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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability and budget of CO_2 in Europe: analysis of the CAATER airborne campaigns – Part 1: Observed variability" *by* I. Xueref-Remy et al.

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The authors thank Referee 2 for his/her constructive comments. We reply to each point here below.

General comments:

* Referee 2: For the better understanding of the regional and global carbon budget we need more information on the distribution and spatial/temporal variation of carbon dioxide and related compounds in the atmosphere, especially in the lower troposphere. Such information also helps the development and validation of 3D atmospheric transport models. Aircraft measurements are still rare because of their costs; therefore any

new data are highly valuable and appreciated. The paper presents new data and address relevant scientific questions, namely the effect of the European CO2 sources and sinks on the carbon dioxide concentration of the lower troposphere. The data obtained during two measurement campaigns are analyzed from several points of view. The descriptions of the campaigns, instrumental setup, methods and environmental conditions are clear. The authors of the paper give proper credit to the work used during the evaluation of their own data. The title of the paper reflects the content of the paper and the abstract gives a concise summary. The structure of the paper is logical. Generally, the text is clear, easy to follow. The only exception might be the description of the semicontinuous Radon-222 daughter sampler. Careful reading is needed to understand the setup. In addition, radon data are not discussed in the paper. I do not think we need the description of an instrument if the data are not used in the paper. I think, the language of the paper could be a bit improved, but the reviewer is not a native English speaker either so he refrains from criticism on language. I do not see reasons for essential changes but I have a few minor comments. My overall opinion is that the paper is suitable for publication in Atmospheric Chemistry and Physics with minor revision.

Answer: The section on Radon instrumentation has been moved to the companion paper. Also, the text has been revised by a native English-speaking colleague.

Specific comments:

* Referee 2: Page 5667, line 15: a earlier -> an earlier

Answer: this has been done

* Referee 2: Page 5668, line 20: requiere -> require

Answer: we have replaced requiere by requires

* Referee 2: Page 5672, line 22: The title of the section should be "In-situ continuous CO2 measurements"

Answer: this has been done

* Referee 2: Page 5676, line 22-24: The authors seem to use the CO2 and CO data from Mace Head station (marine sector) but refer to GLOBALVIEW-CO2 (2006) and GLOBALVIEW-CO (2006) as sources. GLOBALVIEW is not a database, it is rather a data assimilation model product. Later in the text it seems as if the authors used the marine boundary layer reference data from GLOBALVIEW for the geographical position of Mace Head. It should be clarified.

Answer: the authors agree, that a confusion between GLOBALVIEW assimilation products and real data from the RAMCES (LSCE) network has been done. Indeed, the CO2 and CO marine background concentrations at Mace Head have been calculated using the RAMCES (the French greenhouse gases observing network) database. They are calculated using the marine sector concentrations averaged during the duration of the campaigns. All of the references to GLOBALVIEW have been removed from the paper.

* Referee 2: Page 5677, line 4: an horizontal -> a horizontal

Answer: this has been done

* Referee 2: Page 5677, line 9: 37% is mentioned two times concerning the air masses coming from northeast.

Answer: this has been done

* Referee 2: Page 5678, line 7: into the boundary layer -> (with)in the boundary layer ?

Answer: It seems from our English native speaking colleague that into is well appropriated in this context.

* Referee 2: Page 5678, line 27: germany -> Germany

Answer: this has been done

* Referee 2: Page 5683, line 21 and 27: References to Fig. 12 are wrong in this

context.

Answer: Reference to Fig.12 has been removed

* Referee 2: Page 5685, line 25: at least 5 to 8 higher -> at least 5 to 8 ppm higher

Answer: this has been done

* Referee 2: Page 5687, line 6 and page 5689, line 10: Hungria -> Hungary

Answer: this has been done

* Referee 2: Page 5688, line 9: bak-trajectories -> backtrajectories

Answer: this has been done

* Referee 2: Page 5869, line 20: Usually the text has to have a reference to the accompanied figure (in this case to Fig. B1).

Answer: this has been done

* Referee 2: Page 5691, line 11: Drexler -> Draxler (see text: page 5677, line 2)

Answer: this has not been done, as Drexler is the correct name.

* Referee 2: Page 5691, line 15: Hardly accessible publications are not recommended to refer to. Does this thesis an electronic version in the public domain? If yes, please, give the URL. My comment is the same on Pépin et al. (page 5693, line 18-19).

Answer: the reference on Filippi's phD thesis is not very useful and has been removed. The reference on Pepin et al's paper has been kept, but we have added the mention that it is available on demand.

* Referee 2: Page 5691, line 26-28: Gerbig et al. (1999) is not referred in the text. Ramonet et al. (2002) (page 5693, line 21-24) is not referred in the text either.

Answer: the reference from Gerbig et al (1999) has been removed. However, the reference Ramonet et al (2002) has been kept, and added in the text at the beginning

of section 6.

* Referee 2: Page 5692, line 18: Intergovernmental Panel on Climate Change is referred in the text as IPCC. Although, it is understandable, but it would be better to be consequent.

Answer: this has been explicited.

* Referee 2: Table 1: Hegyhatsal has no airport at my best knowledge.

Answer: this is totally true. The airplane landed at 65km eastern of Hegyhatsal in Sarmellek's airport. This has been corrected through all the text.

* Referee 2: Table 3: The tall tower at Cabauw is 213 m tall and its bottom is at 0.7 m below the sea level (see e.g. http://www.knmi.nl/onderzk/atmoond/cabauw/cabauw.html). CO2 measurements are performed at four elevations, including 20 m. It is not clear from the table if data from 213 m or 20 m are used. Similarly, the top measurement level on the Hegyhatsal tall tower is located at 115 m above the ground, but the tower itselfis located at 248 m above the sea level (see http://nimbus.elte.hu/hhs/). In the case of Mace Head the sampling elevation is given as altitude, while in the case of Westerland the station (ground) elevation is given. Please, check and correct the data.

Answer: this has been corrected, and precised in Table 3.

General comment on the figures:

* Referee 2: Most of the figures are too small in the present version to see the details. Hopefully, they will be bigger in the final version.

Answer: we have done our best to enlarged the figures.

* Referee 2: Figure 2: Caption says that wind speed is given in m/s. Would the arrows with numbers in the top right corner be the wind speed scales? Different scales in the different panels are not the best solution.

Answer: To make the comparison easier, we paid attention to produce figures with constant longitude and latitude ranges for the four panels of Fig.2. However, the website interface did not give the possibility to change the scale of the wind fields.

* Referee 2: Figure 8: The caption refers to the left (2 Oct, 2002) and to the right panels (3 Oct, 2002). However, there is only one panel that seems to cover both days.

Answer: this is true, any mention of days has been removed.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 5665, 2010.