

Interactive comment on “McRALI: a Monte Carlo high spectral resolution lidar and Doppler radar simulator for three-dimensional cloudy atmosphere remote sensing” by Frédéric Szczap et al.

Anonymous Referee #1

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The paper describes a MonteCarlo-based multiple scattering Doppler radar and lidar simulator. Though some of the described techniques replicate already published methods the work has its value because it offers a tool for both radars and lidars and represents an independent mean to evaluate results of other simulators developed by the scientific community. The simulator will have value especially with the launch of the EarthCARE mission. The scenarios proposed to demonstrate the capabilities are quite simplistic (e.g. only box clouds are used), but this is ok for presenting the potential applications of the tool.

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I have few comments.

- 1) There are no results shown for polarization. It would be great to see some results for the other Stokes parameters (not simply the intensity)
- 2) I am a little bit surprised to see a mirror image from a Lambertian surface (but I may be radar-biased). Is this also present in lidar observations?
- 3) Line 16 in the intro: not true for the EC radar, no spectrum will be actually be provided.
- 4) line 14 page 4: “receiver shape” which shape??
- 5) Notation of Eq.8 is confusing, you are using first double and then single subscripts
- 6) Fig4, bottom left panels: not sure why in the SS result there are values below cloud base. There should be none.
- 7) Page 7: “The frequency shift due to satellite motion is deliberately ignored...” well it is not clear to me then how you can simulate the Doppler broadening due to the satellite motion itself.
- 8) Formula 19: the formula is not accounting for other causes of spectral widths (for sure microphysics should be accounted for!). Add missing terms.

Other minor comments: why not using the same color scheme for 65 and 650 micro-rad?

Line 9 in the introduction: not clear why this line is there, out of context.

Introduce titles for the Appendices

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-236, 2020.

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