

## ***Interactive comment on “The origin of ozone” by V. Grewe***

### **Anonymous Referee #2**

Received and published: 14 November 2005

**ASSESSMENT:** This is a well written manuscript, which aims to differentiate between dynamical and chemical implications for ozone and to answer the question on the ozone production region at any given position.

However, I have some major comments and suggestions described below, which should be addressed before publication in ACP.

#### **COMMENTS AND SUGGESTIONS:**

- The model top layer at 30 hPa seems to be rather low. From figure 2 and 3 it is evident that the main ozone production rates occur near the model top. What kind of boundary layer conditions are applied at the model top? I assume that the conditions at the model top substantially affect the ozone production rates and the transport time scales.

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In addition, the upper branch of the Brewer Dobson Circulation extends to higher altitudes than 30 hPa in a real atmosphere. Here it is forced into the top model layer. This point is shortly addressed in the discussion section (page 9653, lines 6-15). But I fear that the resulting errors in the dynamical turnover time might accumulate and mask errors occurring in the chemical production rates.

I would like to see this point discussed in much more detail. It would also help very much (if possible) to see the results presented here compared to a simulation with a chemistry climate model extending to higher altitudes and covering the Brewer Dobson circulation properly.

- model description, page 9644, line 15:

Please explain the convective parameterization scheme in more detail. Convection is essential for upward transport to the tropopause region and the lower stratosphere especially in the tropics. The convection scheme is crucial for transport time scales, mixing rates, and chemical lifetimes. In addition, it is coupled to the lightning NO<sub>x</sub> production. It would therefore be delighting to know more details about the convection scheme.

- page 9649, lines 15ff:

How is the tropopause defined here?

It is not clear to me, why the distinction between tropospheric and stratospheric regions are chosen only so roughly in this study (table 1 and fig.1). Especially, when calculating stratosphere-troposphere exchange, the contributions from the different regions might differ substantially, if a more realistic distinction between stratosphere and troposphere is used. Please explain and discuss this in the manuscript.

TECHNICAL CORRECTIONS:

- Abstract, line 18:

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You certainly mean "upper troposphere" in stead of "upper tropopause"

- Introduction, page 9643, line 5:

replace "but than" by "but then"

- page 9647, line 2:

replace "20 hPa an 40 N" by "20 hPa and 40 N"

- page page 9655, line 3

replace "may too large" by "may be too large"

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9641, 2005.

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