

## ***Interactive comment on “Case studies of ozone transport between North America and Europe in summer 2000” by G. Guerova et al.***

**G. Guerova et al.**

Received and published: 10 October 2005

We are much grateful to the Referees for their valuable comments on this manuscript. The critical remarks and comments will help to improve the quality of the work. Here is a summary of our intentions and responds to the questions raised by the three anonymous Referees (Ref#1, Ref#2 and Ref#3).

**Reply to the general comments of Ref#1, Ref#2 and Ref#3**

Title:

Based on remarks of Ref#2 and Ref#3 we will change the title to reflect better the focus of the work.

Introduction:

We agree with the suggestion to extend the introduction. The suggested manuscripts as well as others will be taken into account.

Section 2, 4:

We will rewrite sections 2 and 4 to avoid unnecessary lengthen of the manuscript. In particular, we will rewrite section 4 following Ref#2's suggestions, and will introduce a table to summarize our findings on individual events.

Section 5.1:

We agree that the model is not capable to reproduce very well the ozone observed at Jungfraujoch (JFJ). Unfortunately, our model does not offer a better representation of this site. To our knowledge there is no tracer continuously observed at JFJ which could be used to identify easily long range transport (LRT) events. CO observations were initially included in our work, but this did not help to identify clearly the LRT events. This section will be however improved, as further detailed in the following.

Section 6:

This section will be rewritten to include a more detailed discussion on the results and uncertainties.

**Reply to the specific comments of Ref#2**

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“In section 3.2 it is mentioned that the model underestimates ozone in the FT. Some possible explanations/uncertainties are given (stratospheric downward flux, uplift of EU sources, transport from North America). What implications can this have on the mixing ratios given: NA-O<sub>3</sub> in the FT over EU 10-13 ppb? Does it mean that the influence from NA-O<sub>3</sub> can be about twice as high as given in this paper? These uncertainties should be discussed in more detail in the conclusions.”

The GEOS-CHEM model has problems to reproduce the mid-troposphere (e.g. 500 hPa) seasonal cycle of ozone at mid-latitudes. We believed this is due to a lack of seasonality in the stratospheric flux as discussed in Bey et al. (2001) and Fusco and Logan (2003). We do not have any clear indication on possible problems in the representation of mixing between the boundary layer and the free troposphere. However, the contribution of sub-grid scale processes is not well known and could not be discarded. We will try to introduce more discussion on that subject in the next version of the paper.

“Further, in section 4.2 it is not clear how much of the description of the single LRT events (1-9) is adopted from Li et al. (2005).”

This point will be clarified. In general we only used Li et al. (2005) work to identify the number and places of cyclogenesis over continental US.

“The black contours of the continents are well highlighted in Figure 10-13. However, in Figure 5-8 the line strength and the size of the labelling of the axes should be increased.”

We will take into account this comment.

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“Fig. 10-13 (d-e) perhaps use dark green instead of the light green colour (more pronounced)?”

We will take into account this comment.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 6127, 2005.

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