

## ***Interactive comment on “Intense precipitation events in the Central range of the Iberian Peninsula” by Manuel Mora García et al.***

### **Anonymous Referee #2**

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The paper entitled “Intense precipitation events in the Central range of the Iberian Peninsula” assesses various atmospheric stability and moisture indices during heavy precipitation events for the above mentioned mountain range. The study of heavy precipitation indices over mountainous areas is relevant and useful subject. However, at this stage, the manuscript requires significant work before it should be considered for publication.

Main comments:

1. There are issues with regards to the methodology.
  - a. More details need to be provided on the kriging method, as it will have an impact on the results. Please elaborate which technique and why it was chosen.

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- b. More details are needed on how the precipitation episodes were defined. From Table 1 the length of the events varies significantly (from less than one day to eight days), which makes it very hard to compare the precipitation totals in Table 2. In the abstract you mention 24 hours, but I cannot find anywhere that this is mentioned again in the text. On page 4, it is mentioned that the episodes were chosen with ‘the heaviest precipitation’, but over what time period, over what area/which rain gauges? For Case study b, you acknowledge that the total precipitation was less due to the short duration of flow perpendicular to the mountain range, yet, is this 30-40mm in 18 hours similar to other events, less than other events? Calculating the maximum hourly precipitation, or daily precipitation amount could be a solution.

- c. The choice of models. By referring to the ECWMF model, implies the forecast product – but there is no reference to confirm, and at which time steps the variables were selected. And are the two datasets really comparable? It would be preferable to either use one dataset over the entire period, or use ERA40 + ERA Interim where there is an overlap and you can assess the differences between the two datasets (1979 – 2002).

- d. Not clear why the one particular point for the analysis was chosen. Because the windward slope is steepest? Would the values in Table 1 change much if point what somewhere else?

2. Suggest some reorganizing of the theoretical concepts, study area and data. Only some of the indices are introduced (e.g., Froude number, although somewhat confusingly the equation is left out until the study area section; the index by Lin et al 2001 is introduced, but not mentioned in the list of indices in the next section, but then is included in the results discussion). It is interesting to compare these indices, so I suggest all the indices that you use are included in the theoretical concepts (at least a brief explanation about what is moderate/high values or a reference to where one can find out), including why they were selected as not all indices are included, such as deep layer shear. To provide an example, you do not consider any wind only measurement

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for each episode, yet you discuss wind intensity as being an indicator for convective vs stratiform precipitation (page 6). Furthermore, there is inconsistency on the flow regime types: On page 3, type I-III are all for convective systems (with differences in propagation), yet on page 4 you refer to type II as stratiform.

3. There are inconsistencies between the conclusion and the results. For example on page 8 lines 1 – 2 state that "...the moisture flux associate with the cases of heavy orographic precipitation considered here was. ..., and both the dry and moist Froude numbers were >1". Although clearly from Table 1, some of the Froude numbers are less than one. In the abstract, you state "all events were associated with a south-westerly flow, a low level jet. ." yet you only consider the composite of 19 events and not the individual events. Did you assess each of the events individually? Even if plots of the individual events are not shown, it would be useful to know that each event was indeed associated with the above synoptic situation.

4. The discussion on page 6 is confusing. Where do the values 1.6km and 35km come from and why are they acceptable? 5km is the resolution of what? The DEM you used in ArcGIS? Similarly, doesn't the type III imply the presence of a convective system propagating similar to the flow, not that it is just a convective system?

5. The language also needs to be improved. Some examples:

a. Page1 lines 18-19, what increases? Do you mean "...the forecasting of precipitation is therefore difficult, particularly for forecasts with coarser spatial and temporal resolution"

b. Page 4 lines 4 – 5: "to increase to higher areas" what do you mean?

c. In the abstract: "from 19 episodes, with the highest average values for the study area, of precipitation accumulated within 24 h, occurring between years 1958-2010" Do you mean "from 19 episodes, which have the highest average 24 hour precipitation amounts in the study area between 1958 and 2010"

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6. The figures and tables also require some work (see comment from the previous reviewer). Some additional/specific comments:

a. Table 1: Caption needs improvement. It states "the values at 850hPa", but CAPE is measured only at the surface. Total totals also uses information at other pressure levels. The caption should also indicate that these are the values at the point indicated in Figure 1.

b. Table 2: where is case 19? And what is the time period (for the entire days in Table 1)? It would be useful to know the number of hours considered for each episode.

c. Figure 3 – how was the precipitation calculated (blue line)? Is this average precipitation for the episodes? No horizontal distance on the x-axis (difficult to estimate using figure 1b). Can you use something similar as in 7b?

d. Figure 6 – difficult to determine the location, perhaps include lat/lons. It would be useful to include the horizontal line that use in 7b as well for reference.

e. Figure 7 Where is this profile for? (see comment above). And what is meant by 'precipitation profile'? Average for the episodes, or is it just one episode?

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