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Interactive comment on "Differential absorption radar techniques – Part 1: Surface pressure" *by* L. Millán et al.

Anonymous Referee #1

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The paper proposes a DiAR system near the 60 GHz O2 absorption band for retrieving surface pressure. The paper clearly describes the underpinning theory and presents a detailed performance analysis in terms of accuracy and precision for different atmospheric scenarios. The paper is generally well-written and clear. I would like to pinpoint at three areas that may need some improvement.

1. I am not a spectroscopy expert but I would expect possible biases related to the modeling of the absorption band. Is it possible to add an additional perturbation to the ones already used in Table 1 and account for such an uncertainty (e.g. by using a different absorption coefficient model)?

2. It would be informative to mention what are the user requirements for surface

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pressure. I guess the target here is the NWP community.

3. It is difficult to understand the impact of hydrometeor differential absorption. What are the differential PIA signals we are confronting with for instance for the frequency pairs used in Tab.2? And what is the uncertainty on top of such signals produced by PSD variability? Maybe an additional plot could help.

Minor comments:

- Page 5798 after Eq (1). It is a little bit misleading what is said with respect to the normalized surface backscattering (of course for surface the Equation looks a little bit different and it is not just replacing eta with sigma (which of course have completely different units!)

- Calibration uncertainties are expressed in dB not dBZ

- Not clear why the horizontal resolution should be 400mx400m (what is the rationale for that?)

- Page 5804 line 12 and page 5809 line 10 'retrieved' should read 'retrieve'

- Not clear what is the meaning of +-1 dBZ aat page 5804 line20

- Fig6-8 : I am not so sure that the logarithmic scale is the right choice for the histrogram (I do not care if the IWC is causing an error of 0.00001 mb)

- Fig4 and fig5: wrong units for hydrometeor column . It should be kg/m^2

- Fig3: Maybe change the color scheme (2 curves are basically red)

- Fig2: why for the bottom panel there is no reflectivity in the FM simulation above 7km?

- Fig.10 You may cut the x-axis at 6 or 7 hPa

- It is not clear what the numbers reported in the abstract correspond to. Maybe better talk about worst case scenarios or your cumulative distribution; the term 'generally' is too vague.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5795, 2014.