

## ***Interactive comment on “Contribution of advection to the carbon budget measured by eddy covariance at a steep mountain slope forest in Switzerland” by S. Etzold et al.***

**Anonymous Referee #2**

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### General comments

The manuscript of Etzold et al. presents interesting results for the net ecosystem exchange (NEE) of CO<sub>2</sub> at a very steep alpine site and demonstrates the possibility of flux measurements at such sites. The advection is assessed by a very simple set-up and the results are cross validated by more than one independent approach. Therefore, it provides valuable results worth publishing. All figures are of good quality. However, I agree with the referee1 that the budget equation should be developed more carefully (including all terms) and I have concern about using two different integration heights within one budget equation a priori. The structure of the text should be improved in

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that way that the reader is better taken through the text. I recommend the paper for publication after careful revision.

### Specific comments

P1638 Site description: I think, it would be useful to get some basic information about the main wind directions. I would also prefer some information (in terms of °) about the upslope and downslope direction of the slope.

P1638 Instrumentation: What are the measurements depths for soil heat flux, soil temperature and soil moisture?

P1638 CO<sub>2</sub>-concentration profiles: I would prefer if first one profile measurement is completely presented and then the second one. I am also puzzled throughout the text by the used reference heights. Often, it does not become clear what the respective reference point is. For which area is the topographical minimum representative?

P1640L19-20 I have always problems with the term "correction. I assume the CO<sub>2</sub>-fluxes (EC-fluxes) are best estimates according to the state of the art. Therefore, I would prefer the term "completed mass balance" following Aubinet et al. (2010).

P1641 Integration height: At this point, there is no reason to set the integration height for horizontal advection to 2 m. I have problems with the dimension of the CO<sub>2</sub>-concentration gradients.

P1644 Eq. 6: At least it should be noted that storage terms are neglected. Equation number for next equation is missing.

P1644L5-15 Some information of this part would be more suitable in section "Site description" (e.g. soil heat flux measurements).

P1644L15-17 It remains open which statistical analyses for which term are carried out with the software package R.

P1645 discussion of Fig. 7b: Unfortunately, a sign convention is not given and should

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be added. Usually, a positive storage change indicates an increase of the storage i.e. CO<sub>2</sub> is added to the storage. Under this assumption, I cannot see a sharp depression of the storage term in the first half of the night. The storage change is smaller but still positive. Therefore, the storage increases and does not decrease. If this holds then also the subsequent discussion should be revised.

P1646L25 "That is, the growing SNBL....." . This gives the impression that the SNBL is growing right from the bottom of the valley. I think, this is not what you mean.

P1647L9 How did you define this threshold?

P1648 I am often mixed by inspected different time periods.

P1648L14 "- 1day"; I do not understand this "-1day".

P1652 different estimates of Reco: I would find it useful if the different Reco estimates would be introduced in the part "Method", explicitly.

Table 1 and Table 2: Do they correspond both to the period May to August 2007?

Fig. 1 North is not indicated.

Fig. 5 The different heights are confusing. To which period does the Figure correspond?

Fig. 8 In my print version the broken lines are black and solid lines indicate medians.

Fig. 9 I would transfer main parts of figure caption 9 to the section "Methods" (see remark "different estimates of Reco")

Fig. 10 Figure captions. There are no open circles in my print version, only black and grey circles.

Minor issues

P1634L4 The site name is sometimes spelled with "ä" and sometimes with "ae". Please stick to one version.

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P1637L2 "IP" is not introduced.

P1639L10 "Logan" instead of "Loughborough"?

P1648L3 I would remove "sudden" and "short". A peak should be short otherwise it is no peak.

Cited literature Aubinet et al. (2010) Direct advection measurements do not help to solve the night-time CO<sub>2</sub> closure problem: Evidence from three different forests. Agric Forest Meteorol doi: doi:10.1016/j.agrformet.2010.01.016

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