

## ***Interactive comment on “Day-time identification of summer hailstorm cells from MSG data” by A. Merino et al.***

### **Anonymous Referee #2**

Received and published: 2 December 2013

#### General comment

This is an exhaustive study describing the development and application of a satellite based thunderstorm and hail detection method. I think it is an interesting and valuable paper and I recommend accepting it for publication after a number of corrections and improvements are performed – please see below. Language and syntax used is generally correct – I include some comments and corrections but I recommend a general review of this aspect.

#### Specific comments

1. Authors do not distinguish here if the method is intended for or works better for large hail (say with diameter equal or larger than 1.9 cm). I think a comment on this would

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be interesting, given the potential damage produced by large hail. Besides, it could help to clarify if the hail-bearing storm studied can be considered a severe storm in the usual NWS US convention – see Johns and Doswell (1992).

2. There are many acronyms used in the text, which sometimes might be confusing for the reader. I suggest including an acronym list at the end of the text.

3. Page 5454, Abstract, line 11. As the abstract should provide self-contained information, I suggest to add “(Spain)” after “middle Ebro Valley”.

4. Page 5454, Abstract, line 8. The expression “Hail Detection Algorithm (HD)” is introduced here but is not used later; instead it is used “Hail Mask (HM)”, see for example page 5457, line 22. Please change it in the abstract to use the term consistently.

5. Page 5454, Abstract, line 19. Suggest not introducing here the acronym “(POD)” as it is not used later in the abstract – just as done with the expression “False Alarm Ratio”.

6. Page 5455, line 7. Suggest changing “new generation of geosynchronous” by “current generation of European geosynchronous” as MSG cannot really be considered new in 2013 and the explanation given is specifically focused on MSG.

7. Page 5456, line 6 to 8. Suggest looking for an alternative, simpler, way, to express the sentence: “these clouds had 6.7 micrometer BT values that were less than –1.5 K with respect to temperature at the tropopause level”.

8. Page 5460, equation 3. I was a bit surprised to see that a sign function, which typically may take only the values 0, -1 or +1, equals to the sum of two parameters beta, which in general (see table 2) have real values and therefore will yield something different to 0, -1 or +1. Is this equation correct? Please check and if it is correct provide a brief explanation in the text.

9. Page 5462, lines 5 to 8. Authors define precisely what an event is. I suggest defining as well what an “episode” is. It is a possible hailfall in a given day? Can one day have

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more than one episode? Please clarify this.

10. Page 5462, 21-22. "Thus, severe convective clouds characterized by strong updrafts that appear bright yellow can be distinguished from cumulonimbus clouds with large ice particles": what are exactly "severe convective clouds" here? Do they refer to convective clouds associated to severe weather - in the usual terms of the USA NWS, i.e. Johns and Doswell (1992)? In that case does that mean that "cumulonimbus clouds with large ice particles" cannot produce severe weather? Please clarify in the text.

11. Page 5463, 2nd sentence. English language. Please rewrite this sentence to make it clear.

12. Page 5464, line 11. English language. "for only one case study as example" suggest "for a representative single case study".

13. Page 5465, first line "cirrus and cirrostratus": are cirrostratus included in class "cirrus" listed in the figure legend? Please clarify, this is not obvious as they represent different cloud genera.

14. Page 5470, 2nd paragraph. Regarding the definition of "event" from the radar perspective, there is something I could not understand. If radar data resolution is 0.75 km, then, assuming a square pixel, the area of a pixel is 0.5625 square kilometers, and therefore, the area of 10 pixels is 5.625 square kilometers. However, in the text the area of a 10x10 pixel region is said to be at least 10 square kilometers, which seems to assume that radar pixels are 1 square kilometer extension. Please clarify this in the text.

15. Page 5471, line 4. "... indicators gave 0.588 and 0.784, respectively" Please check the order of the values – it looks to me they should be swapped, according to Table 6.

16. Page 5472, comment of LWP, Fig. 4. It looks to me that no-hail events present values of LWP exceeding 3000 g per square meter – and the value given "up to 1500

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g per square meter" corresponds to hail events instead. Please check.

17. Page 5472, comment of OT, Fig. 4. Suggest: "were in regions with OT between 40–100" -> "were mostly in regions with OT between 40–100"

18. Page 5472, comment of Re. the range of values 20 to 40 micrometers, shouldn't be 30 to 50? Please check.

19. Page 5475, last paragraph. It is not clear to this reviewer what is exactly shown in Table 8. What are exactly "average likelihoods of the two algorithms for the events in 2011"? Is it showing the result of the classification for each mask type? Please clarify.

20. Page 5476, lines 6 to 7. I think this sentence is potentially confusing, does it mean that six hail events were wrongly classified as non-hail events? Please clarify.

21. Page 5476, first paragraph of section 6.3. The information provided about the meteorological conditions of the case study is rather limited and could be completed with additional details, for example what was the temperature at 500 hPa of the 'cold air mass', or some instability index such as LI to illustrate better the stability conditions.

22. Page 5476, lines 22-23. See previous comment on the use of the term 'severe storm'. Here it implies that the previous 'intense storm' was already a severe storm. Perhaps authors could indicate that large hail was observed from the first one (or some other item to illustrate why was severe).

23. Page 5490, Table 8. According to a previous comment, please clarify the content of this table, in particular here provide proper units (%).

Technical comments

24. Page 5455, line 12. English language: a board -> on board? Please check.

25. Page 5455, line 28. To avoid possible misunderstandings, I suggest changing "6-8 K" by "6 to 8 K".

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26. Page 5456, line 25. Adler et al.: reference not found listed in reference section.
27. Page 5457, line 4. English language: none have -> none has
28. Page 5458, line 7. Possible typo: NMHD -> NMDH? Please check.
29. Page 5459, line 12. English language: "is a intercept" -> "is an intercept", or "is the intercept", perhaps? Please check.
30. Page 5459, last line. Typo: predictiveequations -> predictive equations
31. Page 5461, line 15. English language. Please look for an alternative expression of "Toward this".
32. Page 5463, line 16. Typo: Nalgelkerke -> Nagelkerke
33. Page 5465, line15. Typo: from -> form
34. Page 5465, section 4.3.2. title. English language. Suggest: Model input variables.
35. Page 5467, line 14: Rosenfeld et al (2004): not found in references section. Is it perhaps 2008?
36. Page 5472, comment of Re. English language: haved -> had
37. Page 5476, line 20. Typo: favor -> favoured? Please check.
38. Page 5478, line 22. "two research projects" but 3 codes are given. This is a bit confusing, perhaps the word "two" can be simply suppressed. Please check.
39. Page 5483, Table 1. Typo: the central wavelength of channel IR10.8 should be 10.80 micrometers, not 10.08.
40. Page 5484, Table 2 and Table 5, Table 10, etc.. To allow for an easier reading, I suggest giving the same number of decimal digits whenever possible (for example for Wald parameters) and use a proper alignment.
41. Page 5491, Table 9. Suggest centering the term "Forecast" in the second row as it  
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refers to both the "Hail-free" and "Hail" columns, not only to the first one.

42. Page 5493, Figure 1. Some labels of mountain ranges are hard to read. Please check and try to improve their contrast with the background map. Similarly this should also be checked with label numbers of Figure 2.
43. Figure 3 and 4. These are very interesting figures and also produced with high quality. However I could read them ok if I zoomed on the screen but not on my printed version, in particular the cloud type legend; please make sure that they are printed large enough for an easy reading.

#### REFERENCE

Johns, R. H., and C. A. Doswell III, 1992: Severe local storms forecasting. *Wea. Forecasting*, 7, 588–612.

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