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Interactive comment on "Evaluating the potential of IASI ozone observations to constrain simulated surface ozone concentrations" *by* G. Foret et al.

M. Weber (Referee)

weber@uni-bremen.de

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This study evaluates the potential use of IASI satellite measurements of tropospheric ozone to constrain surface ozone in a regional data assimilation scheme, here applied over Europe. Most IR sounders like IASI and TES have very limited sensitivity to the PBL layer, so the question arises how free tropospheric ozone, well measured by IR sounders like IASI, can help in constraining modeled surface ozone.

This study uses passive tracers in a regional model to investigate how much ozone from a given level in the free troposphere subsides into the planetary boundary layer and to the surface. The idea promoted here is: the higher the fraction that reaches the surface, the more effective the constraint from satellite observations will be. On the other hand, one could argue that models that assimilate satellite observations will

anyhow force model results towards observations, and errors due to the limited sensitivity to PBL ozone will be effectively incorporated into the model as well. That leaves the question how surface ozone in the model can be indeed improved using thermal IR nadir sounders like IASI. This discussion is central to this paper given the paper title but, however, is absent here.

In another study, also cited in this paper, Parrington et al. (2008) have assimilated TES observations (which are similar to IASI) and claim improvements in modeling surface ozone in the US. This study should be critically evaluated and discussed in this paper and implications for/from this study indicated. IASI is also operating since 2006, so data assimilation with IASI ozone profiles is possible, but not done here.

This paper solely focuses on subsidence of ozone from the free troposphere to the surface above Europe using passive tracer experiments. In the first part passive ozone tracers are initialised at different altitude levels and their evolution over successive four day periods during two European summers are followed, and secondly, a passive tracer profile mimicking the averaging kernels from IASI is used. The major results are that 1) only free tropospheric ozone below the 500 hPa level subside to the surface and 2) subsidence is strongest in the southeastern part of Europe. This second result was also confirmed by the IASI passive tracer experiment. The methodology is sound, but processes other than subsidence (convection, chemistry, horizontal tensport etc.) are not covered here. It seems that the paper promises less than what the reader may expect when reading the title of this paper.

With regard to the passive tracer experiment, some additional major issues remain.

1.) The handling of boundary conditions is not well explained. What happens if the major wind direction comes from outside the model domain of Europe. This may lead to underestimation of subsidence in certain regions of Europe. This may put a question mark to the 2nd result of this study. In the hot summer of 2003, I would have expected that strong subsidence may occur over a more extended region in Europe than in 2004,

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but yet the results look very similar for both years.

2.) It would be nice to describe the mean European summer meteorology by adding wind maps and pressure maps for 2003 and 2004 to the paper

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