

## ***Interactive comment on “Dependence of CO<sub>2</sub> advection patterns on wind direction on a gentle forested slope” by B. Heinesch et al.***

**B. Heinesch et al.**

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This theoretical remark is correct but introduces, as stated in the comment, no significant modifications of the results.

When performing the vertical integration of horizontal advection (FHA) and vertical advection (FVA), the molar volume of dry air ( $V_m$ ) is considered constant and equal to that at temperature and pressure at a reference level. Over the vertical extent of integration (the height of the eddy-covariance measurement level, i.e. 40m), the mean temperature differences observed are around 2 K, as shown in figure 6. According to the ideal gas law, these non-isothermal conditions will introduce a relative variation of  $V_m$  of  $2/288 = 0.7\%$  only (if background temperature is assumed to be equal to 15°C) on the total height of integration. The assumption of incompressibility therefore introduces an error that is negligible compared to the impact of other assumptions

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made when integrating FHA and FVA as is partially discussed in the paper.

We propose to keep the present formulation in the paper but to state more clearly that incompressibility of dry air is assumed when performing vertical integration of storage and advection terms, and to mention the limited numerical impact of this assumption, commonly made in previous publications.

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**BGD**

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