

Interactive comment on “Formaldehyde (HCHO) in air, snow and interstitial air at Concordia (East Antarctic plateau) in summer” by S. Preunkert et al.

Anonymous Referee #1

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General comments

This paper reports first combined formaldehyde measurements in the air, snow and interstitial air in Antarctica. Formaldehyde is a key compound in atmospheric chemistry which can play an important role in the HOx budget and therefore it is important to characterize its sources and sinks. This manuscript brings an interesting and original dataset which is thoroughly analyzed through different aspects. Especially the formaldehyde budget is examined and confirms that snow is a net source of formaldehyde at the studied site but simulations with a model allow the authors to conclude that the gas-phase oxidation of methane remains the dominating source. Generally the pa-

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per is clear and well written. Nevertheless, there are some sections which could be improved to help the readiness of the paper (in terms of structure). Therefore I would recommend publication of this paper in ACP once the comments below have been addressed (Please note that my field of expertise covers only partly the results presented here).

Specific comments

The abstract should give the main conclusions (main results) of the paper and therefore should answer the objectives which are described at the end of the introduction. It is therefore recommended to include the important result about snow versus photochemical production contributions to the atmospheric formaldehyde in the abstract.

The introduction could be a bit extended to give some more information about formaldehyde. Even if the authors have already addressed the question of formaldehyde in remote areas in previous papers; a few more information is needed for the readers who do not know these previous works. A short paragraph introducing formaldehyde in general (its main sources and sinks, its lifetime) and its role in atmospheric chemistry and especially in remote atmosphere would allow to have a broader view on the importance of this compound and would better introduce the objectives of this paper.

It is suggested to introduce the “method and field campaign” section with a paragraph to present the overall experimental strategy (explaining that 2 campaigns were performed and how they complement each other).

The 2011/2012 field experiment (P32031, L23): could you give the standard deviation associated to the mean difference? (P32033, L13): “the contamination of firn air became weaker”: would it be possible to quantify this contamination and to show that it did not affect the presented results?

(P32038 L20)The daily cycle mentioned from 14 to 18 December is not clear for me (for example data at midnight have the same value than at 12h). Section 6 mentions

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an amplitude of 45 pptv but this is only valid for the period 19-28 December. Could this be discussed more detailed?

As the paper is currently pretty long, I'm wondering if it could be a bit shortened and more focused on its main objectives (sources and sinks of HCHO in Concordia, section 6). For this, some intermediate results could be presented in the supplementary material and only their main outcome would be presented in the main text. Two sections who could potentially be moved to the supplementary material would be sections 4.3.1 (just mentioning the main conclusion that the "polar snow appears often undersaturated with a particularly large depletion at Concordia") and section 5.2 (giving only the results from this other approach to calculate fluxes and all details being shifted to the supplementary material).

If other sections are shortened, the discussion on the results from the main section (6) could then be slightly extended. Section 6.2 could compare these results with other diurnal cycles of formaldehyde observed in Antarctica (and comments on similarities/differences). The simulations were performed on a mean case; what about case studies for one or two specific days?

Fig.6 : why does the figure mix a simulated value (at 7cm below the snow surface) with observed values?

Technical Comments

P32032, L16 and 19: 29 or 28 December?

Several figures currently are difficult to read (small and often the colors are difficult to distinguish, especially for figure 2).

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 32027, 2014.

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