Atmos. Chem. Phys. Discuss., 3, S27–S29, 2003
www.atmos-chem-phys.org/acpd/3/S27/

Atmospheric Chemistry and Physics Discussions

ACPD

3, S27–S29, 2003

Interactive Comment

Interactive comment on "Relation between weather radar equation and first-order backscattering theory" *by* F. S. Marzano and G. Ferrauto

Anonymous Referee #2

Received and published: 11 February 2003

As many people in the radar meteorology community are engineers and operational staff, the practical aspects of this highly mathematical paper should be emphasised more, i.e. if one is using high frequencies and or detecting intense rain it is necessary to consider the attenuation within a bin rather than that simply that along the path. The practical aspects are well explained in Section 4 and the Conclusions, but better advertisement of this at the beginning of the paper would allow better communication of the significance of this work to scientists not from a mathematical background. For example, the practical relevance could be put at the head of the abstract rather than the end. Similarly for the impact on inversion techniques in heavily attenuating conditions and the impact on spatial averaging, both of considerable interest currently.

In several places, the mention of radiative transfer theory is associated with the quantification of multiple scattering effects, later qualified to be only first order effects. This could be unified into one sentence to avoid the impression multiple scattering effects have been dealt with.

p1 2 lines up C Band is the most common frequency for the operational case.

p2 Equation 1. Is omega a normal or solid angle here. All vector quantities should use bold font.

p3 It would be useful to have a figure explaining the coordinates system, showing a radar beam and a range volume.

p3 Reference for equation 3

p3 7 lines up "compares" is wrong word. p3 7 lines up, "section" not "paragraph". Other similar faults in the paper should be corrected.

p3 4 lines from the bottom discusses the two attenuation terms in equation 2, both the "along path" and the "within cell". This concept could be explained in the introduction to the equation to avoid confusion on initial reading of the equation.

p6 Equation 13 requires more explanation as it is not initially clear what is meant by "receive direction". Neither is it clear why this equation includes only free-space-loss and not other scattering mechanisms e.g. L(r) or all orders of multiple scattering.

p6 Equation 14 defines two parameters in one equation: apparent radar reflectivity and backscatter specific intensity. Related to the statements about Equation 13, it is not clear why the transmitted power flux density should only include free-space-loss while backscatter specific intensity includes all scattering mechanisms. It is also not clear why transmitted power flux density is used, rather than a more general specific intensity in the negative receive direction. What are the assumptions required to equate these quantities? These assumptions must moderate the claims (particularly i) after equation 19. It is clear that claims ii and iii require the assumption that only single

ACPD
3, S27–S29, 2003

Interactive Comment

backscatter is important. This assumption is inherent in the definition of apparent radar reflectivity in terms of the backscatter crossection, only as long as multiple backscatters are not important e.g. two consecutive backscatters increasing the transmitted power flux density. The y-axis in figure 3 should be the same as the X Band and C Band y-axis in figure 2.

p9 6 lines up, "less than -0.7 dB" not -0.6dB.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 301, 2003.

ACPD

3, S27–S29, 2003

Interactive Comment

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper