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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Rapid and sudden advection of warm and dry air in the Mediterranean basin" *by* J. Mazon et al.

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1/ Concerning the introduction to the topic, I would suggest Authors the following paper that might be of interest for them, in particular to enlarge the discussion on heat bursts that, indeed, are related to downward air motion, but not always in association with thunderstorms. http://www.adv-sci-res.net/2/139/2008/asr-2-139-2008.html

The goal of the research presented is based in describing an event of rapid rise of temperature that last several hours. On the contrary, heat burst is defined, by the AMS, as a rapid rise of temperature and fall humidity that last few minutes, usually associated to nocturnal thunderstorms.

To our opinion, the event described is very similar to the Heraklion event analyzed in

the present manuscript. Its timescale is between heat burst and heat wave timescales. For this reason, the reference is added when the Heraklion event is described.

2/ Concerning the need for a new definition, Authors state that it is based both on time duration and on physical reasons (katabatic winds). I think that if the presence of katabatic winds is just a mere possibility, then it would not be necessary to introduce a new definition but simply extend the time duration of "heat wave" definition to encompass the Barcelona and Heraklion events. If, on the contrary, physical reasons are a fundamental aspect (not included in "heat wave" definition), then I would agree with Authors for a new definition.

The definition of flash heat proposed in the paper is only based on duration of the event. It was never our idea to base the definition also on the dynamics. However, in the manuscript, we obviously describe the different physical mechanisms that may govern the thermodynamics during the events: katabatic winds, Foehn effect, rapid movement of ridges, but we don't incorporate these mechanisms in the definition.

On the other hand, we don't agree with the referee's suggestion about enlarging the heat wave definition to include small time scales (less than two consecutive days) because the physical mechanisms producing a heat wave and a flash heat are different. By applying the suggestion of the referee in a similar context, it wouldn't be necessary to define a mesoscale; it would be enough with time scale of the phenomena included in the macro or microscale

3/ Concerning the effects on "flash heat", I would encourage Authors to include some discussion on air quality. Sudden adiabatic temperature increases, indeed, favour ozone formation with consequent health impacts. Some data on hourly ozone might probably be retrieved by Environmental Agencies.

The referee is right; it would be interesting to do it. However, in the analyzed events, for different reasons ozone levels were not much affected by the increase of temperature.

The Heraklion event occurred during the night and early morning, and consequently without or with low levels of UV radiation. Consequently, ozone formation was no important.

Referring to the Barcelona event, information about alarms by ozone has been consulted in the official Catalan Environment Service (Departament de Medi Ambient); no alarms of ozone were detected during this event, probably by 2 reasons:

- The rise and fall of the extreme temperature was sudden, lasting 4 hours during the morning, and at 15 LT (when sun radiation is higher) temperature falls to average values. Moreover, while the event occurred at the end of August, radiation is lower than June or July, when ozone formation is more common in Barcelona area. - Dangerous levels of ozone request large amount of emissions of SOX and NOX (mainly from traffic). During August traffic emissions use to be lower in the Barcelona metropolitan area because this is the most common holyday period for many of the inhabitants in the Barcelona metropolitan area. As a consequence traffic are much lower than June or July, when ozone concentration can be dangerous for healthy.

4/ Concerning the numerical simulations, the (however slight) differences between observations and WRF outputs are intriguing. I would suggest authors to extend their comments on them. Might these differences to be connected with some PBL parametrizations? Or might them be related with orographic representation in the numerical model? Or might them be related to the sea boundary representation?

In both simulations, the same parameterizations were used, as well as the number of vertical levels. However, in Barcelona case 4 nested domains were defined (27, 9, 3 and 1 km of horizontal resolution), while in Heraklion event three domains were used (18, 9 and 2 km of horizontal resolution). In the paper, the smallest domains are used, and consequently the resolution from the Barcelona event is 1 km, while for Heraklion is 2 km. Moreover, Barcelona event occurred during the day, while Heraklion event occurred during the night, and probably different parameterizations could work better

for each simulation.

However, the differences are small, and it is not the aim of this paper to investigate what parameterization is most suitable for this type of events.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/1/C1836/2013/nhessd-1-C1836-2013-supplement.pdf

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 3735, 2013.