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Atmospheric Measurement Techniques Discussions

Interactive comment on "Total columns of H_2O measured from the ground and from space at Observatoire de Haute-Provence in France (44 N)" *by* S. Alkasm et al.

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General comment on the Methodology (section 3)

"The quoted text comes from the referee."

The results obtained using larger and a single domain for all instrument (satellites and ground based) has been done already but it showed a very low correlation and interpretation was not possible: we could not identify the sources of the discrepancies. Note that larger area decreases the correlation coefficient and the challenge was to define the trade off between the number of measurements by instrument in the area with a

straightforward effect to the statistics, and the size of the area (affecting negatively the statistics when measurements are not related). The land-sea gradient appeared when the area was restricted as indicated in the text. A better explanation should have been provided in the text.

"1- Then also explain in more detail how exactly you searched for these domains: did you also search outside of the lat/lon box of figure 1? Why (not)?"

Our objective was to obtain enough observation for the OHP, as explained in the text. Then enlarging the domain would have included domains far from the field of view of SAOZ and Elodie, providing inhomogeneous domains showed by the low correlation coefficient obtained (not discussed in the paper, to be added in the text). Then the Pearson correlation is really a powerful tool for such study because it calculates also the linear dependency of the parameters, the reason why it was chosen. This same correlation is used already in our study but is not presented in the paper, and as been calculated outside the boxes presented in the paper. In the table, we decide to present only results with a correlation larger then 0.75 (arbitrary decision but related to the difficulty to explain not correlated observations), this is clearly missing in the paper and should be added in the future for one or two cases only.

"2- If there are no additional strong arguments in favor of using different spatial domains for the three satellite instruments, then (as mentioned above) I would select one larger spatial domain, or (optionally): (A) one domain to compare the three satellite sensors to SAOZ; (B) another domain (probably over sea) to compare the three satellite sensors to Elodie."

The authors agree with the referee, but when we started this study, the effect of the geo-localization of the measurements was not so obvious. The domains for the satellite observations proposed in the paper are the results of the preliminary search for domains, for both SAOZ and Elodie. We are convinced that such exercise would improve significantly our conclusions and we will try to check it in the future, respecting

the trade off between the number of measurements needed to make statistics and the size of the chosen domain.

"3- As it is now, it is not clear to me what the differences found between e.g. GOME and GOME-2 actually tell me. Do the represent differences between the instruments, or differences between the selected spatial domains?"

We were not able to compare GOME and GOME 2 because the measurement periods were different.

"4- The conclusion that the difference between SCIAMACHY and Elodie is due solely to a different time of observation is not supported by strong arguments. A potential argument could be: (1) we see in summer no systematic bias, (2) the histogram of differences observed follows a Gaussian distribution (please check), which indicates that the differences are random, (3) we see the same random differences if we compare model results (over the same period as the observations) of water vapor columns between two times of the day or night (please check)."

The authors agree with the referee, such argument should be explored and distributions need to be checked in future version of the paper. Note that in the non-systematic bias in summer for SCIAMACHY/Elodie, the geometry of the observations can have an important role.

The authors agree with the referee on all indicated improvements with respect to English writing.

The authors agree with the referee on General remarks on Section 2 and Section 5.

The authors agree with the referee for the suggestions to improve figures and tables

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