Review for **"Assessing the accuracy of microwave radiometers and radio acoustic sounding systems for wind energy applications"** by Laura Bianco et al. submitted to Atmospheric Measurement Techniques

General comments:

The manuscript presents results from a study of atmospheric boundary layer observations with remote sensing instruments. The focus was on the performance of microwave radiometers and wind profilers for temperature and humidity profiles. These observations were validated by frequent radiosondes and a 300-m high tower. The main findings are well presented and illustrated.

However, the discussion on the observed deviations between the different methods is quite short and incomplete, especially with focus on the microwave radiometers. The observed biases are in the range of calibration and retrieval uncertainties and should be therefore more thoroughly discussed. My main concern is that the observed differences between the two MWR profilers are caused by calibration offsets. To me, this result is not satisfying, and therefore, I suggest this manuscript to be published only after major revision.

The number of figures should also be reduced; the information gain is not very high when having all datasets separated into different months.

Specific comments:

p.8, line 158ff.: Which type of retrieval algorithm was used for the microwave radiometer profiles? You mention here "using historic radiosondes and a regression method or neural network". Please specify which of the two methods has been used? Regression or neural network?

Do you apply a separate algorithm for relative humidity, or do you calculate relative humidity from temperature and water vapor density? Please specify!

The accuracy of microwave profiles in the presence of rain does also deteriorate because of scattering of radiation due to raindrops in the atmosphere, not only due to a wet radome (p.9, line 168). Please clarify!

p. 9, lines 172: the resolution of the profiles (50/100/250 m) is not the "true" resolution of the profile which would be the number of independent layers you can retrieve. Some information on that is given in Löhnert and Maier (2012, AMT) or Crewell and Löhnert (2007, IEEE TGRS). There also uncertainties are given for temperature profiles from microwave radiometers in the lower troposphere. Please also discuss your results in the light of the findings of these two articles mentioned here.

p. 9, lines 176-179: why can't you take the pressure value from the other radiometer and do post-processing of the raw data? With that you could extend your dataset very easily!

p. 11, lines 226ff: To me, this mean absolute error can only be explained by inaccurate calibration of at least one of the instruments, considering the fact that you used the same retrieval algorithm. This could be assessed if the observed brightness temperatures from the MWRs are compared to each other. Another possibility for the inconsistency between the two MWRs could be inaccurate ground pressure or temperature sensors, since these data are included in the retrieval algorithm.

p. 12, line 249: What do you mean by "temperature saturation"? Under an angle of 15°, the atmosphere becomes saturated also for frequencies that are not saturated when zenith looking.

p.12, line 250: Friedrich et al., 2012 do not talk about off-zenith microwave observations.

p.13, lines 270ff: The accuracy might also decrease because of elevated temperature inversions that cannot be detected by the MWR

p.15, lines 312-313: The observable range for wind profilers decreases with increasing frequency, this is a well-known feature.

p. 16, lines 325ff: Again, the bias is most likely caused by calibration uncertainties or application of a not suitable retrieval algorithm.

p.20, lines 428 ff.: The uncertainties in relative humidity are higher due to both the temperature and the water vapor uncertainty that influence this variable.

Technical corrections:

Throughout the manuscript, you use the unit °C for biases, errors and gradients. However, for comparison please use Kelvin "K", since this is an absolute unit. °C is only accepted for actual temperature values. Please change also the figure captures!

p.8, line 156: GHz (not GZ)

p.13, line 271: check phrase in brackets!

p.19, line 409: "10 m AGL" – this doesn't make any sense. Do you mean "1000 m AGL" ?