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Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "Intercomparing $CO_2$ amounts from dispersion modeling, 1.6 $\mu m differential absorption lidar and open path FTIR at an c$ release at Caldara di Manziana, Italy" *by* M. Queißer et al.

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## please see attachment

**Interactive comment on Atmos. Meas. Tech. Discuss., 8, 4325, 2015.**



Author's reply to comments of reviewer #2 in AMTD

The authors would like to thank the constructive comments made by the reviewer and the time he/she took. Below please below find the responses.

All changes made to the manuscript are marked in yellow.
Author's replies are marked in green

**We finally propose to not publish the DIAL data as we found that the error introduced by not normalizing is too large to be able to have a useful interpretation of the data (see section 2.5 below). We think that this is a reasonable thing to do as this does not degrade the quality of the paper but on the contrary increases it, because it is less convolved and the take home message is clearer. Some replies have become redundant but we have kept some of them nevertheless. Of course, we need to change the paper title accordingly.**

**Begin of comments**

The study is of considerable interest to the volcanology community because it discusses two rather new techniques for quantitative determination of CO2 concentrations and fluxes: the DIAL and the dispersion modelling. In principle, the combination of the two approaches might in the future be used to determine the CO2 flux emitted from a diffuse degassing region, an application that I believe the authors fail to mention but should be touched upon, as it lends additional importance to their study.

Reply 1:

Changed last phrase of manuscript "(…) an Eulerian dispersion model and an optical remote sensing instrument represent complementary techniques for determining $CO_2$ fluxes in regions with non-uniform degassing, such as $CO_2$ storage sites or volcanoes."

2.1. Difference in light paths. One problem arises from the different light paths chosen for the two open--path instruments. Though the paths are close to one another, the fact that the FTIR path runs at a constant 0.5 m above the ground while the DIAL path starts 1 m above the ground and ends at the ground itself is unfortunate. The first meter of air above the ground in regions of diffuse CO2 degassing such as Caldara di Manziana is characterized by a very strong vertical gradient in the CO2 concentration. The CO2 mixing ratio can approach 100% a few mm above the ground (or water) surface,

**Fig. 1.**