

## ***Interactive comment on “Tropospheric profiles of wet refractivity and humidity from the combination of remote sensing datasets and measurements on the ground” by F. Hurter and O. Maier***

**Anonymous Referee #2**

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This paper shows how wet refractivity profiles can be obtained by an adequate combination of data from different observing systems (GPS, radio-occultation, ground based sensors and balloon soundings). The combination of data is achieved with a so called least squared collocation algorithm. In addition the authors show that by also using temperature profiles from a microwave radiometer relative humidity profiles can be retrieved at the location of the microwave instrument.

It is not easy to see what the authors really want to communicate and what is the benefit for the reader, what can the reader take home from these investigations. There is a risk that a reader will stop reading after a few paragraphs. The main reason for

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this is that the largest part of the paper deals with refractivity, resp. the wet path delay in the atmosphere, a parameter commonly used in geodesy but not in atmospheric investigations.

Path delay and refractivity that depend on humidity and temperature are frequency dependent parameters. Most part of the paper deals with the refractivity what per se is not a problem. Difficulty arises towards the end of the paper when humidity profiles are retrieved at a single location (Payerne) by using data (temperature) from HATPRO, a microwave radiometer able to retrieve temperature AND humidity profiles. The reader might ask why not go the direct way and take the humidity profiles from HATPRO directly.

There are some more questions that arise: The authors show that they use data from a whole network in Switzerland. In principle they should be able to retrieve a map of the refractivity but they only show a profile for Payerne what is somewhat disappointing. The paper shows (p. 4917, line 17) that the combination of GPS etc. plus microwave radiometers can provide humidity profiles. Unfortunately the authors do not point out what they gain by this combination compared to the humidity profiles that are obtained from the microwave instrument alone. In the discussion the authors include some results from lidar but they do not go in depth. As lidar is not mentioned in section 2 I recommend to delete this part. I do not understand why the scale height,  $H$ , is the same in equation (7),(8) and (9).

Some minor issues: p. 4897, line 14 and 15: it should read microwave radiometry and ... solar spectrometry. The radiometer and the spectrometer are the instruments whereas radiometry and spectrometry is the technique. p. 4901, line 4: April 31 does not exist ;- ) p. 4912, line : Explain why the correlation lengths have to be chosen larger for a coarser network Figure 5 is difficult to read Figure 10 is too small

In summary, I recommend publication of the paper after revision with emphasis on explaining and making more clear the link between refractivity and humidity and by

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considering the issues mentioned above.

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