

# ***Interactive comment on* “First reported case of Thunderstorm Asthma in Israel” by Yoav Yair et al.**

## **Anonymous Referee #1**

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### **1 Summary and review**

The authors describe what seems to be an episode of thunderstorm asthma, apparently the first such reported case in Israel. The authors have covered most areas that may be expected in such a case study, and such case studies should be published. Thunderstorm asthma is a rare phenomenon, and only by pooling knowledge across the international community can we develop a sufficiently rigorous understanding for prediction of these events. However I am suggesting that it be subject to major revisions, not for any one reason but for a range of moderate and minor issues that probably should be fixed before it be published.

I would also question whether this is the right journal for this particular topic. Natural Hazards and Earth System Science isn't really a health-focussed journal, in my under-

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standing. My searches haven't revealed anything on asthma or thunderstorm asthma in particular. This is really up to the editors, but I think it would probably be better placed elsewhere.

## 2 Major comments

- There is an overabundance of review articles on thunderstorm asthma, relative to the number of original case studies. There are quite a lot of theories about the exact causation of this phenomenon. Multiple factors are no doubt at play, but there are difficulties in the scales of what can be observed. The proposed mechanisms span a vast range of scales (rupturing of bioaerosols, inhalation of microscopic particles, advection and transport of these particles over potentially considerable distances and large heights), and many of these phenomena are difficult to measure in the laboratory, let alone in the uncontrolled environment. As such, I would recommend that the authors treat the published theories of the causes of thunderstorm asthma as theories that have only limited support, rather than as well established.
- Several of the figures seem of relatively poor quality (especially figures 2, 3 and 5), with poor resolution, small legend text, legend text that isn't self-explanatory and lines that aren't obviously distinguishable when printed in black and white.
- The Introduction talks a fair bit about ozone and NO<sub>x</sub>, but this doesn't feature in the results section.
- The results section doesn't look at any particular pollen or fungal spore taxa. I would recommend providing more information about what pollen types were present on these days. It might be worth showing counts if they are available. If not, I would suggest recounting these slides if they are still available. Pollens

vary in their allergenicity and other attributes, and it would be of interest to know if the thunderstorm asthma reported was likely linked to some particular taxa. Your Appendix A provides some limited insights, but I would like to see more.

- The results for the aerosol concentrations appear to show  $PM_{10}$  concentrations (Figure 5), rather than  $PM_{2.5}$  concentrations, as mentioned in the text (L247). An increase in coarse particles (as would be seen in a “raised dust incident” during a severe gust front) does not necessarily lead to a big jump in  $PM_{2.5}$  levels. It may be worth presenting results for both the coarse and the fine fractions.
- Were the hospital data available for longer periods? If so, one can do some statistical analysis to detect spikes in asthma-related presentations, which may help identify other (previously unreported) epidemic asthma episodes.
- Were hospital data available for sites that were not directly in the storm path? If so, it would be informative to compare what was experienced at these locations.

#### Minor comments:

- Consider adding a map (in the appendix, at least) showing the locations of all the sites referred to in the text.
- L43-46: there is some repetition here, probably best avoided in the Abstract.
- L47: Melbourne, not Perth.
- L48: Don't introduce an acronym in the abstract when it won't be used again in the abstract. Don't use an acronym before introducing it, even if it's an obvious one in your field.
- L50-52: I think this is a bit of over-reach. The article doesn't really do this, and even if it did, it would be quite speculative.

- L58: “Public health heffects of thunderstorms not related to direct strikes of people are caused by downdrafts...” – what about flash flooding, damaging winds, large hail and landslides? These can cause some fairly serious harm to people?
- L58-59: Somewhere around here I think it should be mentioned that thunderstorm asthma is both rare and quite limited in its scale compared to the burden of asthma more generally.
- L62: “eject” → “result in the release of”
- L69-78: This section needs many more references.
- L77-78: please cite the article supporting this claim.
- L81: The Suphiglou (1998) reference (note: no co-authors, so you can delete the “et al”) was in large part copied (directly rather than paraphrased) from Knox (1993; Clinical and Experimental Allergy, Volume 23, pages 354-359). I would suggest at least citing Knox (1993) as well. Given the egregious nature of this case of plagiarism, the authors may choose to the Knox (1993) paper instead.
- L83-84: references to support this statement are lacking.
- L110: “Waga-Waga” → “Wagga Wagga”
- L111: It may be worth qualifying the number of presentations and admissions by also stating the population of Wagga Wagga at the time (which should be available from the Australian Bureau of Statistics).
- L115: The number ‘8000 people being admitted’. Please double-check your sources. I suspect that this may be the total number of admissions or presentations for all causes (not just asthma-related). A more relevant figure may be the percentage increase in asthma-related admissions or presentations associated

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- with this event, or the excess number of admissions or presentations associated with the event.
- L122: “allergenic pollens” → “allergenic pollens and/or fungal spores”
  - L134: “... and is also a precursor for the production of greenhouse gases”. First, this is tangential to the topic. Second, it’s unclear which greenhouse gases you are talking about. Third, from what is written it is unclear whether this is a major contributor to any of the major greenhouse gases.
  - L147-148: “the authors ... to pollution”. Ozone production requires sunlight, hydrocarbons and NO<sub>x</sub>. Lightning provides only the NO<sub>x</sub>. Anthropogenic pollution isn’t the only source of volatile organic compounds, but is indeed responsible for the more intense concentrations. The authors should review this article to see if their critique is warranted.
  - L153: “WRF” – see my comment above about acronyms.
  - L158-160: Please specify what time period and geographic regions was studied. Were all the data available for the full period? Were some data available for longer periods?
  - L174-177: How many hospitals? What time-period? Was this just the total admissions or specific ICD codes? If the latter, which ICD codes? Did the authors need or obtain ethics approval for this research? If not, please note. If so, please cite the ethics authority.
  - L184: “Levant region”. Please consider marking this on the map suggested above.
  - L185: “lower levels”, “upper levels”: please quantify this statement. What pressure levels or heights above ground level do you mean?

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- L194-195: “torrential rains”: it would be worth stating the rain rate or rainfall total over this period.
- L227-228: I would suggest moving this sentence earlier in the paragraph, such as after the first sentence. It provides additional perspective.
- Figure 4: For this journal, does it really matter how many positive and negative lightning strikes were recorded. Would the total strike count not suffice?
- L257-265 and Figure 6: See my comment above about being more specific about which pollen and fungal taxa are present.
- L272-300: Please be more consistent (or at least clearer) about whether these were ‘admissions’ or ‘presentations’. The hospital records may not differentiate this. As I understand it, a ‘presentation’ occurs when somebody arriving and asking for treatment, whereas an ‘admission’ occurs when somebody has seen the triage nurse and then been treated by a doctor.
- L272-300: I’m unclear whether the results reported are for all diagnoses, or only those related to asthma and allergic respiratory diseases. See my comment above about ICD codes.
- L288-289: See the previous comment. Without knowing if these are all diagnoses or asthma-related, this statement isn’t fully justified.
- L296: “and it lasted” → “lasting”
- L298: “likely to” → “likely due to”
- L298-299: “air pollution related to aerosols”. The Introduction talks about the influence of ozone and NO<sub>x</sub>, but these concentrations aren’t reported in this paper. Do you think that ozone and NO<sub>x</sub> played a role here? If not, I’m not sure that its prominence in the Introduction is warranted.

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- L313: “summer” → “spring or summer”
- L318-319: “During these months there is little flowering and pollen concentrations are low.” – References would help.
- L331: “showed → “suggest”. See my first comment under ‘Major comments’
- L333: “D’Ammato” → “D’Amato”
- L335-337: “in exploding the outer shell of pollen particles and enriching the air with allergens, that accompanied other aerosol particles already in the environment → “in rupturing the pollen membranes and enriching the air with respirable allergens”.
- L340: “that play an important role in asthma allergenicity” → “that may play an important role in triggering allergenic asthma”
- L344-345: “is bound enable us to properly identify” → “will help us to understand”
- L362: “the Lightning Potential Index [LPI] which is being used for medium-range...” → “the Lightning Potential Index, as calculated by some numerical...”
- Please write PM10 and PM2.5 as PM<sub>10</sub> PM<sub>2.5</sub>

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