

Interactive comment on “Co-located column and in situ measurements of CO₂ in the tropics compared with model simulations” by T. Warneke et al.

Anonymous Referee #3

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General comments

This paper presents the first CO₂ column measurement with ground-based high-resolution FTS at the inner-tropical site. The values of the CO₂ column measured with the FTS are compared with surface sampling data and TM3 model simulation. The in situ and column measurements and model results are in good agreement. Topics of this paper are fitted into the focus of ACP. Overall this paper is well written, but descriptions and explanations for methods and some words are not sufficient, and they are stated in specific comments. After considering their comments and modifying the manuscript, the modified manuscript should be published in ACP.

C1190

Specific comments

Abstract

Please correct the latitude and longitude of the Ragged Point (7.9S, 14.4W).

1 introduction

The description of motivation in this paper may be not clear and slightly weak. This is the first ground-based column measurement in “inner” tropics. The observation in the region which belongs to the both of northern and southern meteorological hemisphere is important to evaluate spatial bias of CO₂ in the tropical region. It should be better to describe and appeal the importance of ground-based column measurement in the inner tropics and climatological difference from Darwin which belongs to outer tropics.

2 Measurements and data analysis

The characteristics of season in Paramaribo are separately described in “The Intertropical Convergence Zone (ITCZ) migrates twice a year over the measurement site resulting in two dry and two rainy seasons. During the short dry season from February to March the measurement site belongs to the meteorological Northern Hemisphere and during the long dry season from August to November to the meteorological Southern Hemisphere.” and “The air is transported from the Atlantic Ocean to the measurement site by the easterly tradewinds. During the short dry season (SDS) from February to March the air passes directly over the Surinamese coastal region to the measurement site. During the long dry season (LDS) from August to November the air passes frequently over French Guiana resulting in a longer passage of the air over the South American continent, which can also be seen in stronger impact by biomass burning during the LDS (Petersen et al., 2008).” If possible, please organize them.

Readers will be happy if details of these campaigns are organized in the table.

I want to know the reason you used optical infrasil-glass filter and the wavenumber coverage of the filter.

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Please check the description of “The initial vmr-profiles are taken from the GFIT-package and are based on balloon observations at Ft Sumner (35_ N, 104_ W) using the JPL MkIV Interferometer.”, because the description in the current version of GFIT may be different.

3.1 CO2 in surface air

“SDS”, “LDS” and “spring”, “fall” should be unified.

Schematic map would be helpful for readers.

The large variation of flask_surf in the Fig.2 top panel might depend on the time of sampling of the day. Comparison should be made using only mid-day data (air is well mixed by convection). How is the time matching of observation and model?

Most of readers might not familiar with geography around Suriname. It is difficult to imagine the wind system and trajectory of air mass based on only the text.

Ascension Island is too far from the observation site to assume the air uniformity?

In LDS, the eastward grid is downwind of the continent (Brazil)?

Descriptions of C3 plants and C4 plants are needed.

Description of TM3 model is needed.

3.2 Column averaged volume mixing ratios of CO2

The reason of the Spitsbergen scaling factor can be applied to Paramaribo should be described.

The method to sort out the spectra which are affected by cirrus should be explained in detail.

4 Conclusions

I want some more comments from the point of the site belongs to the inner tropical

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area. For example, is there comment against study by Stephens et al. (2007)?

Technical corrections

P. 3174 L. 21 “CO2” should be replace with “Carbon dioxide ”.

p. 7174 L. 10 Use “intertropical convergence zone (ITCZ)” rather than “ITCZ”.

P. 7175 L. 1 “in-situ boundary layer measurement stations” is able to understand, but not so clear. Please clarify.

P. 7175 L. 8 It should be added “(Total Carbon Column Observing Network)” after “TCCON”.

P. 3180 L. 2 Use “XCO2” in place of “The column averaged volume mixing of CO2 (XCO2)”, because “The column averaged volume mixing of CO2 (XCO2)” is already described.

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