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Comment

Interactive comment on “Multilinear approach to the precipitation–lightning relationship: a case study of summer local electrical storms in the northern part of Spain during 2002–2009 period” by I. Herrero et al.

Anonymous Referee #2

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The paper deals with a study about lightning activity and rainfall amount in a region of Northern Spain. The lightning activity consists in CG flash count and the rainfall is measured at twenty-two sites in the region with rain gauges. The methodology is based on an initial selection of days with a number of CG flashes detected larger than a threshold which leads to 91 days. Thus the parameters issued from both types of data are daily values. Then several correlations between lightning and rainfall are evaluated. An expression of the rainfall amount as a function of several parameters related to the rainfall locally measured and the lightning count locally detected, is used

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for estimating the cumulative rainfall. I have substantial comments on the work and the methodology which have to be considered before the paper can be analyzed in detail for minor comments and language correction. These comments concern the methodology, its presentation but also its relevance according to the goal of the study.

1- The first concerns the title: it would be better to say “Multilinear approach to the precipitation-lightning relationship : application to summer local. . . “

2- The authors look for relationships between lightning and rainfall to be used for rainfall estimation, especially in cases of very active storms. They use a rainfall depth determined very locally at several stations, one may ask how such a setting is representative of the whole rainfall. First, it is not an amount of rainfall and furthermore one knows the rainfall produced by a convective system can be very spatially variable. It is usually expected to find relationships between rainfall amount (volume for example) and lightning flash count. They use also a cumulative rain parameter calculated by summing all depths found at each station. This parameter is therefore relative to the number of stations, it does not represent a physical quantity. The correlation found between rainfall depth and lightning flash number, displayed in Figures 2 are weak. I think with such parameters it will be difficult to make a reasonable correlation study between rainfall and lightning flashes produced by a storm. At least, the authors could consider a study of sensitivity with different values of the distance around the station to count the flashes (10 km in the study).

3- What is curious in the study is the methodology developed to find new relationships between lightning and rainfall based on a technical (multilinear) using several parameters. First the methodology is difficult to understand because a lot of explanations are missing. The methodology has to be clearly explained to be evaluated. Secondly, the method is based on the analysis of the rainfall anomalies which could imply to have the rainfall measurement to apply the methodology, while the goal of this kind of study is to provide a method to estimate the rainfall with the lightning activity when the rain is not directly measured. The methodology leads to equation (2) at page 6473 and in this

equation, the term R_j is effectively a rainfall parameter. Thus the rainfall is estimated from rainfall... Anyway the rainfall parameter R expressed with equation (2) is not a physical quantity, what is the interest to make this estimation? Which coefficients are displayed in Figure 5?

4- In page 6473 : what is EOF ? What is the origin of equation 2? What is the link between equation 1 and equation 2? Why the daily rain anomalies are almost linearly correlated (line 18)?

5- For most of figures, the captions do not give information enough. An example with Figure 1, what is the signification of the gray stone, that of contours... Figure 3 : do the values of the maximum of CG flash and that of rainfall for each dot correspond to the same station? Figures 7 and 8 are too small.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 6467, 2013.

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