

Interactive comment on “How well do tall tower measurements characterize the CO₂ mole fraction distribution in the planetary boundary layer?” by L. Haszpra et al.

Anonymous Referee #1

Received and published: 27 January 2015

Review of the manuscript: "How well do tall tower measurements characterize the CO₂ mole fraction distribution in the planetary boundary layer?" by L.Haszpra et al.

The paper is describing the vertical profile distribution of CO₂ in the low troposphere measured at a rural site in Hungary. Input data are combining high precision mole fraction measurements from a 115m high tower and from an aircraft flying over the tower, as well as surface fluxes derived from eddy covariance measurements. The objective of the data analysis is to evaluate how well a tall tower can estimate the mean CO₂ content in the planetary boundary layer. The data analysis is clearly explained and I do recommend the manuscript for publication in AMT after few minor revisions

C4735

suggested below.

Introduction Page 12252: "We present the trade-off between the height of the tower and the accuracy of the CO₂ mole fraction estimation": I would add "...estimation at higher elevation above the tower"

Page 12252: "Is it reasonable to suggest co-located eddy covariance measurements to improve the performance of the tall towers?": ... in terms of representation of the PBL Methodology

Page 12254: "The comparability of the tall tower based and the airborne measurements": I understand that the compatibility of the two dataset is described in details in other papers, but I think you should give the order of magnitude of the possible differences. It should illustrate that they are much lower than the biases you are calculating.

Page 12255: "Estimation height": I don't find this term gives a clear idea of what it is representing. Why not Model height ?

Page 12256: "Gradients are function of depth within the PBL, not absolute elevation above ground": Is it true that 50% of a 1000m or 100m m high PBL give the same bias ?

Page 12258: "if the eddy covariance can be considered as representative to the surrounding region": what is your estimate of the footprint of the eddy flux measurement at 82m a.g.l. ?

Results Page 12264: Specific case of shallow PBL is described for Figure 1 but this case can only be described in Fig.2 with absolute vertical axis.

Discussion In the discussion I am missing two points:

1. can you say something about the representativeness of the Hungarian tall tower/aircraft site ? How well is it representative of a typical tall tower ?
2. regarding the VTT concept that you are promoting in the conclusions, what is the

C4736

sensitivity of the results to the elevation of the eddy covariance system ? Your system is set up at more than 80m above ground level which is quite unusual. Most systems are installed at elevation lower than 20m. Since the footprint of an eddy flux measurement installed at 10-20m would be much smaller than yours 82m setup the added value of the VTT concept to extrapolate the CO₂ vertical profile would probably also be decreased. I would be interested to see a discussion on this point.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 12249, 2014.

C4737