Atmos. Meas. Tech. Discuss., 5, C3214–C3216, 2012
www.atmos-meas-tech-discuss.net/5/C3214/2012/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Novel method for fog monitoring using cellular networks infrastructures" *by* N. David et al.

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Received and published: 12 December 2012

This paper shows some observations of attenuation of between one and two dB on four microwave links during fog. Because attenuation is directly proportional to liquid water content of the fog the method is attractive. Closer insepction of the manuscript reveals fundamental flaws in the technique.

The major problem is revealed in figure four where we see that the attenuation is about 2dB but is recorded with a quantization of 1dB.

It is a relatively simple procedure to convert the attenuation by liquid water in clouds in dB/km to a liquid water content of g/m3; in the Rayleigh regions the relationshiop is linear (see their equation 2). Unfortunately in the paper the coefficient is never quoted. However, looking it up I find that at 20C it is about 0.3db/km/g/m3 at 20GHz and 0.6dB/km/g/mˆ3in So for a link of length 1.6km at 35GHz, 2dB loss would imply about 2 g/m3 of lwc.

This value is unrealistically high for fog. We know that fog is caused by cooling air by a few degrees and such high values are never observed. They do occur in vigorous convective clouds.

At the end of section 2.1 on 'fog identification' there is a discussion on the problemm of the varying background received signal - and the choice of a 'baseline'. This baseline can vary by 1 or 2dB when there is condensation on the radome which is very likely in fog.

The final stage is to convert liquid water content in to visiblity - which depends on the drop size distribution and so introduces further errors.

So why are the results of lwc in the fog too high? I think there are two reaons:

Firstly, as is the case when trying to use microwave links for rainfall measurement, the 1dB quantization level introduces a massive error, Secondly, the background level of the received microwave signal can vary and there is difficulty defining the 'baseline' particularly when condensation on the radome is likely to introduce losses of 1 or 2dB.

CONCLUSION: This paper should be rejected. The example shown is not convincing. The detected changes of 2dB in received power are small compared with the 1dB quantization level. Secondly, the background 'threhsold' baseline can vary. As a result the derived LWC values are error prone. The derived values of liquid water content quoted in the paper of several g/m3 are too high, and are not physicallly sensible for values in fog.

The paper could be written much more succinctly. The method is simple - the coefficient linking db/km with liquid water content should be quoted and plotted at the two frequencies. The associated errors in derived lwc due to quantization and problems with choice of a background level 'threshold' should be discussed.

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Interactive Comment

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5725, 2012.