit relatively large changes); they appear to explain about half of the observed methane changes during 1992-1997. These chemical effects are not large for the future simulation out to 2050.

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While the study is interesting and relevant to understanding upper stratospheric variability, the concepts are not new. Nedoluha et al. (GRL, 25, 1998, p. 987) presented an analysis of the HALOE CH4 observations, and studied the exact chemical mechanisms (and solar variability) discussed here. Considine et al (JGR, 106, 2001, p. 27711) also studied upper stratosperic methane and water changes using a 2D model (very similar to the Mainz 2D model used here), commenting on the chemical influence of chlorine. Both of these papers showed that the chemical effects produce smaller methane changes than observed in the early HALOE record (consistent with the present study), and suggest that stratospheric circulation changes (associated with Mt. Pinatubo) could explain the rest. The present study extends the earlier work by directly calculating the separate chemical terms, explicitly showing the water vapor changes, and including predictions of future behavior. However, these are not novel ideas or striking new results, and overall I think the new science in this paper is marginal.

If the paper is accepted, one suggestion is to add a figure showing time series of the various model results, and include updated time series of the HALOE measurements (this will highlight the chemical variations explained by the model, plus the (substantial) variability that is unexplained).

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 833, 2004.