

Interactive comment on “On the relationship between total differential phase and pathintegrated attenuation at X-band in an Alpine environment” by G. Delrieu et al.

Anonymous Referee #1

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General comment

The manuscript entitled “On the relationship between total differential phase and path integrated attenuation at X-band in an Alpine environment” presents interesting observations of radar measurements conducted at various relative altitudes with respect to the melting layer. The two-radar set-up and the combinations of their measurements is interesting, uncommon, and surely relevant for the radar meteorology community. I believe that the manuscript is suitable for publication after a major review, following the major and minor comments proposed here.

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Major comments

1. Let us take as example Figure 4, but this has to be considered as a general comment on how to present the MRT data. When the authors show the reference dry value of reflectivity, i believe they should show also an indication of its variability (standard deviation or quantiles, to put some sort of error bars to the black curve). In my experience, the variability of mountain returns can be significant even at short time scales. This is particularly true as the radar of this manuscript is scanning and not pointing at a fixed direction. I would be pleased to see a significant section of the manuscript devoted to illustrate and statistically characterize the stability of MRT signals in dry weather before to discuss the analysis and the results of the two cases.
2. It would be beneficial if the authors could extend their analysis beyond the focus on two contrasted events only. It would be also more consistent with the title of the manuscript, that suggests a more global approach rather than the analysis of individual precipitation events.
3. While I found the data shown here very interesting, I could not see in the manuscript a clear research goal but rather a showcase of interesting radar observations.

Other comments

1. Abstract: I believe that the goals of this research should be better stated in the abstract.
2. Page 2, L 53: to my knowledge, the Swiss meteorology office has all the radars

- installed at high altitude, i.e. it copes with the altitude dilemma by choosing visibility over proximity to the ground. Is it right?
3. Page 6, L 173: please consider that in case of hail of cm size, δ can be very large at X-band.
 4. Page 7, L 200: the clutter identification by means of ρ_{HV} should be interpreted as visual, or an algorithm is implemented to discriminate clutter from ρ_{HV} ?
 5. Page 7, L 191: was this choice based on comparison with ground-based instruments?
 6. Page 6-7: is K_{dp} then simply estimated as gate-by-gate derivative from the clean Φ_{dp} , or an estimation method is used?
 7. Page 11, L 345: would it be possible to show the position of the 16 MRT targets on a map? Also, could it be clarified more in detail how those (gates?pixels?) have been chosen, and which are their statistical properties?
 8. Section 4.2: this one is in my opinion the most interesting part of the manuscript. I would recommend to expand it, and to apply this methodology to many more precipitation events and aim at results based on a large dataset.
 9. Figure 4, please show all the polarimetric variables over the same range. For example the Ψ_{dp} profile is shorter than the Z_H or ρ_{HV} profile. If a censoring is applied, please mention it in the caption and describe it in the text.
 10. Figure 5: please mind the overlapping labels on the y axis.

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