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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "The travel-related carbon dioxide emissions of atmospheric researchers" *by* A. Stohl

**A. Stohl**

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I thank reviewer 1 for his/her comments and, particularly, for the references. I remember having seen the EGU conference impact assessment but have forgotten to cite this related work, which I will do in a revised version of the paper. I also appreciate the many issues raised by the reviewer. They are all important, although many go far beyond the actual scientific content of the article.

Reviewer 1 says that the method used to estimate the emissions is valid and the data should be accurate. However, his/her main point is that ACPD is the wrong publication platform for this paper. However, I cannot follow this argumentation – in fact, I have carefully selected ACPD for publishing this article. The examples given by the reviewer (his/her references 1-3) are "grey" literature whereas I considered it important that my results withstand the scrutiny of independent reviewers. The paper is well within the

scope of ACPD, as many papers about anthropogenic emissions of various substances have already appeared in this journal. The present article is different from these other emission papers only by the fact that it quantifies the emissions for a certain group of people (scientists) rather than for a certain emission category (e.g., ships, road transport). Why should a paper about, say, emissions from road transport in a particular country be more appropriate for ACPD than a paper about the $CO_2$ emissions by travelling scientists? Just because this concerns ourselves and also raises questions that we find difficult to answer?

Another reason for publishing the paper in ACPD is that ACPD is an open access journal for which I have a strong preference. Nature – which has been suggested by the reviewer – is not accessible free of charge and although I considered Nature's News and Views I have abandoned that idea in favor of ACPD's open access. Another reason why ACPD is most appropriate is its online discussion forum. I have hoped for a greater number of short comments than have been published so far. However, I have been asked about the paper by probably every second colleague I have met since the paper has appeared in ACPD, which proves to me that the paper is in fact reaching its intended audience.

In paragraph 3 on page S3482, the reviewer discusses the representativity of NILU as an example for the travel behavior of atmospheric researchers. This issue is also discussed in the paper where it is admitted that NILU's northerly location may increase the frequency of air travel. However, I doubt that the difference to other institutes is large. Tolonen-Kivimäki et al. (2008), in their comment on the paper, find that researchers from the Finnish Meteorological Institute (FMI) produce comparable $CO_2$ emissions. The difference may be explained entirely by the fact that NILU is a research institute, whereas FMI's main task is providing operational services (e.g., weather forecasts). Many of their employees/scientists are not involved actively in scientific research and are likely to travel less than active researchers.

NILU's experimental activities are most likely less intense than those of most other



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large atmospheric research institutes. While NILU is maintaining measurement stations at Spitsbergen and, since 2006, in Antarctica, NILU's scientists have participated in very few field campaigns during the years considered; most trips were indeed to project meetings. From my own working experience in several countries, I would estimate that scientists in other countries do not travel substantially less than NILU scientists, and they also travel mostly by aircraft (often even for rather short distances because the air tickets are cheaper than the train tickets). Furthermore, NILU scientists normally do not travel in business class (that's why I have used a single emission factor), whereas this is quite common for senior staff at some other European research institutions. In summary, while I can't prove this without seeing data from other institutes, I do not think that NILU's travel-related per capita $CO_2$ emissions are substantially higher than those for other research institutions in Europe.

In paragraph 3 on page S3483, the reviewer states that the study could have been done by anyone using a $CO_2$ calculator on the internet and that it was "well known before that scientists travel often". I fully agree that the calculations presented are rather simple. I also agree that it was well known that scientists travel often. But how often? And was it known how much $CO_2$ is produced as a result? The core value of the study lies in the basic travel information. While other institutes should have similar records, I am not aware of a case where this information has been made available (in fact, some colleagues told me that their institutes have made similar calculations but have never made the result public).

Regarding the $CO_2$ calculators on the internet, I would caution against using them. They are excellent tools for private persons but not for a scientific study, as it is normally not fully documented how $CO_2$ emissions are calculated. Differences between different calculators can be quite large (50% and more for the same flight), and those that I have seen do not actually calculate $CO_2$ emissions but $CO_2$ equivalents. Calculating these equivalents requires very uncertain assumptions on how the impacts from ozone, water vapor, cirrus formation, etc., can be compared to that from $CO_2$. For



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most calculators, these assumptions are either not explicitly mentioned at all, or are not clearly documented.

In the last paragraph on page S3482 and on the following page, the reviewer raises many important societal questions, like whether atmospheric scientists are more aware of their carbon footprint than the average person. Or: whether they do change their travel behavior as a result of that knowledge. Or: whether scientists, including non-travel-related activities produce more $CO_2$ emissions than the average person. Or: whether virtual meetings over the internet could have reduced the $CO_2$ emissions. Or: what was the cost/benefit ratio of the meetings that people traveled to?

I fully agree that these are all important questions but I think it is clearly beyond the scope of this paper to answer them. Also, then ACPD would indeed have been the wrong platform, as these are all questions about society and economic values. Whether a meeting is worth the emissions or not is determined by how the quality of the environment is valued against economic values but also by societal standards. For instance, to obtain research funding from the European Union, it is nowadays just as important to be well connected to other scientists as it is to do good science. Thus, a meeting is more important for a scientist's personal success now than if priorities by funding organizations were changed (e.g., more emphasis on scientific content, less pressure to work in big consortia). Many funding agencies currently pose ethical questions when project funding is sought (e.g., about tests with live animals) but none is asking about the climate impact of the research. This can be changed, of course, if societal priorities change, and then the value of a meeting will also change.

However, one answer is obvious: If the average NILU scientist causes greater annual $CO_2$ emissions just by traveling to meetings (mostly using aircraft, whose emissions of species other than $CO_2$ cause additional climate impacts) than the average world citizen by all her/his activities, it is quite clear that our travel emissions are too high, regardless of the yardsticks that we compare the emissions with (some of them suggested by the reviewer). I consider this as the core result of my study and hope that



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both individual scientists as well as funding organizations will draw their conclusions from it. The personal comments I have received on the paper do show that it has made at least many individual researchers think about their travel behavior. Most of them (virtually from all over Europe, not just Norway) admit that they probably travel too much.

Reference:

O. Tolonen-Kivimäki, H.Tuomenvirta, and A.Laaksonen, 2008: Interactive comment on 8220;The travel-related carbon dioxide emissions of atmospheric researchers8221; by A. Stohl, Atmos. Chem. Phys. Discuss., 8, S27578211;S2758, 2008.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 7373, 2008.



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Interactive Comment