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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief Communication: An Electrifying Atmospheric River: Understanding the Thunderstorm Event in Santa Barbara County during March 2019" *by* Deanna Nash and Leila M. V. Carvalho

Anonymous Referee #2

Received and published: 2 January 2020

General Comments

This brief communication is appropriate for publication in NHESS. It describes a topical event impacting southern California in March of 2019, and uses remote sensing and operational analysis data sources to better understand the behavior and evolution of this particular potentially hazardous atmospheric river event, which was unusual due to the frequency of lightning strikes.

Specific Comments

Section 1 – what is the purpose of including the information on the peak current – for example, is the strength also an outlier? Also, there are several different numbers used for the flashes over Santa Barbara County in this and other sections (e.g. line 72), please clarify the areas over which these numbers are representing.

Section 2 – consider adding brief justifications for the data sources used. In particular, why GPM for precipitation and not any in situ gauges? How well does GPM estimate precipitation in this region? Please also discuss the implications of using the two different lightning data sources and uncertainties that might result from comparing between the two during different periods.

Section 2 - Consider moving some of the discussion on the lightning observations (e.g. after line 70) into the next section.

Fig 1b - I find the color scale a bit confusing. Consider a scale that goes up only to the maximum of what is in the domain and using a scale that doesn't have the black and brown colors as the highest accumulations.

Line 73 - Consider adding "even" before "if"

Line 117-118, where is this transport from AR to WCB shown?

Line 121 – Is this implying that the combination of the two was necessary for the updrafts, precipitation and hail formation? Perhaps state something more like "In this case, we observed an AR interacting with a WCB, along with updrafts and hail formation" (Please check on other statements of this nature too).

Line 136 – why not just say saturated if the dew point is equal to the temperature?

Figure 3b – I am a little confused on the units. How was this calculated? How is water vapor incorporated?

Section 3.3 - careful with tenses, some examples below in the technical corrections section. Also please make sure it is clear what processes you are hypothesizing played

a role and what you can show played a role based on the data (e.g. paragraph lines 159-166)

Section 4 - Could you explicitly quantify how unusual the lightning is (also in the abstract). It would be helpful to also explicitly quantify the distribution of freezing level – based on prior literature or the datasets you are using here, is this a much colder than normal vertical structure for an AR, or for this area, to make the case for this to be a potential reason behind the high number of lightning strikes?

Technical Corrections

Line 151 – I think “formed” should be “forming” or “allowing the formation of” Line 152 – rephrase to something like “At the time closest to the peak of the event in Santa Barbara, dry air was entrained between 300 hPa and 200 hPa with winds reaching approximately 100 knots (Fig 3a)” Line 160 – should be “warmer than its environment” Line 174 – consider rephrasing to “The last peak of lightning frequency” or something like that

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