

## Reply to the Interactive Comment by Dr P. Patra

We thank Dr Patra for his interest in our article and his comment. We appreciate also the two references which Dr Patra provided to us.

Dr. Patra wrote:

***“I would like to congratulate the authors for being able to show us the 2-dimensional distributions of age of air. I think the paper would benefit from a comparison (or should I say validation?) of the age of air derived using MIPAS data with those based on balloon-borne measurements of SF6. The latter set of data has much higher accuracy. Here are couple of references, which you may find useful.***

***Harnisch, J., R. Borchers, P. Fabian, and M. Maiss (1996), Tropospheric trends for CF4 and C2F6 since 1982 derived from SF6 dated stratospheric air, Geophys. Res. Lett., 23(10), 1099-1102.***

***Patra, P. K., S. Lal, B. H. Subbaraya, C. H. Jackman and P. Rajaratnam (1997), Observed vertical profile of sulphur hexafluoride (SF6) and its atmospheric applications, J. Geophys. Res., 102(D7), 8855-8859.”***

We agree with Dr Patra that comparison to independent observations or, if possible, validation, is of benefit for each data set, and should be done whenever possible. In the special case of the SF6 and age of air data set presented in our paper, we have provided a number of comparisons:

- The tropical troposphere daily mean SF6 data from MIPAS have been compared to highly accurate ground-based in-situ and flask observations of the NOAA/ESDL network (see Fig. 2 of our manuscript); in particular, comparison to two tropical stations and a global mean has been provided, and good agreement has been found.
- The Northern midlatitude middle stratosphere age of air data have been compared to age of air derived from balloon-borne whole air sampler measurements as published by Engel et al. (2009) (see Figs. 4 and 6 of our manuscript); again, good agreement within the error bars of the observations has been demonstrated.

Further we refer to our previous publication (Stiller et al., 2008) where MIPAS SF6 measurements (single profiles) have been compared to balloon-borne whole air sampler SF6 measurements co-incident in space and time (see Fig. 4 of this paper). For good co-occurrences (in particular when same air masses in terms of potential vorticity were sampled) good agreement within the error bars of the single MIPAS measurements has also been shown. Within this publication we have also demonstrated that the latitudinal distribution of our measurements agrees well with that derived from a collection of air borne samples of the early 1990s (see Fig. 8 of this paper). To reinforce this argument, we'll provide a figure comparing the MIPAS latitude cross-sections at 20 km altitude for all daily means from 2002 to 2010 to the air-borne early 1990s measurements in the revised version of our paper (see reply to reviewer # 1, Fig. 1). Part of the aircraft data shown in this figure are from one of the references Dr Patra pointed to us, namely Harnisch et al., 1996.

Regarding the references pointed out by Dr Patra, we consider as insurmountable difficulty with respect to real validation that the observations described there are not co-incident in time and space to our observations. Given the strong increase of SF6 over the last 20 years or so, we cannot figure out a method which would provide meaningful validation of SF6 using a data set which has been observed 10 years and more earlier than ours. We would need to include so strong assumptions on the temporal evolution of SF6 that the validation could not be considered as reliable. Regarding age of air, we consider it impossible to assign any differences potentially found between age of air derived in the 1990s and from our data unambiguously to changes of age of air over the time, or to measurement

biases. For both cases (age of air and SF6), we consider co-incident observations in space and time as imperative. We are confident that we have used in our paper available data fulfilling this requirement.

Nevertheless, in order to put our paper better in the context of pre-existing work, we will make reference to the suggested papers in the introduction of the revised paper.