

Second review of

Contrasting stable water isotope signals from convective and large-scale precipitation phases of a heavy precipitation event in Southern Italy during HyMeX IOP 13

February 2019

Overview

This review comments on the revised version of the article. The authors have made a great effort to address the comments and rectify the the substantial weaknesses of the manuscript, which were present in the first version. All major and minor points were adequately taken care of and I recommend publication of the manuscript after a number of minor revisions. While the comments below are numerous, none of them warrant another round of major revisions, as all of them can be addressed without investing too much time.

Minor Comments

1. While reading the manuscript, I still missed the basic justification for this article, as I have emphasized in my first round of comments. However, it turned out to be located in the last paragraph of the last section of the article. I suggest to present it toward the end of Section 1 and even make a short comment on the intentions behind this study in the abstract!
2. In section 2.1, the grid spacing and domain dimensions are mentioned at the very end of the section (p. 7, l. 2 – 6). I suggest to move them to the start of the model description or at the very least to the beginning of the second paragraph.
3. While section 3 is greatly improved, the shortening had an unwanted side effect. Due to the density of the text, the third and fourth paragraph of section 3.2 (p. 10, l. 6 – 28) contain no less than 12 references to figures, more than one every two lines, referring to four different figures in the order 5, 3, 5, 3, 3, 4, 3, 4, 4, 5, 5, and then back to 2. I understand that it is necessary to refer the reader to the correct figure, but you should try to rearrange these two paragraphs a bit, such that they don't jump around between figures this often and contain at least slightly fewer references to figures.
4. The manuscript contains multiple instances of *the X value*, where X can be a quantity like q or θ and so on, remove both, *the* and *value*, and just use X instead (e.g. p 11, l. 4, 5, 6, 7, 27, 28–29, ...)

5. It says on p. 11, l. 20 that *between 18 and 6 hours before arrival...* but looking at Fig. 7 shows evaporation more or less the instant the trajectories start passing over the sea, for some of them well above 24 hours before the event. Perhaps you should consider a less restrictive formulation here.
6. Section 4.1.1, third paragraph refers to dots following mixing/Rayleigh lines, but that doesn't really seem to be the case, at least not exactly. Do these lines depend on the constants in their equation, which might fit better for other values? If so, consider using them. If not, or if this is too much effort, explain more clearly how they agree with the scattered dots.
7. At multiple locations in the text, a moist plume over Africa is mentioned, and it is not always referred to in the same way (African moist plume, African moisture plume, the plume of ...), please keep this consistent throughout the manuscript. Also, explain whether this is a climatological plume or a feature of this specific event.
8. Section 5 can still be slightly shortened by removing some of the values (not needed in the conclusions) and condensing the text further, specifically the part on p. 15, l. 8 – 26.

Typos and Formulation

page	line(s)	comment
1	20	replace <i>linked to a frontal feature</i> with <i>ahead of a cold front</i>
2	4	change to <i>large amount of convective precipitation</i>
2	6	replace <i>preceding the occurrence of</i> with <i>before</i>
2	8	remove comma after <i>SI</i>
2	9	replace <i>brings</i> with <i>lifts</i> , remove <i>masses</i>
2	10	remove <i>to higher altitudes</i>
2	23	change <i>mesoscale deep convection</i> to <i>organized deep convection</i> , add comma after <i>events</i> , remove <i>along</i>
2	24	remove <i>content</i> , remove <i>deep</i>
2	25	replace <i>question</i> with <i>research topic</i>
2	28 – 29	Using <i>either... or</i> like this indicates that Africa or extratropical remnants of Atlantic tropical cyclones over the Atlantic are the only sources of moisture, but other sources are possible as well as a combination of sources. I suggest to rephrase this a bit to account for these possibilities or at least not exclude them.
2	29+	Change sentence to <i>More recent studies (e.g. Lee et al., 2016 and 2017), pointed out a significant moisture contribution, one quarter of the total integrated water vapor, from North Africa...</i>
3	9	remove the <i>s</i> at the end of <i>isotopes</i>
3	11	replace <i>constraints</i> with <i>insights</i>
3	20	change <i>at surface</i> to <i>at the surface</i>
4	11	remove comma after <i>evaporation</i>
4	15, 17	repetition of <i>the free troposphere of ...</i>
5	12	change <i>in the low levels</i> to either <i>in the lower troposphere</i> or simply <i>at low levels</i>

page	line(s)	comment
5	12	What exactly is meant by <i>initiated over Algeria</i> ? Is this where convection first occurred?
5	13	replace <i>large</i> with <i>high</i>
5	14	add <i>s</i> after <i>temperature</i>
6	5	replace <i>sense</i> with <i>context</i>
7	15	replace <i>written as an output</i> to <i>extracted from the model</i> or just change to <i>written out</i>
7	20	insert <i>specific</i> before <i>humidity</i> , remove comma after <i>humidity</i>
8	4	add <i>s</i> after <i>ratio</i>
8	10	add <i>s</i> after <i>condition</i>
8	17	insert <i>region</i> after <i>SI</i>
8	23	replace <i>a reasonable</i> with <i>good</i>
8	25	add <i>s</i> after <i>observation</i>
9	2 – 6	The two parts of the sentence <i>The moisture structure (...) has been further studied...</i> are extremely separated and the sentence becomes difficult to read. You could rephrase it to something like: <i>The moisture structure upstream of the HPE studied by Lee et al. (2016) has been further analyzed. Three features are highlighted below: 1) the presence of ...</i>
9	7	add commas before and after <i>located over south-eastern France</i>
9	8	The threshold of 1002 seems arbitrary, this might be a relic from back when the area of MSLP < 1002 hPa was the only shaded part of Fig. 3.
9	10	remove comma after <i>air</i>
9	11	remove commas before and after <i>q</i> , remove <i>thus</i>
9	15 – 16	change to (...) <i>is located ahead of the trough (red area in Fig. 3b).</i>
9	16	change to <i>Comparing the maps of q and $\delta^{18}O_v$ (crescent enclosed by a dashed line in Fig. 4a–b) reveals an additional...</i>
9	28, 29	repetition of <i>the hourly evolution of</i>
10	3	move <i>slightly</i> to after <i>increase</i>
10	7	is it the upper level trough or the cold front? Those are two different things.
10	12	remove both, <i>the</i> and <i>level</i> , at the end of the sentence
10	13	remove <i>Then</i> at the beginning of the sentence, add a comma after <i>UTC</i>
10	14	which western edge?
10	27	insert <i>at</i> after <i>SI</i>
11	2	insert <i>the</i> before <i>two</i>
11		Multiple instances of <i>history</i> where <i>evolution</i> might be the better word (e.g. lines 7 and 11)
11	10	change title to <i>Phase one: the convective phase</i>
11	13 – 15	change to <i>The 3-day backward trajectories in Fig. 7 indicate that the air parcels arriving at SI in the 800 – 700 hPa layer originated over the North Atlantic.</i>
11	16	replace <i>are mostly</i> with <i>remain</i>
11	17	add comma after <i>SI</i> , remove <i>rapidly</i>
11	20	change <i>as well as</i> to <i>and</i>
11	22	change <i>mixing</i> to <i>they mix</i>

page	line(s)	comment
11	23	remove <i>occurs</i> , change <i>the median q value</i> to <i>the median of q</i>
11	27	change to (...) <i>before their arrival, showing that q and $\delta^{18}O_v$ increase rapidly in the last 12 hours before the parcels arrive over SI. Between 60 and 12 hours before their arrival (Fig. 8a, b), q and $\delta^{18}O_v$ are still relatively small, at around 2–6 g kg⁻¹ and between -25 and -19 ‰, respectively. (Is this really in the dry pocket of upper-level trough? The trough itself should also be somewhere else this long before the event...</i>
12	3	change to <i>for conditions in the Mediterranean</i>
12	3	<i>blue line</i> I do not see a blue line in the figure, does this refer to the dashed line?
12	6	<i>gray to purple</i> - shouldn't this be green to purple?
12	14	change to <i>Horizontal SWI distribution</i>
12	15	remove <i>feature</i> , remove <i>a region of enhanced convective activity and</i>
12	16 – 18	change <i>multiple convective cells</i> to <i>a convective line, which extends (...) and is located ahead of the surface cold front. Westerly and north-westerly winds prevail at 542 m ASL while south-westerly wind is dominant at 2455 m ASL.</i>
12	18 – 21	change to <i>Within the precipitation area, lower $\delta^{18}O_v$ values (< -16‰) than in the vicinity are found at 542 m ASL while locally higher $\delta^{18}O_v$ values are found at 2455 m and 5565 m ASL (Fig. 10d, f), indicating the presence of strong and deep convective mixing. This convection causes the vertical transport of SWI-depleted moisture ...</i>
13	1	remove <i>large</i>
13	7	remove <i>of</i>
13	9	replace <i>at</i> with <i>along</i>
13	10	change to <i>Additional moisture is then...</i>
13	12	add <i>s</i> after <i>hour</i> , remove <i>the ... values</i>
13	13	change <i>strongly increase</i> to <i>increase strongly</i>
13	19	remove third zero
13	23	add comma after <i>altitudes</i>
13	24	the vapor take-up isn't over North Algeria, it's over the Mediterranean sea
13	24	end sentence after (Fig. 11a–b) and remove <i>and</i> before <i>the median q</i> , change to <i>the median of q</i>
13	25 – 26	change <i>precipitation onset</i> to <i>the onset of precipitation</i>
13	26, 27	repetition of <i>moist and SWI-enriched</i>
14	2	add <i>s</i> at the end of <i>parcel</i> , add comma after <i>particular</i>
14	7	change to <i>Horizontal SWI-distribution</i>
14	12	this is still hardly visible at 5500 m, all shades of blue look almost exactly the same in print
14	15	the black line shows very little decrease, it's visible for the others though
14	19	multiple repetitions of <i>moisture plume over North Africa</i> or similar in this line
14	23	replace <i>becomes more depleted</i> with <i>decreases</i>
14	24	replace <i>that</i> with <i>which</i>

page	line(s)	comment
14	24	I thought P2 was dominated by large scale ascent, not convection
14	24 – 28	This paragraph seems like it belongs to section 4.2.1, not 4.2.2