

Interactive comment on “Improvement of RAMS precipitation forecast at the short range through lightning data assimilation” by Stefano Federico et al.

Anonymous Referee #1

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The paper describes the application of a methodology for the assimilation of lightning data into RAMS in 20 case studies characterized by widespread convection and lightning activity. First, the analysis focuses on a case study of intense convection during the HyMeX SOP1 campaign, then statistical indices are derived for all the cases analyzed. Results show a clear improvement due to use of assimilation technique compared to the control run (without assimilation). The paper is well written and appropriate for NHESS, thus I recommend publication after minor revisions.

MINOR POINTS: Line 120: why did you choose 4 km as inner grid spacing? This corresponds to the grey area for convection and it is slightly below actual standards (2-3 km). For future studies, I suggest to test your assimilation technique at higher

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resolution; Line 181: I understand you increased the water content only in the charged zone (0°C - -25°C): is there a relaxation region above and below this area, or did you just change the values only in that zone? In the latter case, did you notice whether the discontinuity in water vapor generated a perturbation affecting the lower and upper regions? Line 213: please write explicitly that the “previous R4 forecast” belongs to the F3HA6 set of simulations; Lines 216-217: please change into “Please note the switch of the initial conditions . . .”; Lines 266-281: I suggest to remove this part from here and put in a specific Appendix, possibly explaining the resampling technique more in detail; Line 306: please change into “From Fig. 3a, convection is apparent over the Tyrrhenian Sea and is enhanced over land because of . . .”; Lines 319: “for the largest threshold”: do you mean “above 90 mm/day”? Line 355: delete “a” or change “spells” in singular; Line 385: in how many stations was the precipitation “subtracted where it did not occur”? Line 399: “. . . increases with the threshold from . . .”; Figure 7: since the lower threshold you consider is 1 mm/day, I believe showing also 0 mm in the x-axis is not proper; Lines 436-441: the assimilation increases the rainfall amount, thus the hit rate and POD are better, but there is a general overestimation (thus, the bias is higher and there is an increase of false alarms). Anyway, I agree with you that, even with these limitations, the result is overall helpful for operational purposes. I suggest you should speculate more on this point; Lines 442-462: the description of Fig. 8 is too long: you can reduce this part referring to the similarities with Fig. 7; Line 475 and elsewhere: convection without “the”; Lines 474-479: are the results for the other cases similar to those for October 27? Line 511: “. . . improvement in some statistical scores, . . .”; Line 519: please rephrase into “. . . the performance of the precipitation forecast is clearly dependent on the type of event . . .”; Figure 3: apparently, the maximum threshold of 90 mm is too small, thus the peak in simulated rainfall cannot be clearly estimated; please, could you add the information about the maximum precipitation simulated by the model at least in the text?

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