**Atmospheric
Measurement
Techniques**
Discussions

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Interactive comment on "Impact of radar data assimilation using WRF three-dimensional variational system, for the simulation of a heavy rainfall case in Central Italy" *by* I. Maiello et al.

Anonymous Referee #1

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Review on "Impact of RADAR data assimilation using WRF 3D variational system for the simulation of a heavy rainfall case in Central Italy" by I. Maiello et al.

General comments

The paper focuses on the assimilation of radar observations in the WRF model and investigates their impact upon the precipitation forecast. Various assimilation methodologies are assessed from a single case study of convective rain observed over central Italy. It is concluded that the precipitation forecast is improved especially when a cycled assimilation is used. The issues addressed in the paper are very relevant. Assimilation

of radar observations (in particular radar reflectivities) is far to be common in km scale models and certainly deserves further investigation and testing.

However, in its present form the paper have several weaknesses that should be addressed before publication

Specific comments

1- In various places, the conclusions drawn are only weakly supported by the results. For instance, it is claimed that the assimilation of DWR data improves the precipitation forecast. However, AIREP and SYNOP data were also ingested in the mesoscale assimilation system. To what extent the forecast improvement can be ascribed to the DWR data? This issue must be discussed and possibly clarified by running an additional experiment with the sole radar observations. Otherwise, the conclusion and even title should be amended to avoid over-selling.

2- More generally, even if the results are encouraging, the improvement in the precipitation forecast is fairly limited and would require additional case studies to be really confirmed. This point should be acknowledged in the conclusion.

2- The text would need to be more polished. Some pieces of information are unnecessarily repeated. Some sentences are unclear and some grammatical constructions incorrect.

Minor points

p 7315 Remove or correct the third item in the affiliation list as it is strictly identical to the first one.

P 7316 L 20 more accurate than what? The introduction is too much focused on the WRF/MM5 system. Some references on similar experiments based on simpler methodologies (e.g. latent heat nudging) or more advanced one (e.g. from the ARPS community) should be quoted to provide a better picture of the state of the art. Many repetitions of the word "important", in the introduction, try to be more precise or more

imaginative

p 7321 L 4 referred to –> found in L 7 velocity –> vorticity (?)

p 7322 L 21-22 not very clear, reformulate

p 7324 L 3 Weather Research and Forecasting –> WRF L 19 "which accounts for ECMWF data on Mediterranean Basin" Unclear

p 7325 L 5 Remove here "using a specific B calculated for each domain" and modify line 10 "For Exp1, 2 and 3 a specificic ..." to avoid repetition

p 7326 L 8 If the Pratica Di Mare sounding is used in the assimilation, it is quite surprising that the mesoscale assimilation (i.e the initial conditions of exp.1) does not succeed in reproducing better the observed moisture profile above 600 hPa.

p 7328 L 23-25 The results are not so convincing. Exp3 shows improvement for thresholds under 15 mm/h but degradation for higher thresholds (mainly due to overestimation as clearly indicated by the FAR). Here, it would be wiser to highlight the improvement obtained between Exp2 and Exp1. Actually, this is only figure which can support your conclusion regarding the positive impact of a warm start.

p 7343 Remove the unreadable green text.

p 7345 Indicate in the caption the corresponding height or pressure level unless you are plotting the maximum of reflectivity.

p 7347 Remove the black contours to clear up the figure (provincial borders would be more helpful than unspecified topographical contours)