Natural Hazards
and Earth System
Sciences

Discussions

Open Access

Interactive comment on "Sea surface temperature and torrential rains in the Valencia region: modelling the role of recharge areas" *by* F. Pastor et al.

Anonymous Referee #1

Received and published: 17 March 2015

The present paper describes three events of heavy rain in Valencia region, considering simulations performed with RAMS. Also, some sensitivity experiments are performed by changing the SST in some specific regions along the parcel trajectory ending in the precipitation area. In this way, the Mediterranean sub-regions that could have affected more deeply the precipitation amount and distribution are identified.

This new strategy to perturb the SST field is able to determine the regions that may have played a key role in the development of the torrential rain and then to investigate just the effect of that specific area in the model results. This approach is very interesting and could be applied also to other region in the Mediterranean basin. However, the

potentiality of this idea is not fully exploited in the present manuscript version, thus I recommend the authors to improve the discussion in some points.

MAJOR POINTS: - According to Figure 4, for each run the modifications with respect to the control run are not limited to a small area: for example along the coast of Algeria, none of the runs has a SST structure similar to panel (a). Thus, how did you modify the SST field? This point is very important, and it is never clearly explained in the manuscript;

- For each case, a comparison with precipitation observations is suggested, otherwise it is not possible to understand how reliable the control simulations are;

- Page 1369 L3-5: the motivations for the shift from offshore to onshore should be better motivated; is a convergence line present in CTLA, that no longer appears in A1? Can you add a figure to better comment on this point? Similar considerations apply to the other cases;

- End of Section 3.1, P 1370 L20: some comments are missing about the connection among trajectories and SST modifications: in other terms, which change in SST is relevant for precipitation? Those along the trajectories? This is discussed in the Conclusions, but it should be explicitly stated already during the comment of each case;

- From Figures 4, 8, 12, it appears that some interpolation in SST is done along the border between the modified and the unmodified regions, but this is not mentioned in the text;

- P 1367 L20: is SST the climatological map? Or is the monthly map just for August 1989? This is not clear from the manuscript. Also, why not using the measured value before the episode? Again, how do you select the exact shape of the area where the SST has to be changed? Similar considerations apply to the other cases;

- Figures 3, 7, 11: from what level do the trajectories start from? To what level do they arrive at?

- P 1374 L5: "the simulation with less change respect to the control simulation in both spatial distribution and rainfall amounts is the one when the most remote area across the air mass trajectory (Gulf of Tunis and Libyan coast) modifies its SST, being also the one with highest SST values": Figure 8 shows that in such a simulation the SST is also modified near the Balearic island, which could affect significantly the results; please explain better this point;

MINOR POINTS:

- Abstract: introduce also here what you mean with recharge areas;

- Page 1359 Line 4: "favours both its own and differentiated meteorological ...": the sentence is not clear;

- P 1360 L25: about the role of heat/moisture exchange from a modelling point of view, please consider also the following two papers: - Moscatello, A., M. M. Miglietta and R. Rotunno (2008), Numerical analysis of a Mediterranean "hurricane" over south-eastern Italy, Monthly Weather Review, 136, 4373-4397; - Rainaud, R., Brossier, C. L., Ducrocq, V., Giordani, H., Nuret, M., Fourrié, N., Bouin, M.-N., Taupier-Letage, I. and Legain, D. (2015), Characterization of air–sea exchanges over the Western Mediterranean Sea during HyMeX SOP1 using the AROME–WMED model. Q.J.R. Meteorol. Soc., doi: 10.1002/qj.2480

- P 1360 L28: please consider that the exact trajectory can be important for air-sea exchanges also because it controls the time the air mass remains above the sea surface and air-sea interaction can work;

- P 1361 L2: rephrase "could be identified, that information" instead of "could be established that"

- P 1361 L8, P 1366 L7, P 1366 L23: "these" -> "this"

- P 1362 L10: delete "who"

- P 1364 L25: why is LEAF-3 prescribed with a homogeneous soil texture?

- P 1365 L5: whose -> which

- P 1367 L10: the location of Valencia region should be indicated in a map (maybe Fig. 3?)

- P 1367 L16: add a comment about Fig. 2b otherwise please remove it;

- P 1367 L28: "of" instead of "reaching"

- P 1370 L19: "and" instead of "to"

- P 1370 L23: what do you mean with "equivalent potential fields"?

- P 1370 L26: a decrease in dew point temperature determines lower humidity content: do you mean "a decrease in difference between dew point and temperature"?

- P 1371 L6: for non-Spanish readers: please show where Alicante province is;

- P 1371 L23: mm instead of L;

- P 1371 L27: as instead of than;

- P 1373 L2: The following sentence is not clear: "In both modes, differentiated areas were found presenting similar qualitative features across the whole study period"

- P 1374 L5: "where" instead of "when"

- P 1375 L9: "The determination of sea areas that contribute to the development or intensification of heavy rain events in the Mediterranean countries can be used as a prognosis and monitoring tool": the way how this tool should work is not clear and three case studies are not enough to draw any general conclusion.

Figure 1: what is the meaning of the colors in the right panel?

Table 1: why the rate in Time is 2 between grid 1 and 2, and 2 and 3, while in DX is it 3?