



Comment on acp-2021-350

Anonymous Referee #2

Referee comment on "Overview towards improved understanding of the mechanisms leading to heavy precipitation in the Western Mediterranean: lessons learned from HyMeX" by Samira Khodayar et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-350-RC2>, 2021

General aspects

The paper "Overview towards improved understanding of the mechanisms leading to heavy precipitation in the Western Mediterranean: lessons learned from HyMeX", by Samira Khodayar et al. is a good review about the present understanding of the heavy precipitation in the Western Mediterranean, mostly oriented to work recently done in connection with the field phase "SOP1" (2012) of the "Hydrological cycle in the Mediterranean Experiment" (HyMeX), but also including references to research about the matter, not strictly based in HyMeX; even significant work done before the HyMeX initiation is referenced here. By this way a more complete vision about the problem is achieved.

This review is not the first about HyMeX-SOP1, but it is timely now, because 2020 was indicated as the end of HyMeX. Ducrocq et al (2014), can be seen as an initial review, and a special issue (2016) of the Quarterly Journal of the Royal Meteorological Society, introduced by Ducrocq et al. (2016; <https://doi.org/10.1002/qj.2856>), can be considered as a second one. In any case, since 2016 to present days' significant research results have been added.

A positive aspect of this review is the team of authors that has been formed: their different specialisations cover many aspects of the problem and this permit a wider and also more precise vision of it.

The number of commented references is really large. The list of references occupies more than 24 pages of a total of 63 pages. This means a hard and valuable work, but the list of references is not complete. In fact, it would be almost impossible to construct a complete list.

In summary, I consider this paper is good enough, it is useful and it is an interesting tool to face the problem of the West-Mediterranean heavy rain in many aspects, and therefore I recommend its publication, almost as it is. In the following there are a few comments that can be taken into account by the authors, although the consideration of all of them is not strictly mandatory to publish the paper.

Details

-Line 154 mentions 16 IOPs during the campaign SOP1: the total of IOPs was 20 (see Ducrocq et al, 2014)

-The measurement site named BA (Balearic Islands) not only included Menorca (where specific facilities were installed), but also Mallorca, with operational radar and radio-sounding stations (lines 180-181)

-In figure 1, I don't understand what the colour of each radar station means

-By line 320, it seems that the authors consider that only breaking Rossby waves (cut-off lows) can induce Mediterranean cyclogenesis, but also open troughs can do it

-Fig. 2a, b. The meaning of the colours is not clear to me

-In section 3.2.1, another interesting reference for water origin of heavy rain in Western Mediterranean is Insua-Costa et al (2019; <https://doi.org/10.5194/hess-23-3885-2019>)

-With regard to section 3.3.1, IOP8, the most important event that affected Spain during SOP1, and also IOP15 and others, are analysed in Jansà et al (2014; <https://doi.org/10.3369/tethys.2014.11.03>). [Note also that Ferreti et al (2014; <https://doi.org/10.5194/hess-18-1953-2014>) is a parallel paper on the cases that affected Italy]

-Regarding section 3.3.2, the convergence associated to a cold pool boundary was already highlighted as a continued triggering convection mechanism in Western-Mediterranean heavy rain in Ramis et al (1994; <https://doi.org/10.1002/met.5060010404>)

-Fig. 6 is not clear enough to me

-With regard to section 4.3, the Arome-WMed reanalyses, made with assimilation of all available added observations, permitted to detect a secondary cyclone that produced severe weather in Menorca during IOP18. See Carrió et al (2020; <https://doi.org/10.1016/j.atmosres.2020.104983>)

-Continuing with 4.3, Campins et al (2016; <https://doi.org/10.1002/qj.2737>) studied the impact in the forecasting of the assimilation of some extra observations during SOP1