

## ***Interactive comment on “The impact of free convection on late morning ozone decreases on an Alpine foreland mountain summit” by J.-C. Mayer et al.***

### **Anonymous Referee #1**

Received and published: 4 April 2008

#### General comments

This paper describes an interesting phenomenon of atmospheric transport under conditions of free convection. A convective injection of ozone depleted surface layer air into levels above the top of the atmospheric boundary layer was observed. This phenomenon was investigated in a detailed analysis of one event using data from one station at the top of Hohenpeissenberg and two stations at the base of the mountain measured by various instruments, including a SODAR-RASS and a tethered balloon system. It was shown that such events may have occurred on 18% of the days over a five-year period at this location. The validity of the automated detection scheme to

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identify ozone drops at the top station is very critical for the validity of this conclusion. From my judgment, this scheme is able to reliably detect drops in ozone concentration. However, it gives no indication if the process behind this drop is related to free convection or not. Although there are some indications for the free convection theory, e.g. diurnal distribution, there may also be other processes involved as reason for some of the ozone drops. Therefore, the authors should weaken their conclusion in this respect. It would be interesting to see if and how frequent such phenomena occur also at other locations. At the moment the relevance of this phenomenon for atmospheric transport processes in general cannot be evaluated.

The paper is well-structured and worth publishing. The technical quality of the presentation is good. The use of the English language is poor. The use of tenses is not always consistent. The paper needs quite a bit of work to make it easier to understand. It might be good to simplify the title to the following: The impact of free convection on late morning ozone concentration upwind of a mountain summit.

#### Specific comments

p. 5438, l. 24 Nitric oxide rather than nitrogen oxide

p. 5440, l. 7 Are you certain that it is nitrous acid?

p. 5440, l.11 replace overtop by is higher than

p. 5440, l. 23-25: Use past tense instead of present perfect.

p. 5442, l. 27: Do you mean the 'barometric formula'?

p. 5443: l. 11: The commonly used term is 'acceleration due to gravity'.

p. 5444 l. 14-20 please give an example using Fig. 2 and simplify the writing

p. 5447, l. 16 To gain some insight. There are many expressions like this that should be changed.

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p. 5448, l. 8: 'crashed' is maybe not the appropriate word, I'd prefer 'dropped' or 'collapsed'

p. 5448, l. 9: 'Coincidentally' instead of 'Coinciding';

p. 5450, l. 10: 'above' instead of 'aloft';

p. 5455: l. 24: 'temporary' instead of 'temporal';

p. 5456: l. 11: What do you mean by the altitude of the wind direction change? Doesn't the wind direction change at all altitudes at some point?

p. 5457: l. 4: The main reason why the CBL was not higher than the mountain top at the time of the ozone drop is probably that it occurred relatively early in the day.

p. 5457: l. 5: You just argued that the CBL height was lower than the Hohenpeisenberg summit. Therefore, you should write something like 'Convective injection of surface layer air into levels a b o v e the ABL'.

p. 5458, l. 14: I'd prefer 'justified' instead of 'done'.

p. 5459, l. 14 ff: How certain can you be in identifying similar phenomenon, when you don't have all the other observation but only the ozone concentration time series at the top of the mountain. Wouldn't it be possible that other processes than free convection may have been the cause of these drops?

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 5437, 2008.

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