

Interactive comment on “Impact of upstream moisture structure on a back-building convective precipitation system in south-eastern France during HyMeX IOP13” by Keun-Ok Lee et al.

Anonymous Referee #2

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Title: Impact of upstream moisture structure on a back-building convective precipitation system in south-eastern France during HyMeX IOP13 Authors: Keun-Ok Lee, Cyrille Flamant, Fanny Duffourg, Véronique Ducrocq, and Jean-Pierre Chaboureau Recommendation: Minor Revisions

The sensitivity of HyMeX SOP1-IOP13 to low level moisture content is analyzed in a series of sensitivity experiments. The two layers 0-1 km and 1-2 km are analyzed separately in order to test whether an increase or decrease in moisture content would affect the rainfall location, amount, and duration. The main conclusion is that the moisture structure in the lower troposphere is a key for accurate prediction at short-term

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range of precipitation in the coastal mountainous region in southern France. Results are presented clearly and comprehensively, although some deepen investigation is suggested.

Major point: The reasons why an increase of humidity in the 1-2 km layer would increase the cold pool are not clear and should be investigated better. My interpretation is that a higher humidity content produces earlier precipitation (as discussed in Page 13, Line 27-28), thus producing anticipated and stronger cold pool than in control run. I suppose the cold pool is mainly generated by the mid-level air, thus it is not affected directly by the changes of vapor content in the low troposphere. Anyway, this or any other justifications you have should be properly supported.

Minor points: Page 1, Line 19: ... the response to the variability ... Page 2, Line 27: a simplified theory for the interaction of the low-level jet with a mountain range is provided in Miglietta, M. M., and Rotunno, R.: Numerical simulations of sheared conditionally unstable flows over a mountain ridge, *J. Atmos. Sci.*, 71, 1747-1762, 2014; Page 3, Line 6: ... with respect to ... Page 4, Line 4, 17: grid spacing is more appropriate than horizontal resolution. Section 2.2: since the title of the section includes “validation”, you should include an image of observations, e.g. the observed 6-h cumulated rainfall, for sake of comparison. Page 5, Line 14: “maximum 15-minute” instead of “6-hour” Page 5, Line 16: ... similarly as observed ... Page 6, Line 20: where are SSM/I data retrieved? In the same window considered for the analysis data? Page 6, Line 25: since most of the IWV concentrates below 1 km ASL, one would expect that humidity is due to evaporation more than to advection: did you try any sensitivity experiment to test how the results change in the absence of surface fluxes? Page 7, Line 14: it is not clear how you impose under-saturation in case of increased moisture (MST5P experiment); Page 9, Line 20: stay instead of stays Page 10, Line 21: rephrase as “instead of 435 min in CNTL”; Page 12, Lin 23-24: which are the implications of the improved location of the simulated rainfall? Does it mean that the reference analysis is not accurate in the 1-2 km layer?

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Figure 6 caption: is the duration of precipitation above a threshold calculated in a fixed point and does it refer to any point in the domain? Figure 7 caption: what do the ellipses represent? Figure 10 caption: how is the “sensitivity bubble” shown in this figure related to that shown in Fig.1?

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