Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2020-311-RC2, 2020

Atmospheric Measurement Techniques Discussions

Interactive comment on "Integrated water vapor and liquid water path retrieval using a single-channel radiometer" *by* Anne-Claire Billault-Roux and Alexis Berne

Anonymous Referee #2

Received and published: 15 September 2020

AMT-2020-311: Integrated water vapor and liquid water path retrieval using a single-channel radiometer Anne-Claire Billault-Roux1 and Alexis Berne

The manuscript presents a single channel retrieval for IWV and LWP using the 89 GHz frequency. The retrieval uses a neural network trained with a synthetic dataset from a collection of radiosonde data worldwide. The coefficients are applied to the test dataset and to real data collected during two field campaigns. The retrievals provide robust, albeit not excellent results. The quality of the retrievals is however good and robust enough to be acceptable when more sophisticated instruments are not available. I found the paper interesting and the results useful considering the difficulty of deploying

Printer-friendly version

Discussion paper

full radiometric suites in many locations.

Overall the exposition is clear and well organized. I have some comments and questions that are listed below:

Line 140: "The first category consists of TB and higher order polynomials (up to fourth degree)" -Do higher order polynomials actually add information to the network? I would imagine that non-linearity is accounted for in the network structure.

Line 157: "In order to avoid this, the dataset was subsampled so that clear-sky and cloudy cases (up to 600 g m−2) would be equally represented;" -I am not sure I entirely agree with this approach. The point here is that neural networks perform better when the training dataset reproduces statistically the true occurrence of the events. Statistically clear sky cases occur more often than cloudy cases so I am afraid that modifying that distribution may actually cause the network to bias the LWP. Note that this is different from what you did earlier to avoid the uneven geographical sampling. In that case the problem was due to an uneven distribution of the monitoring network and the resampling was legitimate.

Section 5.1.1, line 193: Does the retrieval contribute anything to the ERA estimates of IWV? i.e. if you compute the RMSE of the ERA water vapor on the same dataset would you get the same RMSE as the retrievals (1.6 kg/m2) or worse? I see you show this information later on, but it would be useful to also comment on it here.

Section 5.1.2, line 210-2-13: "Similar reasons can help explain why the addition of reanalysis data significantly improves the IWV retrieval, but only in a minor way does it increase the LWP retrieval's accuracy. Liquid water content can vary on a shorter spatial and temporal scale than that captured by ERA5 models." -Another reason is that the 89 GHz is not a water vapor resonance therefore the information content for vapor is less than for liquid water path.

Figs 6, 10, 11, and 12 are a little bit difficult to interpret in my opinion. I am not sure I

understand them entirely. The general conclusion that I would draw from them is that the RMSE is very similar for almost all combinations of input parameters except for two or three combinations. However, looking at the various combinations, is hard to understand the rationale for the different performances. As an example if I look at Fig. 10a I see that the combination noERA-Geo-noSurf has a vastly different RMSE than noERA-noGeo-Surf. Does this mean that the effect of having surface parameters is equivalent to having ERA data? Similarly, for example in fig. 10b I see that the combination ERA-noPWVpred-Geo-Surf has much higher RMSE than ERA-noPWVpred-noGeo-noSurf. I am not sure how to interpret that.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-311, 2020.

Printer-friendly version

Discussion paper