

Review of the paper “First reported case of Thunderstorm Asthma in Israel” by Yoav Yair, Yifat Yair, Baruch Rubin, Ronit Confino-Cohen, Yosef Rosman, Eduardo Shachar, and Menachem Rottem, submitted to NHESS.

The paper refers to the first recorded case of thunderstorm asthma in Israel. It presents new interdisciplinary research findings that can contribute a lot in the knowledge of health problems associated to meteorological factors. The analysis of thunderstorms integrating lightning activity is not new; some literature already shows the relationship between some thunderstorms and respiratory problems; but the combination of all of them in order to relate the cycle of life of this convective system and health crisis evolution is new. Besides this, the paper discusses how the likelihood of incidence of such public-health events associated with thunderstorms will be affected by global trends of population growth, urbanization and climate change. The paper is well supported by recent literature, the scientific methodology followed and the different expertise of the authors.

Authors say that the event occurred during an exceptionally strong super-cell thunderstorm accompanied by intensive lightning activity, severe hail, downbursts and strong winds followed by intense rain. They have found that the amount of admissions of patients with respiratory problems in the hours immediately following the passage of the gust front. They also discuss how the likelihood of incidence of such public-health events associated with thunderstorms will be affected by global trends of population growth, urbanization and climate change.

Attending that the other referee has focused their comments on aspects related with the medical and health aspects and has provided a detailed list of comments and suggestions, I will focus my review on meteorological aspects.

Abstract

Write the meaning of ER

Introduction

Page 2, line 3. Add “human losses” (“that entail significant economic and human losses”). There is a great number of references about fatalities due to this kind of events (i.e. Petrucci, O., L.Aceto, C.Bianchi, V.Bigot, R. Brázdil, S.Pereira, A.Kahraman, Ö.Kılıç, V.Kotroni, M.C. Llasat, M. Llasat-Botija, K. Papagiannaki, A. A. Pasqua, J. Řehoř, J. Rossello Geli, P. Salvati, F. Vinet, J.L. Zêzere, 2019. Flood Fatalities in Europe, 1980–2018: Variability, Features, and Lessons to Learn, *Water* 2019, 11, 1682; doi:10.3390/w11081682)

Page 2, lines 4-5. There are numerous public health effects of thunderstorms, because they can be related with heavy rainfalls and floods, hailstorms or tornadoes. In those cases, health effects can be drowning and heart attacks -see the previous suggested reference-, impact of direct strikes, GOLPES due to the collapse of trees or walls, or by objects transported by the wind, direct impact of severe hail, car accidents, and so on. Consequently, you should modify this sentence, perhaps including some literature references to other health effects of thunderstorms.

Page 2, lines 4-5. I would recommend a little modification of the Introduction. You start the physical explanation that relates the cycle of life of the thunderstorm with the asthma, speaking about “downdrafts during the mature and decay stages of thundercloud evolution”. In line 15

you introduce the “development stage” (that is anterior to mature and decay stages) and afterwards again the downdrafts. Taking into account that this paper is addressed to scientist from different disciplines, and some of them probably doesn't know the cycle of life of thunderstorms, it can create some confusion. I would suggest moving line 15 to a new paragraph focused on the short explanation of this cycle of life and its relation with the causes of asthma (pollen, etc)

Page 3, line 5. Add a reference on “the formation of well-known dust-wall known as "Haboob"”. It is not so well-known by all the potential readers of this paper.

Page 4, line 7. Remind the interdisciplinary and multidisciplinary character of this paper. Some people cannot know was it a “gust front”. Explain here or in the paragraph in which you explain the phases of the thunderstorm. Taking into account that this event affected more than 8000 people it should be a big gust front, probably due to a multicellular thunderstorm, a supercellular thunderstorm or a mesoscale system. Then, it would be better to say “induced by a thunderstorms system”

Page 4, lines 9-12. Why do you speak here about lightning activity?

Page 4, line 23. You say “Another chemical effect of lightning activity...” but I don't find where you have introduced any chemical effect of lightning activity. Attending your expertise, I consider that it would be interesting to write a paragraph explaining the chemical effects of lightning activity that can be related with asthma.

Page 5, line 6. As you are starting with recommendations and warning systems, I would recommend un PUNTO Y APARTE before “A thorough review published...”

Page 5, line 12. Probably some readers didn't know what WRF is. It would be better to write “which is used in the meteorological model WRF to forecast thunderstorm activity” or something like this.

Meteorological Conditions

Page 6, line 9. Write “upper levels” (they are not only the level of 500 hPa, usually they arrive until 300 hPa)

Page 6. What was the role of the mesoscale cyclone? Probably the organization of the flow that helped the advection of wet air from the Sea. Which factor triggered the convection? The cold front? Please, clarify. Are you sure that it was a supercell and not a multicellular system or mesoscale system? Usually supercells are related with severe weather (i.e. tornadoes) and have a mesocyclonic circulation inside. Could you check it? It would be interesting to include a satellite image showing the thunderstorm and the micro-front or squall line created by the downbursts

Page 7. You say that it “was the most powerful thunderstorm ever observed in Israel since lightning detection became operational in 1997”. This fact merits to be included in the abstract and conclusions.

Page 7. You explain here the role of humidity and electric fields, and the fact that after the thunderstorm that results in rupture and release of allergens into the cold outflow. I think that

it would be useful to comment this in the Introduction linking the cycle of life of the thunderstorm with the evolution of formation and dispersion of pollen and the other pollutants.

Discussion

Page 12. You say that in Israel, thunderstorms and lightning occurs almost exclusively during winter months but afterwards you say that some of the most severe convective events in Israel occur during fall and spring months, and that in both cases they are associated to the RST pressure system. I would suggest to substitute “exclusively” by “mainly” and checking if RST is present in the three seasons.