

Interactive  
Comment

## ***Interactive comment on “A numerical study of mountain waves in the upper troposphere and lower stratosphere” by A. Mahalov et al.***

### **Anonymous Referee #1**

Received and published: 30 March 2011

This paper is a solid case study of the impact of vertically propagating mountain waves on the dynamics and the distribution of trace gases in the upper troposphere/lower stratosphere (UTLS) region. It combines in-situ airborne observations and numerical modelling. A successful application of a novel, recently published numerical approach (nesting of a LES-type model into a mesoscale weather prediction and research model) demonstrates the huge potential for future analyses of aircraft data.

In the study, the appearance of small-scale instabilities due to Kelvin-Helmholtz instabilities is deduced convincingly. Furthermore, the fluctuations of trace gases as O<sub>3</sub> and CO are discussed and their variability is explained.

Altogether, the paper is well written and logically structured. There are only minor comments, otherwise, the paper can be accepted.

C1354

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



## MINOR COMMENTS

The discussion in section 6 never mentioned the term "tropopause" (surprisingly for a paper on the UTLS, it appears only 5 times in the text). I believe, it is a known fact that the observed vertical gradients of O3 and CO are a signature of the tropopause. Can a PV-diagnostic as computed from the model results help to classify the observed air masses as being located in the above/below the actual tropopause??

## GENERAL

page 8: what is the meaning of ARW in WRF-ARW?

page 12 lines 7/8: try to avoid qualitative statements as "The observed and simulated profiles are in good agreement." This says nothing; specify the min/max or the mean standard deviations! See also page 18, line 12, page 21, line 11,

page 12, last paragraph: could you estimate if the vertical profiles of the Scorer parameter would allow for trapped waves and support your findings in such a way by predictions from linear theory?!

page 16, 1st paragraph: "The short-wavelength co-spectrum peak is not present at lower levels; this confirms that these short-wavelike fluctuations do not originate at mid- and upper-tropospheric levels." I don't understand the logic of this sentence. Isn't it just the opposite you want to conclude??

page 19: here, I expect a more physical discussion about the sampling in different air masses related to the tropopause.

page 19, line 10: "In an other hand" = "On the other hand" ?? Also on page 20, line 27.

page 19, line 22: delete one of both "negative"

page 20, line 20. Capital letter in Looking

Use SI units and their abbreviations ("h" instead of "hrs" and so on)

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



## FIGURES

There are 21 figures, some of them could be omitted (e.g. Fig. 1 or Fig 10), some could be combined (Figs 2 and 6,7). Generally, the quality is good. However, the readability of Fig. 18 could be enhanced by using different colors for the aircraft observations instead of dashed lines.

## REFERENCES

- typing errors in Moustouli et al. 2010 (Grubisic), Plougonven et al. 2008 (Plougonven)

not cited in the text:

Dornbrack, A.: Turbulent mixing by breaking gravity waves, *J. Fluid Mech.*, 375, 113-141, 1998.

Wicker, L. J. and Skamarock, W. C.: Time splitting methods for elastic models using forward time schemes, *Mon. Wea. Rev.*, 130, 2088-2097, 2002.

not resolved in the reference list:

Fritts and Alexander, 2003 Dornbrack et al., 1999

---

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 11, 4487, 2011.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

