Atmos. Meas. Tech. Discuss., 6, C2541–C2543, 2013
www.atmos-meas-tech-discuss.net/6/C2541/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Characterization of disdrometer uncertainties and impacts on estimates of snowfall rate and radar reflectivity" *by* N. B. Wood et al.

Anonymous Referee #2

Received and published: 11 September 2013

1 General remarks

This is a very interesting contribution to a research topic that increasingly attracts attention. Radar remote sensing of snowfall is of great interest and a lot of problems have yet to be overcome, until reliable estimates of snowfall intensities can be inferred from such measurements.

The paper at hand deals with the uncertainties that arise with the sampling of snowflakes by means of optical instruments such as the 2D video disdrometer and the snowflake video imager as well as with subsequent modelling of radar reflectivities

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

based on those snow particle measurements. I am very impressed with the quality of the work, especially with the stringent mathematical development of the error model and with the concise presentation of the results.

I am (weakly) disappointed with one fact: every time when I thought that it now becomes really interesting I was consoled with a potential forthcoming work. This criticism applies to the investigation of the uncertainty of the mass density relationship (page 6341, line 3: "While the particle mass-dimension relationship $m(D)$ itself is likely a significant source of uncertainty, the evaluation of those uncertainties is deferred to a forthcoming work.") and the errors that are induced with the assumption of Rayleigh scattering (page 6335, line 16: "For the uncertainty analyses presented here, particles are assumed to scatter per the Rayleigh approximation for spheres. The errors introduced by this assumption are treated in a forthcoming work."). I acknowledge that you might want to treat these errors in a forthcoming article, but then I do not really understand how relevant that your results are in terms of the uncertainty of the radar reflectivity, since, from my feeling and my experience, these two error sources will significantly change the uncertainty values that are published in the current study.

Please find below some few detailed questions and comments.

2 Detailed comments

- **1. (page 6334, line 18):** through instrument → through the instrument.
- **2. (page 6341, line 3-5):** "Since the models use solid ice and liquid water densities and dielectric parameters, these are not expected to be significant sources of uncertainty and are neglected..." → I do not fully agree with this statement, at least not without further justification. The dielectric constant of ice is not that well known, and a wealth of models exist that try to empirically describe it. Depending

AMTD
6, C2541–C2543, 2013

on the model you use, the error you incorporate might be quite large. In addition, the dielectric constant exhibits a temperature dependence. Can you simply ignore it?

- **3. (page 6340, line 9):** "These errors may consist of both systematic biases and random components. Once recognized biases have been corrected, the residual uncertainties are characterized by the covariance matrix S_ϵ." $\rightarrow$ I have not fully understood how you deal with biases. Where and how do you correct these recognized biases?
- **4.:** I have also not fully understood if your errors need to fulfil certain criteria: Do they need to be Gaussian distributed or is this irrelevant?

AMTD
6, C2541–C2543, 2013