Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2022-33

Anonymous Referee #2

Referee comment on "Machine learning-based prediction of Alpine foehn events using GNSS troposphere products: first results for Altdorf, Switzerland" by Matthias Aichinger-Rosenberger et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-33-RC2, 2022

The paper „Prediction of Alpine Foehn from time series of GNSS troposphere products using machine learning" shows first the selection of the ML methods and then usage of two of them on a GNSS tropospheric data set (tropospheric delays and gradients) to detect the foehn occurrences. It is a very new field of study as most of the GNSS meteorology research focuses on the precipitation/humidity parameters rather as foehn. Also the usage of the machine learning algorithms is interesting. I found the paper very well written. The only drawbacks of the paper are: 1. Sometimes a more extended discussion on the results is lacking, 2. The figures (especially Fig.5-10) could be made more interesting.

Specific comments

Title: since you always work on the past data (even with the NRT approach), it is rather a 'detection' than a 'prediction', so maybe the title could be changed accordingly.

Line 3: 'lee/luv' – a specific terminology, maybe worth explaining (at least in the Introduction, however 'luv' doesn't appear anywhere else than the abstract

Line 68 'COSMO (Consortium for Small-scale Modeling).' -> 'Consortium for Small-scale Modeling COSMO)'; the full name should go before abbreviation

Line 90: This is not the exact formula from Rueger and I think there is a mistake there:

In Rueger there is a following formula:

$$N = 77.6890\ Pd/T + 71.2952\ e/T + 3.75463\times10^5 \cdot e/T^2$$

So if we substitute Pd=P-e then we get

$$N = 77.6890\ P/T - 6.3938\ e/T + 3.75463\times10^5 \cdot e/T^2$$

(should be a minus before the second term). However, I would recommend sticking to the original formulation as then you have a clear distinction between the dry and water vapor parts.

Figure 1: Would be nice to see the topography in this Figure to better visualize foehn

Section 4.1: I would recommend giving here at least very brief overview of the selected methods

Line 163: '(negative) maximum' - > why not use 'minimum' here?

Fig.3 and Table 2 show exactly the same information, so I would recommend removing one of them, especially that Fig. 3 is not even addressed in the main text.

Figure 4: Make the foehn line more pronounced

Line 259: Would be good to comment here what the chosen parameters mean

Figure 5: Maybe you could add vertical lines so the reader can more easily compare the data for particular dates; also you do not comment this plot in the text

Figure 6 and 7: Maybe there is a way to plot them together for better comparisons of the two methods?

Line 284: A more detailed discussion about the features would be advantageous

Figure 9: Why not add here a line also of the match with GB (not only with the adjusted one); also it seems like the event of Oct 2020 was caught by the algorithm but in a different epoch – maybe it is something to look into

Line 312: Would be nice to see here more discussion on why you change the threshold and how it is done