

Interactive comment on “Quantification of topographic venting of boundary layer air to the free troposphere” by S. Henne et al.

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1) For the mass budget calculations in the Leventina Valley, the authors assume that the valley flow is stationary over the 2-hour time difference between cross-sectional flights. The authors base this assumption on surface measurements which deviate 16% from the 2-hr averages. There are several problems with this. First, surface measurements are not necessarily representative of the temporal evolution of the valley flow aloft. Depending on the topographical features of the valley (shape, orientation, etc), the surface flow may peak earlier than the flow aloft. This has been observed in the Wipp Valley. Second, if it were assumed that surface measurements are indicative of the valley flow aloft, then it would be useful to determine the increase in wind speed over the 2 hours. Calculating the deviation in surface wind speed from the 2-hr average does not seem to be the same. Third, it appears that the lower cross-section ($F_{y,in}$)

was measured later than the upper cross-section ($F_{y,out}$) (indicated in Figure 3). If the cross-sections were obtained before mid to late afternoon, then there is a good chance that the valley flow was still gaining in strength. The order in which the cross-sections were obtained would then exaggerate the along-valley mass flux convergence and therefore the vertical mass flux.

2) The authors extrapolate the export rates derived for the Leventina and Mesolcina valleys to the whole Alpine region. This assumes that all valleys experience along-valley mass flux convergence. However, along-valley mass flux divergence has been observed in the Inn Valley (Freytag, 1987) and in the Kali Gandaki Valley (e.g. Egger et. a., 2000). More recently, along-valley volume flux divergence has also been observed in the Wipp Valley, a tributary to the Inn Valley (Rucker, 2003). Not only do these observations make the present extrapolation of vertical export rates to the whole Alpine region questionable, it also suggests that air in an Alpine valley may not entirely originate from the plain.

References:

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