Dear Editor,

Please find below our answers to the comments of both referees, how we have modified the text and a marked-up manuscript version.
One problem was the size of the figures. I have enlarged most of the figures in the manuscript and I hope you will be satisfied with them. However, if needed, I can split some figures such as Fig 7 and 15.

Yours faithfully,

Nadia Fourrié

Response to Referee 1
We would like to thank Reviewer 1 for his/her useful comments and suggestions, which helped to improved the quality of the manuscript. Reviewer comments are reproduced in italic text. Answers are in plain text.

"Generally the paper is well written but can be improved by being more precise at some places (see detailed comments). Since lots of acronyms are used within the paper and not all of them have been defined before their first occurrence a list of acronyms would be useful.
We acknowledge the used of many acronyms, a full list of them will be appended at the end of the article and defined when first used.

Appendix B: List of Acronyms
AEMET: Agencia Estatal de METeorologìa
ALADIN: Aire Limitée Adaption Dynamique et développement InterNational
AMV: Atmospheric Motion Vector
AROME-France: Application of Research to Operations at MEsoscale, France
AROME-WMED: Application of Research to Operations at MEsoscale, WestMEDiterranean sea
ARPEGE: Action de Recherche Petite Echelle Grande Echelle
BLPB: Boundary Layer Pressurized Balloon
BLLAST: Boundary-Layer Late Afternoon and Sunset Turbulence
BSS: Brier Skill Score
CNES: Centre National d'Etudes Spatiales
CNRM-GAME: Centre National de Recherches Météorologiques-Groupe d'études de l'Atmosphère MEtéorologique
COPS: Convective and Orographically-induced Precipitation Study
DTS: Data Targeting System
ECMWF: European Centre for Medium-range Weather Forecasts
E-GVAP: EUMETNET EIG Global navigation Satellite System water VApour Programme
EUMETNET EIG: EUMETNET Economic Interest Group
ETS: Equitable Threat Score
EUCOS: EUMETNET Composite Observing System, former EUMETNET EIG Observation Programme
GPS-ZTD: GPS Zenith Total Delay
GTOPO30: Global 30 Arc-Second Elevation Data Set
GTS: Global Telecommunication System
HyMeX: HYdrological cycle in the Mediterranean EXperiment

IASI: Infrared Atmospheric Sounding Interferometer
IOP: Intense Observation Period
MAP-D-PHASE: Mesoscale Alpine Programme-Demonstration of Probabilistic Hydrological and Atmospheric Simulation of flood Event
SBL: Surface Boundary Layer
SEVIRI: Spinning Enhanced Visible and InfraRed Imager
SOP(1/2): Special Observation Period (1: Autumn 2012 / 2: Winter 2013)
SURFEX: Externalized Surface (surface scheme)
SYNOP: surface synoptic observations
WRF: Weather Research and Forecasting

Since no error analysis of the observational data in discussed within this paper it should be mentioned somewhere in the text that the observations are assumed to represent the truth."
The reviewer is right, though observations are also subject to errors but we do not have any other source of comparison for our evaluation. We will mention that fact in the introduction of paragraph 3. "Models were evaluated against observation data, which are subject to errors and biases but in this study they are used as a reference and assumed to represent the truth." In addition we have chosen the word evaluation instead of validation since observations are not perfect as every one knows.

Detailed comments:

1. *Within this work the standard deviation (σ) is used as a measure for the forecast errors. However, it is more common to use the root mean square error (RMSE) which is the same as the standard deviation in the case there is no bias; usually RMSE is larger than σ. Why was σ used instead of RMSE?*

We decided to separate the origin of errors (bias and variability), however we also computed the root mean square error (RMSE). RMSE is very close to the standard deviation (σ), excepting in the case where the bias is large, between 9 and 15 UTC. We can replace (σ) with RMSE. In addition, we found that relative humidity data used in figures (Fig 7 and 15) did not correspond to those used for temperature and wind, we replaced panels for humidity by the right ones.

We have changed the caption of Fig7: "Bias (dashed lines) and Root Mean Square Error (RMSE, solid lines) computed with 2 m temperature (a), 2 m relative humidity (b) and 10 m wind speed (c) with respect to the forecast range for the AROME-WMED model (black) and the AROME-France model (green) for SOP1 from 5 September to 6 November 2012. Dotted lines denote the number of observations used for the comparison (right y axis)."

The paragraph related to Fig 7 is modified as follow:
Temperature biases and root mean square errors are affected by the diurnal cycle. The bias in both models is positive during night-time with a maximum at 06:00UTC and negative during day-time with a minimum at 15:00UTC (Fig. 7a). The absolute bias values are slightly larger for AROME-WMED than for AROME-France, between 0.02 and 0.03 °C on average for AROME-WMED. The RMSE are similar for AROME-WMED and AROME-France. The biases for the 24–48 h ranges follow the same pattern as those of the first 24 h, but RMSE increases for the 24–48 h range (about 0.2 °C). A minimum in relative humidity bias is found at 6 h and maximum at 15 h (Fig. 7b). In that case, the error difference between both models nearly reaches 1 %. As for 2 m temperature, the RMSE are similar between both models and increase for the 24–48 h range. Concerning the wind at 10 m (Fig. 7c), the AROME-WMED mean bias is lower at 12:00UTC and larger during night-time between 18:00 and 06:00UTC

with an 0.2ms^{-1} overestimation. The RMSE, varying between 1.5 and 1.9ms^{-1}, is also a little larger than the one in AROME-FRANCE.

We have changed the caption of Fig 15: “Bias (dashed lines) and Root Mean Square Errors (RMSE, solid lines) computed with 2 m temperature observations (a), 2 m relative humidity (b) and 10 m wind (c) with respect to the forecast range for the AROME-WMED model (black) and the AROME-France model (green) for SOP2 from 1 February to 15 March 2013. Dotted lines denote the number of observations used for the comparison (right y axis).”

The paragraph related to Fig 15 is corrected. “Though the 2 m temperature RMSE are similar (around 2°C) between AROME-WMED and AROME-France, they are slightly larger (5.6% on average) for AROME-WMED beyond the 24 h forecast range. The negative 2 m temperature error bias value becomes larger for AROME-WMED beyond the 12 h range. The difference in temperature biases of both models is around 0.1 °C for forecast ranges over 12 h (Fig. 16a). The pattern of the negative bias follows a diurnal cycle, which is less pronounced than during SOP1 (Fig. 7a). Its values are however identical between the 0–24 h and 24–48 h forecast ranges. Concerning the relative humidity, the bias cycle with respect to time is stronger than the temperature bias cycle (Fig. 16b). The minimum is obtained at 6 h and the maximum at 15 h. Moreover the RMSE in relative humidity is larger for ranges from 24 to 48 h than for the day-1 range. The RMSE maximum is reached at 15:00UTC (15 and 39 h ranges). AROME-France and AROME-WMED have a quite similar behaviour, with a better fit for AROME-France, as shown by a smaller RMSE. As for other parameters, the wind error RMSE in AROME-WMED is larger, ranging from 1.8 to 2.2ms^{-1} during SOP2 (Fig. 16 c). The differences in error bias are more pronounced.”

2. *In line 16 of the abstract it is stated that “The overall performance or AROME-WMED is good….”. What does “good” mean? Same for “…similar to…“ (line 16) and “… less accurate …” (line 18). It would be useful to state some hard numbers here.*

We propose to modify these sentences by “The overall performance of AROME-WMED is good for SOP1 (i.e. mean 2m temperature root mean square error (RMSE) of 1.7 °C and mean 2m relative humidity RMSE of 10% for the 0-30-h forecast ranges) and similar to those of AROME-France for the 0 to 30 h common forecast range (maximal absolute difference of 2m temperature RMSE of 0.2 °C and 0.21 for the 2m relative humidity). For the 24 to 48 h forecast range is of course less accurate (relative loss between 10% and 12% in 2m temperature and relative humidity RMSE, and ETS for 24-h accumulated rainfall) but it remains useful for scheduling observation deployment.”

3. *P 1803, line 29: “A specific…”. This sentence is unclear and should be rephrased.*

We propose to modify this sentence with this short paragraph: “To be able to make forecast during MAP-D PHASE and COPS experiments, an AROME domain was created over the Alps. This model was initialised using ALADIN-France, which was at the time the operational regional Météo-France model, taking its lateral boundary conditions from ARPEGE and its initial state from a three-dimensional variational data assimilation (3D-Var) scheme (Fischer et al. 2006). This AROME model was run during 6-months (June-November 2007).”

4. P 1804, line 22: This sentence (…In Sect. 3, the…) is unclear and should be reformulated.

We propose the following clarification: “In Sect. 3, the performances of AROME-WMED and AROME-France models are evaluated during the SOP1 over a common area. The comparison is based on Météo-France operational scores and on scores computed with additional surface observations from the HyMeX database."

5. *P 1805, line 2: Since different domains and grid points are used it might be useful to mention that both model have a 2.5 km grid. This is only mentioned for AROME-France.*

Lines 1 to 3 have been replaced by "AROME-WMED is based on AROME-France, which is a limited area model that rests upon non-hydrostatic equations (Bénard et al 2010). Both models have a 2.5 km grid and 60 vertical levels ranging from 10 m above ground to 1 hPa. They use a 1-moment microphysical…."

6. *P 1807, line 24: "…over a long period." Could this be more precise?*

We have replaced "over a long period" with "2 week period". To introduce the flow dependency into the background error covariances proves to be too costly, hence, a climatological background error representation (i.e. spatially and temporally averaged statistics over a 2 week period) is used in AROME-France and in AROME-WMED instead.

7. *P 1809, last paragraph: "EUCOS", "BLBPs" have not been defined before. Same for "IASI" on p1810, line 24. All acronyms should be checked for explanation before first occurrence and, as mentioned above, a list of acronyms should be included.*

A list of acronyms will be included in annex 2 as mentioned in the answer of the specific comment. EUCOS is now defined p 1804 (EUMETNET Composite Observing System) but BLPB were already defined in page 1804 lines 10-11 (Boundary Layer Pressurized Balloons). We have carefully verified that every acronyms was explained at their first appearance.

8. *P 1811, line 25ff: It is stated that a code change has been performed during SOP1. Did this affect the results in a noticeable way? Was some verification done to show that this change in code does not affect the results? One or two sentences for clarification would be useful (either in this paragraph or in the Concluding Remarks on p 1823 where this issue is also addressed in line 18).*

For technical reasons, it was not possible to have a single version of the AROME-WMED during SOP1. The main changes in the AROME model reside in the revision of the cloud scheme with a realistic increase of intermediate cloudiness in addition to changes concerning observation use. As it was not possible to run simultaneously both cycles of the AROME-WMED, we could not quantify the impact of the code change on the AROME-WMED forecast during SOP1. However, the evaluation of the code change in the operational AROME-France suite has shown that low-level cloud fields were altered and the precipitation were slightly improved. These clarification sentences will be added in paragraph 2.3

9.P 1817, line 10: However, missing data do not occur…". This sentence is not clear. Does this mean that there is no day with missing data at all stations? Maybe this can be formulated more clearly.

Readers should be aware that only surface stations with daily precipitation for all the 62 days of the SOP1 are plotted (as in fig.6 for the temperature, some raingauge data were missing the date depending of the station). We chose to be very strict and to discard all stations with missing data to make a fair comparison between observation and model.
We have modified this sentence with "Some raingauge data were missing sometimes during the SOP1, the date depending of the station."

10. P 1819, line 10: Looking at Figure 16 the maximum of FBIAS is 1.8 (1.3 is stated). How is the rapid increase in FBIAS at higher thresholds in Fig 16 explained when compared with the decrease of FBIAS at high thresholds shown in Fig 10?

For the lowest x-axis thresholds (i. e. <20mm/24hr) corresponding to comparison samples exceeding 1000, the frequency bias is fairly similar for both SOP1 and SOP2, that is around at 1.2 - 1.3. For higher thresholds, AROME-WMED always exhibits a higher frequency bias reaching 1.8 for the 60 mm/24h. However, for threshold above 20 mm/24h, the smaller the sample (between 100 and 50 verification data), the larger the margin error, hence the larger observed differences are not significant. On the contrary, during SOP1, there were 700 verification data for the 60 mm/24h threshold, making the comparison more robust. We propose to add this comment in the text.

11. P 1823, line 2ff: One sentence explaining the reason why AROME-France gives better results in terms of temperature, humidity, wind and precipitation for SOP2 should be included (in this paragraph or in paragraph 4, "Forecast evaluation during the second Special Observation Period").

In our opinion, AROME-France benefits in this case from a more adequate B-Matrix than AROME-WMED during SOP2. Indeed, the B-Matrix of AROME-WMED has been computed over an autumn period whereas the AROME-France one was made over many different meteorological situations. The following sentences will be added: " During winter period, AROME-France model benefited from a B-matrix, computed over different meteorological situations (including anticyclonic and stable situations), more representative of the meteorological conditions encountered during SOP2 (see paragraph 2.2.1)."

Textual comments:

1. *P 1803, line 20: "…of Mediterranean Sea…" should be ""…of the Mediterranean Sea…"*

The modification is accepted.

2. P 1808, line 20: Is "estimation of the estimation of the error…" correct?

"Of the estimation" has been removed

3. P 1814, line 10: "Rainaud et al. (2014)" should be "… (2015)" as in the list of references.

The modification has been made.

4. P 1822, line 22: "Once the field campaign over" should be Once the field campaign was over"

It has been corrected

5. P 1824, line 18: Better "Frequency BIAS (FBIAS) and Equitable Threat Score (ETS) …"

The clarification has been made.

6. P 1829, line 18: "Murphy, A. H.: A new vector partition of the probability score, J. Appl. Meteorol., 12, 595–600,1973." listed in the reference list is not mentioned within the paper. Remove or include reference somewhere in the text.

This reference has been removed.

Figures & Figure captions:

1. *P 1834, Figure 3: Use "(lower panel)" instead of "(left panel)".*

The modification has been made.

2. *P 1842, Figure 11: There are no stars in this figure. The figure caption should mention this in a way (e.g. by adding “No differences are statistical significant at the 90% level in this case”).*

The figure caption has been changed into:

“Brier skill score computed in a neighbouring distance of 54 km for AROME-France (green) and AROME-WMED (black) computed with rain gauge data from France as a function of 6–30 h rain rate threshold during the SOP1 period from 5 September to 5 November 2012. In this case, there is no significant differences at the 90 % level.”

3. *Some of the figures are very small and details are hard to see (especially Figures 6, 7, and 8) while others are quite large but only have little detail (especially Figures 11, 13, 14, 17 and 18). It should be checked if these figures could be resized.*

Figure 6 has been enlarged:

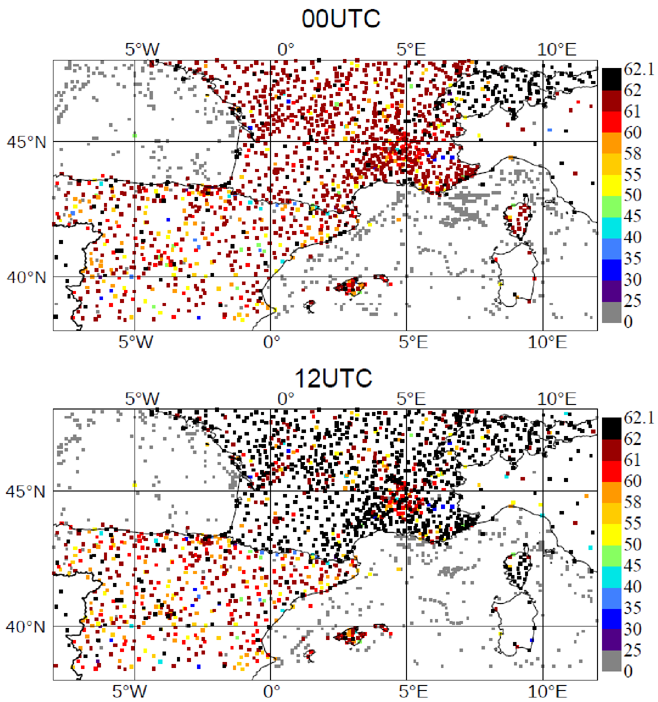


Fig6:

Figures 7 and 15 are adapted to portrait vision, but, if necessary, can be split into 3 panels. They have also been enlarged (please see first detailed comment).

Figure 8 could be split into two parts as shown below:

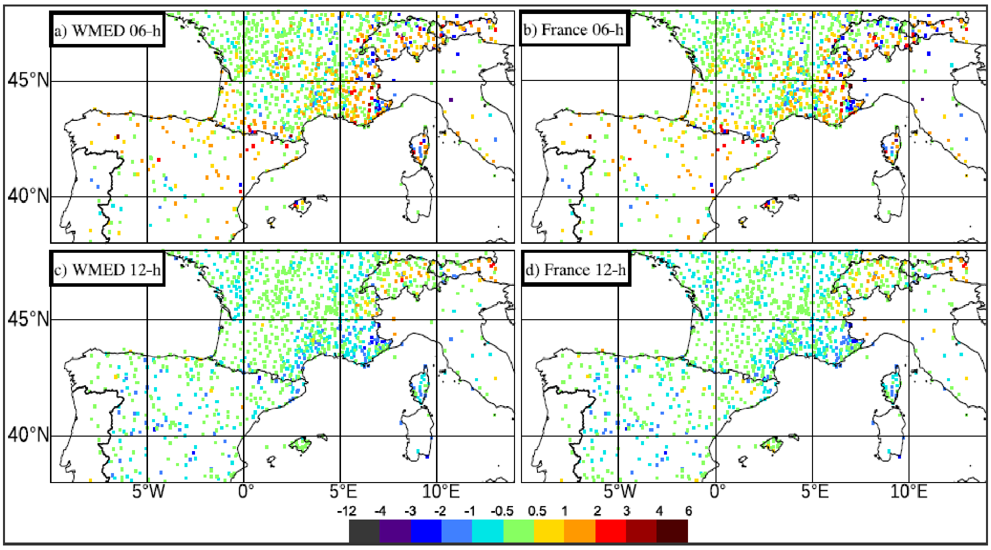


Fig8a:

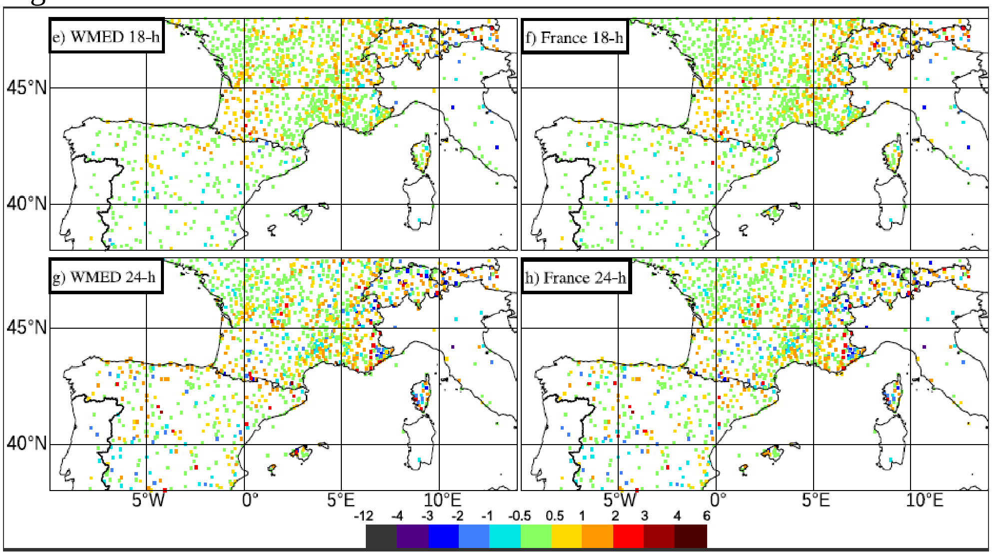


Fig8b:

We propose to interact with the Editor to propose the adequate size of the figures.

<u>Response to Referee 2</u>

We would like to thank Reviewer 2 for his/her careful reading of our paper, and for his/her remarks that will help enhancing the clarity of the main ideas. We did our best to take them into account as explained below. Reviewer comments are reproduced in italic text. Our answers are in plain text.

<u>Specific comments</u>
1. P1803, L15: The sentence starting with "Several studies..." does not fit in here.

We recognize that this sentence is misleading here. We propose to modify with "AROME-France, from which AROME-WMED is derived, leaves a large part of Mediterranean Sea out of its domain. As several studies have shown the importance of an accurate description of the moist low-level flow (that feeds meso-scale convective systems which can result in heavy precipitating events over the Mediterranean Sea, Duffourg and Ducrocq, 2011; Bresson et *al., 2012; Ricard et al., 2012), we choose to extend further south the AROME-WMED domain (Fig. 1). In addition, AROME-WMED ran...”*

2. P1810, L8-9: The authors state that the data from the balloons were discarded when they encountered strong updrafts. Please give more details why the data cannot be used.
The BLPBs (constant volume balloons) do not have the same sampling strategy than radiosoundings which basically collect one set of data per time unit (1 or 2 seconds). The BLPB sampling strategy is meant for horizontal drift : the measurement system yields one set of data (P, T, Hu) every 30 seconds (let call these raw data). Each set of raw data is derived from a series of a dozen of individual measurements that are averaged. These internal measurements are not available outside the gondola and are not transmitted to ground.

This strategy does not allow to capture very sudden changes such as those encountered in convective updrafts. For example, balloon B26 (Figure 4, top frame) ended its flight in a very rapid updraft that uplifted the balloon by more than 2500m in less than 10 minutes !

Moreover the data to be assimilated in AROME WMED had to be representative of larger scale/time features that the 30s raw data produced by the BLPBs. To achieve this representativeness issue, raw data were averaged every 20 minutes approximately. To guarantee the consistency of such data the averaging was performed only over periods corresponding to stable flight. So when the BLPBs underwent transient vertical excursions (sudden change of flight level before returning to the nominal flight level), these part of the data-set where not assimilated.

The paragraph below will be inserted in the text :
“Only data from stable parts of the flights were used to generate this special dataset, which has been derived from raw BLPB data by time filtering. Some balloons ascended rapidly when encountering strong up-drafts which were generated by deep convection. The data corresponding to these rapid vertical variations were discarded. The sampling pace of the BLPBs is not meant to capture very rapid changes in the measured parameters.”

3. P1813, L22-24: The authors just describe that the bias is positive during night-time and negative during day-time. Some ideas about the origin of this diurnal cycle would help the reader here.
A possible explanation of the origin of the positive temperature bias is given further in the text for figure 8 (p 1815 l 2-9). “This positive bias in 2 m temperature of AROME-France during night-time is well known and it is due to the excessive coupling of the scheme between the surface and the lowest level of the model. The Masson and Seity (2009) surface scheme tends, in fact, to overestimate the surface temperature at night-time during summer. The delay in the increase in temperature at 2m during summer in day-time (i.e. at 12:00UTC in Fig. 8c and d) is also well known but not yet explained.” We propose to add the following sentences :
“The positive bias in 2 m temperature during night-time is the result of an excessive coupling of the Masson and Seity (2009) scheme between the surface and the lowest level of the model. The negative bias during day-time corresponding to the delay in the temperature increase is also well known but remains yet to be explained.”

4. Figs. 7, 15: I wonder why the relative humidity is analyzed. As it is linked to temperature, the errors are coupled as obvious from the opposing diurnal cycle. I would recommend to analyze the 2-m specific humidity instead.

You are right, RH is not the best indicator for moisture because it is linked to temperature, however, the observations provide only relative humidity and we do not perform the conversion from RH to q in our scores.

5. The case study at the end is very interesting but too short in my opinion. A few comments on possible reasons for model deficiencies or more details about the relevant processes responsible for this heavy precipitation event would be useful.

We tried to expand the case study by introducing more details about the genesis of the heavy precipitation event and possible reasons for model deficiencies. We tried to supplement the case study by detailing the genesis of the precipitations and try to explain the model deficiency. The section should be modified as following (added comments are in bold).

An example of strong precipitation simulation by AROME-WMED is given with IOP8. IOP8 is a case of deep convection associated with a mesoscale convergence line (Ducrocq et al., 2014) which occurred on 28–29 September 2012 in Southern Spain. Heavy rainfall during IOP8 caused severe damages which resulted in 13 casualties in Andalusia and Murcia (southern Spain, neither of these areas is a specific HyMeX target but they are included in the AROME-WMED domain). The synoptic situation was characterized by an upper level cut-off low over southern Portugal at 00:00UTC on 28 September (Fig. 19a), which first affected Andalusia, then progressed eastward to finally reach eastern Spain at 12:00UTC on 29 September (Fig. 19**). In the north easterly flank of the cut-off low, where there is upwards forcing, favouring the triggering of the convection, low level depression and convergence were created, reinforcing the convection and heavy precipitation. The low-level convergence zone shifted from inner Andalusia (at 06:00UTC on 28 September) to Catalonia at 12:00UTC on 29 September.** Most of the heavy precipitation that fell on the Murcia region was caused by a mesoscale convective system between 10:00 and 13:00UTC on 28 September. It was generated along this convergence line between the warm and moist easterly low-level flow in the Balearic basin and the rapid westerly low-level flow between southern Spain and North Africa, in the Alborean basin (Fig. 20a and b). This convergence line is located ahead of the deep upper level trough (Fig. 19b). **Both progressed north eastwards passing over Valencia and reaching the north of the Balearic Islands at 00:00UTC on 29 September (Figs. 19c and 20c). They finally reached Catalonia on 29 September 12:00UTC.**

The measured amount of daily precipitation exceeded 200 mm in Andalusia and in Murcia (28 September, Fig. 21a). Another precipitation maximum was observed in the Valencia area. Worthy to be mentioned, AROME-WMED was able to forecast accurately the 24 h accumulated precipitation amount (Fig. 21b) at 24 h and even at the 48 h forecast range (Fig. 21c). At the 24 h range, the Andalusia precipitation maximum is indeed underestimated, it has a very small horizontal extension, located at around 37N and 4 W (Fig. 21b). Also to be noted that the 48 h precipitation forecast from 27 September 00:00UTC seems to be better than the 24 h one as it isolates three precipitation maxima over Andalusia, the Murcia area and in Valencia, even though the first two precipitating areas are not precisely located as compared to observations.

The analysis of the 1-h precipitation accumulation in the observations showed that heavy precipitation over Andalusia at 5 °W 36.5 °N occurred as soon as 27 September 21:00UTC. In AROME-WMED forecast from 28 September 00:00UTC the corresponding system is located more westerly with lower values of rainfall (up to 15 mm/1h) instead of more than 50 mm/1h in the observations. In that case, AROME-

WMED model had difficulty in reproducing heavy precipitation in the early 4h forecast ranges. Noteworthy to mention that this area is close to the boundary of the model domain and contains few assimilated data.
This wrong location of the meteorological system is illustrated when comparing the SEVIRI brightness temperature observations against the simulations from the 9 h forecast starting on 28 September 2012 00:00UTC and from the 33 h forecast starting on 27 September 2012 00:00UTC (Fig. 22). At first sight, the low brightness temperature values over Spain, especially in the Andalusian area and the Murcia region are higher in the simulation than in the observations (Fig. 22a). They are associated with two convective systems present over these areas. The system over Murcia is associated with low values around -60 C. The brightness temperature simulation from the 9 h forecast indicates that the system is less developed and extended (Fig. 22b) over the Andalusia region. In the 33 h forecast simulation, the system over Andalusia is less intense, its spatial coverage is smaller than in the observations (Fig. 22c). The Murcia system is also shifted to the north-east and is located over the coast instead of in-land.

For 29 September 2012, the maximum values of rain accumulated between 24 and 48 h are overestimated (Fig. 23a and c) and located over the Cévennes Vivarais area and the south-west of Catalonia. In the 24 h forecast range (Fig. 23c), the maximum is lower than at day-2 forecast and more centred over Catalonia as displayed by the observations (Fig. 23a). The brightness temperature simulation for 29 September 2012 at 06:00UTC shows that the system over Catalonia is more developed and extended over land in the 30 h simulation than in the 6 h one and in the observations (Fig. 24). **The persistence and the stationary position of the convective system in the 24-30-h forecasts lead to an overestimation of precipitation over Catalonia in the first 6-h on 29 September.**
For 29 September 12:00UTC, the global ARPEGE model (not shown) and AROME-WMED (Fig. 25) forecast too much warm air over the Balearic Islands and Catalonia. This feature is associated to a low with two minima off-shore the Var region (south-east of France) and over the Balearic Islands in the 36 h forecast (not shown), which leads to overestimate precipitation on 29 September over Catalonia. The system over south-east of France is already established in 6 h forecast simulation and is ahead compared to the observations (Fig. 24a). Finally, the convective system affecting Liguria is present in the 30 and 6 h simulations, even though the associated brightness temperatures are lower than in the observations.

To summarize, AROME-WMED is able on this case to simulate more than 150 mm/24h even if the location and the temporal evolution are not perfect.

Minor technical or textual comments

1. *P1802, L9: observation instruments -> meteorological instruments*

Correction accepted.

2. *P1803, L13: Meteo-rologique -> Meteorologique*

Correction accepted.

3. P1803, L20: The authors state that due to the domain covered by AROMEWMED, it is better suited for HyMeX. This is clear, since it was developed especially for this project. Thus, this remark can be omitted.
The paragraph has been reworded (cf specific comment 1) and the remark has been removed.

4. P1803, L26: COPS stands for: Convective and Orographically-induced Precipitation

Study
This has been added in the text. Moreover, as suggested by Referee 1, we will add an appendix including all acronyms.

5. P1804, L2: Please give some more details for ALADIN-France.
We will include details on ALADIN-France "which was at the time the operational regional Météo-France model, taking its lateral boundary conditions from ARPEGE and its initial state from a three-dimensional variational data assimilation (3D-Var) scheme (Fischer et al. 2005)."

6. P1804, L15: mobile platforms
Corrected.

7. P1804, L18: Please explain the abbreviation ECMWF.
The explanation of ECMWF acronym has been added: European Centre for Medium-range Weather Forecasts.

8. P1805, L26: ...of grid points are covered...
Corrected.

9. P1806, L7: ...model so as to avoid ... -> model to avoid
"so as" removed.

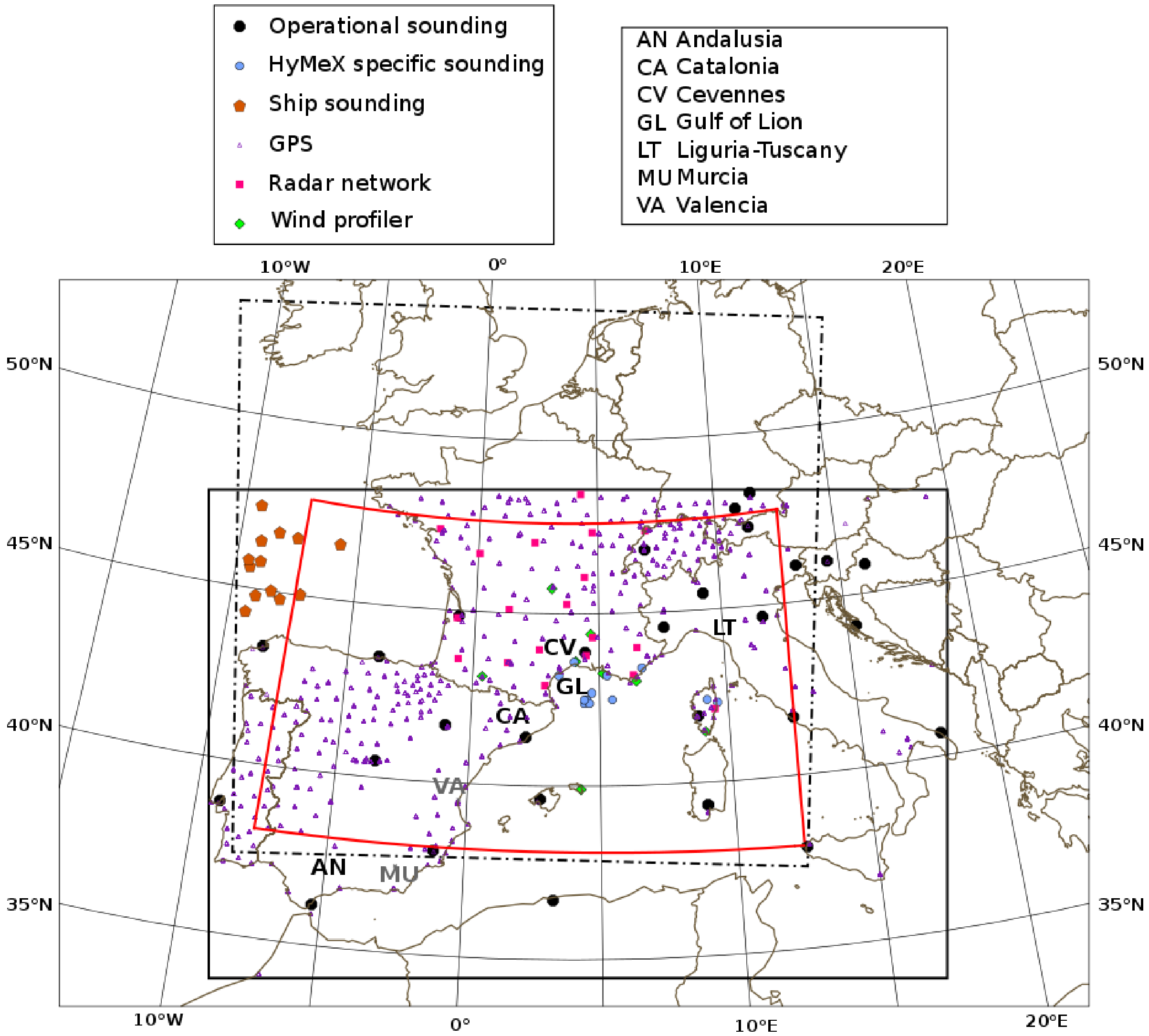
10. P1806, L11: Please exchange performed with initialized or started.
Performed has been change in started.

11. P1808, L20: estimation of the estimation -> estimation of the
Modification made.

12. P1810, L24: Please explain IASI.
IASI stands for Infra-red Atmospheric Sounding Interferometer. It has been specified in the text.

13. P1812: Please explain CAPE and HOC.
CAPE has been replaced by convective available potential energy and HOC by HyMeX Operational Centre.

14. P1813, L4: A rectangle showing the common area could be inserted in Fig. 1.
This rectangle has been added in figure 1, which has been also enlarged.



15. P1815, L12: ... from the HyMeX database
Corrected

16. P1815, L13: ...had been subject to...
Corrected

17. P1815, L17: ...if one 1 h datum was missing... -> if one 1 h interval was missing
Corrected

18. P1815, L21: no SYNOP nor climatological -> neither SYNOP nor climatological
Corrected

19. P1816, L1: The closer to 1 the ETS is, the better is the prediction.
Corrected

20. P1820, L11: ... the Intensive Observation Period....
Corrected

21. P1820, L20: Fig. 19b
“b” has been added.

22. P1820, L22-25: This sentence is too long and confusing, please rephrase.
This long sentence will be modified as following: “It was generated along a convergence line between the warm and moist easterly low-level flow in the Balearic basin and the rapid westerly low-level flow between southern Spain and North Africa, in the Alborean basin (Fig. 20a and b). This convergence line was located ahead of the deep upper level trough (Fig. 19b).”

23. P1821, L7: The Andalusia precipitation maximum could be marked with a circle in Fig. 21b.
A black circle has been added in Fig 21b to highlight the Andalusia precipitation maximum. The figure has been also enlarged.

24. P1821, L10: ...are not located precisely as compared to observations... -> are not located precisely at the observed locations.
Corrected.

25. P1822, L22: Once the field campaign was over...
Corrected

26. Please enlarge the size of the following figures: 1, 6-8, 12, 15, 20-25
We agree that the size of the figure is not adequate in the landscape format. We enlarged Figures 1, 6, 7, 8, 12, 15 and 21. However, if this was not enough, we propose to interact with the editor to propose the adequate size.

27. Fig. 2: SD -> Standard deviation
Corrected
See below for figure 22 and figure 24.

28. Fig. 7: text on Figure a) 2m temperature at -> 2m temperature; please write out SD in the caption
Corrected.

29. Fig. 12: AROME-WMED simulates much more precipitation on the Spanish coast south from the Pyrenees than AROME-FRANCE. The authors should add a comment on that.
We will mention that a maximum was also found in AROME-WMED over the north east of Catalonia. “Another maximum is present over the north-east of Catalonia in AROME-WMED, while the maximum over the Valencia area is larger in AROME-France than in AROME-WMED.”

30. Figs. 22 and 24: Please use the same colourbar ranges for observed and simulated brightness temperatures to facilitate the comparison.
The colour bar has been modified in both figures and is identical for the 3 panels.