

## ***Interactive comment on “Total columns of H<sub>2</sub>O 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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The authors would like to thank the reviewer for the constructive comments.

"The quoted text comes from the referee."

"I- while the exploited satellite instrumentation measures only during the morning), nothing is stated along these lines in the introduction or the summary of the paper. Is the purpose of the work to demonstrate that these instruments can be operated more accurately than other instruments and under which conditions?"

The first motivation for this paper was to demonstrate the validation of the ground-  
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based instruments, SAOZ and Elodie, because they are very long series of total column of H<sub>2</sub>O not explored and not validated before. OHP is representative of Mediterranean region were not so many studies are available for this region.

The secondary motivation for exploiting ground based instrumentation is to validate it to build very long term series. We must notice here that regular spectroscopic observations for astronomy started in 1927 in France as well as from other international sites (Chili for example). Access to the archives will be possible soon and the possibility to retrieve a H<sub>2</sub>O total column data starting 80 years ago is, from my point of view a very valuable motivation. The author should have mentioned it in the introduction as well as the obvious one to build long term series.

"II- My main concern is that the results of the paper are quite likely strongly related and dependent to the selection of the co-location areas (Fig. 1) selected for the various instruments. If a different selection would have been chosen (like the obvious one to use the same quadrangle for all the instruments, optimizing for all statistics), the results would have been significantly different especially with respect to the impact of the sea-land persistent WVC differences (which impact is obviously based on this selection)."

Many different area have been tested for this paper, including the obvious one to use the same quadrangle for all the instruments, but results 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 number of measurements by instrument in the area and size of the area. The land-sea gradient appeared when areas were restricted as indicated in the text. A better explanation should have been provided in the text.

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.

"III) The other main finding ..."

The authors fully agree with the referee and more work is necessary in that direction. Note that the operational analysis were used here, not the forecasts. The week of data presented here is only an example the represent what was regularly observed in the data. The objective of this paper was not a study of Opera operational analysis that is not in our expertise.

Discussion on the Specific comments

"Abstract: The first sentence seems to be incomplete" The authors agree

"Page 4251, l. 9: "Note that these instruments were not initially dedicated" -> to which instruments does the author refer here?" all instruments, SOAZ GOME and Sciamachy were dedicated to the ozone, Elodie to astronomy.

"Page 4251, l. 20: "The objective of this comparison was to build up continuous decadal series of H<sub>2</sub>O data." -> From which instrument? GOME? Please (re-)formulate the objective of the paper clearer. " A combination of GOME and Sciamachy data. We will formulate the objective of the paper clearer

"Is the objective to demonstrate that long-term data- series can be used under certain conditions form the SAOZ and Elodie instrument and for what purposes. Are they expected to be more accurate like the available data from the operational radio-sonde network, or even from MWR or lidars? Or is the latter what will be evaluated by this

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work? (see general comment I)"

See the response to general comment I) above.

"Page 4252, l. 16ff: "One of the objectives of this publication is therefore to bring quality..." -> This objective should be stated in the introduction and in the light of other available and very accurate ground based techniques like the mentioned lidar and micro-wave instruments. What are the advantages of using SAOZ and Elodie above other instrument techniques. How well do both techniques compare to radio-sondes or other ground based instrumentation." See the response to general comment I) above.

"Page 4254, l. 6ff: "ESA has been delivering users three-day.." -> I think this information is not relevant here. The delivery of level-2 and 1 data by ESA should be in the acknowledgment, as well as EUMETSAT should be acknowledged to deliver GOME-2 level-1 data, both in near-real time as offline." OK

"Page 4254, l.17: What does "am" mean in this context?" am and pm indicate respectively morning and evening data in SAOZ data set.

"Page 4255, Section 4: I suggest calling section 4 "results" only and Section 5 "Discussions"." ok

"6- Page 4257, l. 1ff: Why are GOME-2 data not used? In this list the comparisons between SAOZ/Elodie and GOME-2 are not mentioned, while in the next paragraph they are mentioned again. Overall it is not clear why GOME-2 data is mentioned in first place since the data series seem to stop at 2004 with the ground based comparisons, and only inter-satellite comparisons are shown for later periods with GOME-2. Please clarify."

SAOZ vs GOME2 were studied but not presented in this paper

"7- According to the figures previously shown, which compare the monthly averages of H<sub>2</sub>O VCD provided by our instruments..." -> which instruments?" Elodie, SAOZ and satellites. Lets change the text to "the instruments"

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"8- Page 4257, l. 20: "The quantification in Table 3 shows that the differences between..." -> What kind of differences are we talking about here? About the absolute differences between individual co-locations or about the before mentioned "amplitude differences"."

We are talking about amplitude differences here, tex will be changed accordingly

"9- Finally we can say, in the case of instruments..." -> This conclusion is drawn from what?"

This conclusion is drawn from the diurnal cycle study.

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Interactive comment on *Atmos. Meas. Tech. Discuss.*, 6, 4249, 2013.

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