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Hydrology and Earth System Sciences Discussions

Interactive comment on "Radar rainfall estimation for the post-event analysis of a Slovenian flash-flood case: application of the mountain reference technique at C-band frequency" *by* L. Bouilloud et al.

Anonymous Referee #2

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General comment

The paper applies several correction algorithms on the qualitative precipitation data measured by a radar to improve these, or - more precisely - to adjust the radar derived values to the ones, being measured by ground rain gauges. This is done on the case of the strong convective precipitation case in NW Slovenia on 18th of September 2007, leading to the tempest flash flood with strong damages and even with several casualties. The corrections considered calibration uncertainty, attenuation in precipitation field along the radar beam, and screening/clutter of the beam. The methods are using

the radar echoes from mountains, the digital data upon relief, and the assumption that the reflectivity/attenuation relation is known. The final result (Figures 6a to 6d) proves that the strong underestimation of the radar measured precipitation accumulation can be successfully corrected so that the values are no more biased (underestimated) in comparison with rain gauge data and that especially higher values (e.g. above 150 mm) have a rather small dispersion. So: good idea being correctly applied proves to be very valuable and gives appropriate final values.

Some specific comments

1. Is it really possible to separate the "global" vertical radar profile (subsection 4.3 and Figure 5) into the "convective" and the "stratiform" parts with an appropriate reliability? The authors themselves express some doubt in this respect by saying: "Due to the convection predominance in the region of the affected watershed, the similarity of the convective and global mean VPRs and the non availability of rain-typed (Z, k, R) relationships, we have used the global VPR to represent the vertical variation of the reflectivity in the following section." So: it is worth to consider omitting the complete subsection 4.3 and Figure 5?

2. On which basis it is concluded that "a generalized stratification of the rain system occurred in the latest stages (after 17:00 UTC)" of the event? Several descriptions of the case (e.g. on the Slovenian ARSO web page www.arso.gov.si/ search for the case of 18. September 2007 and there is a description of the case - in Slovenian, so it is difficult for the authors to understand the complete description of the case without some help from a person knowing the language) characterize the case to be fully convective. Also the Figure 7 (Slika 7) on the above mentioned web page clearly shows the squall line, that developed at 19h CET, at the time of the cold front passage. So even at that evening time the event was still very convective.

3. One rather "general" comment: the improvement of the radar derived precipitation data after the corrections is very successful in adjustment to the rain gauge measure-

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ments. But it is worth to have in mind the well known fact that also the rain gauge data are in principle biased: the raingauges almost never measure "to much", they more or less systematically measure "less". For rainfall these biases are relatively small, but not negligible: 2% to 10% (WWB 1974; Sevruk 1982; Legates 1987). So eventually the ”correct“ values should perhaps be even slightly higher.

4. It is perhaps worth to stress that all corrections, and perhaps especially the screening correction (subsection 4.2) based on "a simple interpolation scheme" or based on screening factors could work well only on the accumulated precipitation, but most probably do not perform well on the individual radar echoes (in 10-mim intervals). In the strongly convective case with great spatial and temporal variability the interpolation might individually cause very big individual errors - but these may cancel out, when applied on many echoes giving the precipitation accumulation.

Two minor comments:

In equation (2) it would be worth to replace (and explain) the numerical factor -0.46; if it is only written as "a number -0.46" a non specialist in radar meteorology has no idea where it comes from. So consider replacing -0.46 with -2ln(10)/10 = 0.46 and perhaps explaining it a bit. (Like: 2 from the two-way attenuation to the target and back, and ln(10)/10 from the fact that attenuation is expressed in decibels per kilometer?)

Zelezniki is not a city - it is an old small ironworks and market town (approx 3200 inhabitants).

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Interactive Comment