Review of the submitted paper to ACP "Overview of the Chemistry-Aerosol Mediterranean Experiment/Aerosol Direct Radiative Forcing on the Mediterranean Climate (ChArMEx/ADRIMED) summer 2013 campaign" by Mallet et al.

The authors present the overview of the ChArMEx/ADRIMED campaign, which investigates the properties and the radiative effects of aerosols Mediterranean region (mostlyWestern and Central parts of it). Unfortunately, during the campaign period no major aerosol events/plumes occurred in the region in terms of AOD. This manuscript mostly paves the way to the other papers of the way, so in its current status is light in term of scientific findings, although there is presentation of a lot of material from different observations/models mostly as capability examples but not necessarily connected between them (as they refer to different events/periods in general) or answering specific scientific questions. Thus, at the end the reader is wondering why this paper should be published. Personally, as a reviewer I see two ways that could improve the paper in order to make it suitable for publication in ACP. Either strengthen the Introduction section by expanding significantly the discussion about the rationale of the campaign and the open scientifically questions that it tries to tackle together with a Conclusion section about the outcomes of the whole campaign (at least till now) and not just the main findings of this manuscript only. Or provide more scientific results in sections 5 and 6, which are connected together and not just sub-sections of the type 'the instrument/model observed/ simulated this and more deep analysis can be found in that paper'. I encourage the authors to do the respective work in order to improve the quality of their paper and see it published.

***First, we'd like to thank the reviewer for these remarks and comments on the article. We tried to take into account most of the comments to improve the manuscript. In that sense, we have now (i) included two important paragraphs in the introduction (see below), (ii) reinforced the scientific questions and the originality of this project in a broader context and (iii) rephrased the abstract and conclusion parts in that sense. Secondly, we have added different paragraphs in the sections 5 and 6 to provide more scientific results, especially in terms of original aerosol chemical observations (SP2 aircraft measurements of black carbon concentrations), aerosol size distribution (especially for mineral dust aerosols) but also SW and LW radiative fluxes for the estimation of the heating rate vertical profiles. The different answers are detailed in the following parts.***

Major comments

1. Page 19621, Line 17-18: "Numerous studies have documented the AOD for polluted anthropogenic Mediterranean aerosols ..." Why in the introduction there is an overview of the literature only for AOD? What about other properties of aerosols like single scattering albedo (SSA), vertical distribution, etc., there is no information about them, but there are also important.

***This is effectively right and we have now added a large number of references in the new introduction of the manuscript for documenting these two important aerosol properties, which are the aerosol single scattering albedo and the vertical profiles, as mentioned by the reviewer.***

***1) Concerning the SSA derived over the Mediterranean region, we have now integrated the following paragraphs in the introduction:***
***"In addition to AOD, the knowledge of SSA is essential to estimate the aerosol direct and semi-direct radiative forcing. Concerning mineral dust particles observed over the Mediterranean, it should be noted that significant variations in SSA are reported, with values near 1 for purely scattering aerosols, and quite remarkable low values (0.74, 0.77 or 0.81) at Lampedusa (Pace et al., 2006; Meloni et al., 2003). At the high altitude Alpine Jungfraujoch station, SSA values are generally higher than 0.9 in case of African dust but occasional SSA as low as 0.75-0.80 are reported by Collaud-Coen et al. (2004). Intermediate values***

*(0.85-0.92) have been also reported over the Mediterranean basin (Kubilay et al., 2003; Meloni et al., 2004; Tafuro et al., 2006; Saha et al., 2008). These estimates clearly indicate that significantly different SSA values are obtained following the dust particle origins and/or possible mixing of mineral dust with other species. For example, Kubilay et al. (2003) underlined the importance of mixing, showing SSA values clearly lower (0.85-0.90) in case of mineral dust transport coincident with urban-industrial aerosols as compared to pure dust (0.96-0.97).*

*In addition, SSA observed in case of urban/industrial regimes has been also well documented over the Mediterranean Sea and coastal regions. In most cases, moderate or low SSA (0.78-0.94) is observed due to emissions containing absorbing black carbon aerosols. Over southeastern France, optical computations performed by Saha et al. (2008) and Mallet et al. (2004) indicate SSA values of 0.83 and 0.85 (at 550 nm) near the cities of Marseille and Toulon, respectively. Aircraft observations performed over the Marseille/Etang de Berre area during the ESCOMPTE campaign show values ranging between 0.88 and 0.93 (at 550 nm) in the PBL (Mallet et al., 2005). These SSA values are close to those observed in South Spain (0.86-0.90) by Horvarth et al. (2002). Over southeastern Italy, Tafuro et al. (2007) reported a value of 0.94 during summer time corresponding to anthropogenic particles. Finally, polluted particles transported over the Mediterranean basin have also relatively low values as reported by Markowick et al. (2002) over Crete Island (0.87) and by Di Iorio et al. (2003) (0.79-0.83) over the Lampedusa Island for two cases (25 and 27 May 1999) of "aged" anthropogenic aerosols originating from Europe.*

*As opposed to dust and polluted aerosols, few studies have derived the biomass burning SSA over the Mediterranean Sea. One estimate has been obtained during STAAARTE-MED by Formenti et al (2002) who reported a mean dry SSA of 0.89 (at 500 nm) for aged smoke from North America. Meloni et al. (2006) report estimations at Lampedusa with values of 0.82 ±0.04 (at 415 nm) for smoke aerosols over the Mediterranean region. The observed differences between SSA values could be due to the fact that the smoke events described by Meloni et al. (2006) are more "local" and not (or somewhat less) mixed with other secondary species, as compared to biomass burning particles documented by Formenti et al. (2002), which were issued from very distant Canadian fires. Finally, at Palencia (Spain), Cachorro et al. (2008) reported a column-integrated SSA of 0.88 (at 440 nm) for a biomass burning event occurring in July 28, 2004. It should be remained that most estimations of SSA over the Mediterranean have been obtained from surface in-situ or remote-sensing techniques. In that sense, this project provides interesting and original observations of 3-D aerosol SSA, allowing investigating changes in its important optical property during the transport of aerosols over the Mediterranean."*

*2) In a second time and for the aerosol vertical profiles, we have now included the following paragraph in the introduction:*
*" Concerning the aerosol vertical profiles and apart from a few airborne in-situ measurements (Formenti et al., 2002), most of the available information in the Mediterranean region comes from lidar observations, which provide highly resolved vertical profiles of aerosol backscattering at one or more wavelengths and, depending on the complexity of the instrumental setup, particles depolarization and extinction. Several sites are equiped with aerosol lidar systems and carry out regular observations in a coordinated way within the European aerosol research lidar network EARLINET (Papayannis et al., 2008; Wang et al., 2014).*

*Numerous studies have been specifically dedicated to the vertical distribution of Saharan dust during extended time periods and/or selected events from various Mediterranean regions, mainly from ground-based lidar systems: (i) the eastern basin in Thessaloniki (Hamonou et al., 1999; Balis et al., 2004), Crete (Gobbi et al., 2000; Balis et al., 2006), the Aegean sea (Dulac et al., 2003), and Athens plus Thessaloniki (Papayannis et al., 2005; Balis et al., 2006); (ii) the central basin in Lampedusa (Di Sarra et al., 2001; Di Iorio et al., 2003; Meloni et al., 2004), Lecce (Tafuro et al., 2006), and at Etna (Tafuro et al., 2006); and (iii) across the western basin with the first spaceborne lidar (Berthier et al., 2006) and at Observatoire de Haute Provence (Hamonou et al., 1999), and Barcelona (Pérez et al., 2006). Finally, using data from 20 EARLINET lidar stations, Papayannis et al. (2008) indicate that African dust transport over the Mediterranean basin is layered. Their analysis confirms early observations by Hamonou et al. (1999) that*

***not only different dust layers are superimposed at different altitudes, but that these layers have different source regions. The dust layers were generally detected between 1.8 and 9 km altitude.***

***Not only desert dust, however, can be transported above the marine atmospheric boundary layer. Balis et al. (2004) report non-dust aerosols within elevated layers over Thessaloniki, and Formenti et al. (2002) report a forest fire haze layer from Canada observed from airborne measurements between approximately 1 and 3.5 km above the northeastern Mediterranean in August 1998. Pérez et al. (2004) describe the complex interaction among orography, sea-breeze and pollution that cause the recirculation of pollutants and produce a strong layering with pollution aerosol layers above the boundary layer in the region of Barcelona. In addition, aerosol plumes are emitted sporadically in the Mediterranean free troposphere by Etna volcano. Such plumes have been observed to travel at altitudes between 4 and 5 km (Pappalardo et al., 2004) or above (Sellitto et al., 2015) at relatively short distance from Etna. To summarize, the lidar observations clearly show that only part of the aerosol transport occurs in the MBL demonstrating the need of using aircraft observations within the aerosol plume to determine the aerosol microphysical-chemical and optical properties of particles transported in altitude and so not detectable at the surface. Indeed, although lidar observations provide obviously crucial information on the aerosol vertical profiles, most of lidar systems cannot derive information on the aerosol size distribution, optical properties and chemical composition along the vertical. Such observations can only be obtained using in-situ aircraft vertical profiles as proposed in this ChArMEx/ADRIMED experiment. As an example, this project provides interesting and unique observations of 3-D aerosol size distribution during the transport over the Mediterranean basin, allowing us to investigate changes in size distribution between mixed and pure mineral dust. "***

***We have now replaced all those information with associated references in a larger context to underline the interest of building such intensive experimental campaign.***

2. Page 19626, Line 1-9: Which are the open scientific questions addressed by the campaign? From the three main objectives, the first is general applicable to every campaign and the second has been addressed already in the literature, so which are the novelties except from the application to a new dataset (although may be more extensive)? The third objective seems more original; however there is no citing paper in the manuscript trying to explore the questions of this objective. Someone may say that it is rather early to tackle these questions, something that future papers will do. However, there is not indication about that in the current manuscript. In any way it is not clear why this campaign was/had to be organized, except for the obvious reason of providing a new extensivie dataset.

***This remark is effectively right and we did not enough detail this aspect in the previous version. We have now brought more details in the new version of the article. In that sense, we have now included different paragraphs before listing the different objectives of the ChArMEX/ADRIMED project to argue for developing such an intensive experimental campaign over the Western Mediterranean. The two different paragraphs included in the introduction are the following:***

***1) "It should be remained that most estimations of SSA over the Mediterranean have been obtained from surface in-situ or remote-sensing techniques. In that sense, this project provides interesting and original observations of 3-D aerosol SSA, allowing investigating changes in its important optical property during the transport of aerosols over the Mediterranean."***

***2) "To summarize, the lidar observations clearly show that only part of the aerosol transport occurs in the MBL demonstrating the need of using aircraft observations within the aerosol plume to determine the aerosol microphysical-chemical and optical properties of particles transported in altitude and so not detectable at the surface. Indeed, although lidar observations provide obviously crucial information on the aerosol vertical profiles, most of lidar systems cannot derive information on the aerosol size distribution, optical properties and chemical composition along the vertical. Such observations can only***

***be obtained using in-situ aircraft vertical profiles as proposed in this ChArMEx/ADRIMED experiment. As an example, this project provides interesting and unique observations of 3-D aerosol size distribution during the transport over the Mediterranean basin, allowing us to investigate changes in size distribution between mixed and pure mineral dust."***

***Concerning the third mentioned objectives, we agree with the reviewer that this original aspect was not enough detailed in the previous version and we have now introduced more details and some results based especially on the work of Nabat et al. (2015a). For that, we have now included a new paragraph in the section 6.4 to present some results of the climatic simulation conducted for the 2003 to 2009 period by Nabat et al. (2015a). This simulation uses, for the first time to our knowledge in the Mediterranean region, a regional Ocean-Atmosphere (O-A) coupled system model for investigating the effect of aerosol radiative forcing on the Sea Surface Temperature (SST), O-A fluxes (especially latent heat fluxes) and hydrological cycle over the Mediterranean. A new figure (Figure 29), showing changes in SST, AO fluxes and precipitations between two simulations (including or not aerosols) has been included in the new version. We have also mentioned this original result in the introduction and in the conclusion.***

***The new paragraph is the following:***
***"Using CNRM-RCSM with the new AOD monthly climatology over the period 2003-2009 (Nabat et al., 2013), Nabat et al. (2015a) have notably highlighted the response of the Mediterranean SST to the aerosol forcing. Figure 29a presents the annual average difference in SST over the period 2003-2009 between a simulation ensemble including aerosols and a second one without any aerosol. Aerosols are found to induce an average decrease in SST by 0.5°C, because of the scattering and absorption of incident radiation. As a consequence, the latent heat loss is also reduced by aerosols (Figure 29b), as well as precipitation (Figure 29c). This result also underlines the importance of taking into account the ocean-atmosphere coupling in regional aerosol-climate studies over the Mediterranean."***

3. Which of the results summarized in the Conclusions section is new or even important for the Mediterranean region? Just by comparing with the existing references used in the Introduction and the other sections of the manuscript it is not clear what this paper adds on the existing literature.

***As mentioned above, most of previous observations of aerosol microphysical, chemical and optical properties have been made in the Mediterranean region using remote-sensing techniques or surface in-situ observations (except the STAAARTE-MED and MINOS experiments in the eastern basin). In that context, such a new campaign offers a unique 3-D distribution of aerosol properties over the western Mediterranean using fully-equipped aircraft and surface observations. More particularly, this project has allowed us to derive the vertical structure of aerosol optical properties (real and imaginary part of refractive index, asymmetry parameter, single scattering albedo and mass extinction efficiency for different aerosol cases, which was really new over the Mediterranean. This database allows one (i) to investigate the variability of dust SSA obtained during the experiment and (ii) to make comparisons between SSA obtained during the transport of dust over the Mediterranean basin and those referenced near dust sources. Those different points are now reinforced in the abstract and conclusion of the new version.***

***Added-value also concerns the characterization of the aerosol size distribution. Indeed, the ChArMEX/ADRIMED project has allowed us investigating (i) the vertical structure of the aerosol size distribution, (ii) the changes in the size distribution between mixed and pure dust particles, especially in terms of fine and coarse mode effective diameter during the transport over the Mediterranean and finally (iii) to compare the dust size distribution obtained over the Mediterranean with those referenced over dust source regions (FENNEC, SAMUM1 and AMMA projects), as well as measurements in the Atlantic Ocean at Cape-Verde region (SAMUM-2) and at Puerto-Rico (PRIDE). Such observations can also provide some information on the CCN and IN properties of mineral dust for the modelling community. As for the aerosol optical properties, this specific point is now reinforced in the introduction, conclusion and in a new paragraph of the section 5.1.3.***

***In terms of aerosol direct forcing, an original aspect of this project concerns the estimation of the SW and LW heating rate along the vertical, which are directly deduced from observations of downward and upward radiative fluxes on board the ATR-42 aircraft. Our observations reveal instantaneous SW heating rate of about 5°K per day within the mineral dust layer, associated to a cooling (2-3 °K per day) in the LW spectral region. An interesting perspective is now to investigate the ability of the different models involved in the ChArMEx/ADRIMED project to reproduce this important radiative property, which controls, for a part, the semi-direct effect of mineral dust. This point is now more detailed in the abstract and conclusion of the new version. In addition, a specific section (5.4.4) associated to a new figure (Figure 28) have been added in the discussion to show an example of SW and LW heating rate profiles estimated for the 22 June. This case has been chosen as already discussed (see the Figure 21) in the text.***

***Another originality of this project concerns the SP2 observations deployed onboard the ATR-42 aircraft. This point was not enough detailed in the previous version and we have now provided a new paragraph of results of rBC concentrations obtained during the SOP-1a campaign in the section 5.1.4. A new figure (Figure 17), showing the vertical profiles of rBC concentration for five different regions, has been added in the new version.***

***Finally, the last original aspect of this project concerns the observations of aerosol chemical properties estimated from the C-TOF-AMS and PM10-PILS measurements at the Lampedusa and Ersa stations. The analysis and results of these instrumentations are not detailed in the new version but we have clearly mentioned the link with dedicated articles (Claeys et al., and Formenti et al.) which analysed these observations.***

***To our knowledge and in addition to "classical" observations over the Mediterranean, all those mentioned information listed above are really new and original. In that sense, those aspects are now reinforced in the abstract and conclusion as well as in different paragraphs of the new version.***

Minor comments

1. Page 19621, Line 22: AOD value of 0.1 you do not call it moderate but low, please rephrase.
***This is now changed in the text by including "low to moderate…"***

2. Page 19621, Line 27-28: "... only few studies have been dedicated to biomass burning aerosols ...". I do not think it is the case, see e.g. Amiridis et al. (2012), Baldassarre et al. (2015), Barnaba et al. (2011), Kaskaoutis et al. (2011), Liu et al. (2009), Markowicz et al. (2002 – which is cited in the manuscript), Ravetta et al. (2007). Please rephrase and add references accordingly.
***Thank you for this remark. This is now changed in the text and all references have been added.***

3. Page 19624, Lines 4-11: Additional papers dealing with the radiative effects of smoke aerosols are: Markowicz et al. (2002), di Sarra et al. (2008) (both of them cited in the manuscript) and Kaskaoutis et al. (2011). Please rephrase and add references accordingly.
***Thank you. This is now changed in the text of the new version.***

4. Page 19626, Line 2: "... an innovative database ..." I agree that the database is rich, but what is the innovation about it?
***We agree that the term "innovative" is not adapted. In that sense, we modified this part to moderate our message and underline what is really original and new to our point of view. As mentioned above, the new paragraph is the following:***
***"In that context, the main objectives of the ADRIMED/ChArMEx project are the following:***
***- to conduct an experimental campaign, based on surface and aircraft observations, for creating a huge 3-D database of physical, chemical and optical properties of the main Mediterranean aerosols, including (i) original in-situ aircraft observations of extinction coefficients, size distribution, black carbon***

***concentrations as well as (SW and LW) radiative fluxes and associated heating rates, (ii) balloons observations of aerosol size distribution and (iii) surface measurements including original characterization of chemical properties***
***- to investigate how the aerosol size distribution and optical (especially SSA) properties evolve along the vertical, between the MBL and elevated layers, and during the transport over the Mediterranean***
***- to use experimental surface and aircraft observations to estimate the 1D-local DRF and forcing efficiency of different aerosols at the surface, TOA and within the atmospheric layer***
***- to investigate how the modifications of the radiative budget due to aerosols affect the sea-surface evaporation fluxes, relative humidity profiles, cloud-cover, precipitation and more largely the Mediterranean hydrological cycle"***

5. Page 19627, Lines 18-20: "The Capre Corsica ... in-situ measurements". Please rephrase as the statements "remote site" and "important local anthropogenic sources" are contradictory.
***This sentence is now changed in the new version:"The Cape Corsica peninsula is a remote site ensuring that the in-situ measurements are not contaminated by local anthropogenic pollution."***

6. Page 19633, Line 22: "... see also description in Dubovik et al., 2011". This paper is not relevant to currently available AERONET products, as it is about spectral multiangle polarimetric satellite observations from POLDER/PARASOL.
***This is effectively right and this reference is now removed in the new version.***

7. Page 19634, Lines 11-25: What's the point of the EARLINET/ACTRIS network section as the 4 stations operated only for 1-2 days during the campaign and none of their data is presented in the manuscript. I suggest either to eliminate or to reduce significantly.
***If the reviewer agrees, we prefer keeping this part in the article as a study is ongoing to compare aircraft observations with lidar retrievals. However, we agree that the part was too long and in that sense, we have now reduced it in the new version.***

8. Page 19638, Line 24: Not all the balloons had ozone sondes, modify accordingly.
***This is effectively right and now modified in the text: "… respectively coupled, <u>for certain flights (see Tables 4 and 5),</u> to an ozone electrochemical sonde (Gheusi et al., in prep. in this special issue)…"***

9. Page 19639, Line 26: Add references for the satellite retrievals.
***All the references; Tanré et al. (1997), Tanré et al. (2011), Khan et al. (2010) and Thieleux et al. (2005) have now been cited for the MODIS, PARASOL, MISR and SEVIRI sensors, respectively.***

10. Page 19640, Line 9: "... anthropogenic aerosols over the Mediterranean." Delete as in the subsequent discussion in this section there is nothing about anthropogenic aerosols. Otherwise add some text.
***This part is now removed in the new version.***

11. Page 19640, Line 23, Page 19641, Line 3 and Line 21: Provide AOD values for SEVIRI.
***AOD SEVIRI values are now added in the new version.***

12. Page 19642, Line 6 and 25: Provide references for NCEP reanalysis and CRU data.
***The two references for NCEP (Kalnay et al., 1996) and CRU (Harris et al., 2013) data are now included in the text.***

***Kalnay et al., The NCEP/NCAR 40-year reanalysis project, Bull. Amer. Meteor. Soc., 77, 437-470, 1996.***
***Harris I, Jones P, Osborn T, Lister D., Updated high-resolution grids of monthly climatic observations—the cru ts3.10 dataset. Int J Climatol 34:623–642. doi:10.1002/joc.3711, 2013.***

13. Page 19643, Lines 19-21: State explicitly the period for which the anomalies have been calculated, i.e. 2000-2013?
***The anomaly has been effectively calculated for the period 2000-2013. This is now included in the text.***

14. Page 19643, Line 27: Why unexpected? Both Formenti et al. (2002) (cited in the manuscript) and Ravetta et al. (2007) presented similar cases.
***We used "unexpected" to refer to aerosols event which was not one of the main objectives of ADRIMED, but the term is not adapted. We have now removed it in the new version.***

15. Page 19645, Line 5: Why there are gaps for the observations of PM10 at Ersa in Fig. 13?
***This is unfortunately due to a problem of data acquisition on this instrument. This has been specified in the figure legend.***

16. Page 19645, Lines 8-10: Give the values of PM10 at Lampedusa as done for Ersa and not PM40.
***This is effectively a good remark. We have now changed it to indicate PM10 concentrations.***

17. Page 19645, Line 11: Add "of PM40" after "significant peak".
***This is now included.***

18. Page 19646, Lines 11-15: Why the number of samples is not the same for the Ersa and Cap d'En Font stations in Fig. 14 and Tab. 6 ?
***There was effectively an error. This is now modified in the Table 6.***

19. Page 19647, Lines 6-8: It is not evident why at Lampedusa there is important variability for the size of the coarse mode. The other sites have similar variability. Be more specific and may be add some text.
***The variability in the coarse mode size is about ±0.05 µm at Lampedusa, which is slightly higher compared to Cagliari and Cap d'En Font (±0.03 µm) or Ersa (±0.01 µm) stations. This is certainly due to the proximity of this station to dust sources compared to the other sites. Anyway, we agree that the term "important" is not adapted and we remove it in the new version. The standard deviation of the derived coarse mode is now indicated in the text.***

20. Page 19652, Lines 8-10: Why present data for these AERONET stations?
***This was effectively not very clear. The idea is to use different observations for AERONET/PHOTONS stations located within the "ADRIMED domain" and characterized by different aerosol regimes (see Table 2) in order to (i) characterize the aerosol optical properties over the studied region, (ii) to use such observations for evaluating the different models involved in this project (see Menut et al., 2015). We have now added a paragraph to argue about the use of these stations in the new version. The new paragraph is the following:***
***"These AERONET/PHOTONS stations have been chosen as located in a domain encompassing most of the ADRIMED in-situ and remote sensing observations (Figure 3) and they are characterized by different aerosol regimes (see Table 2)."***

21. Page 19652, Lines 8-10: The following AERONET stations Ouijda, Cagliari, Cap d'En Font, Ouarzazate, Frioul and Majorque while appear in Figs. 18 and 25, there are missing from Tab. 2.
***This is effectively true and we have now completed the Table 2.***

22. Page 19653, Line 8: Delete Tab.7 as the all the information exists in Fig. 19.
***This is effectively right and we have now removed the Table 7.***

23. Page 19656, Lines 15-18: Certainly the wavelength dependence is lower than below the 2 km,

but it is not very small, as someone can see just above and below the peak at about 3 km. Why this happens?
***The reviewer correctly remarks that there is a relatively large variability in the backscattering coefficient wavelength dependence at the altitudes where desert dust is expected. This is apparent in figure 22 b), with layers characterized by high values of backscattering coefficient displaying a small wavelength dependence, and intermediate layers with a moderate dependence. This suggests a variability in the aerosol size distribution and/or refractive index/shape. We do not have additional information that allows us to interpret this variability. In any case, all the particles below approximately 2 km display a significantly larger wavelength dependence, suggesting markedly different optical properties. A similar vertical variability of the wavelength dependence is observed, for instance, in figure 20 for the scattering coefficient profile measured over Lampedusa on 22 June; as discussed in section 5.2.3, particles of different origin and optical properties may be identified at the various altitudes.***

24. Page 19657, Lines 6-8: Is the LNG cross section in Fig. 23 correct? It seems from the text and the AOD figure below that the latitude axis is inverted.
***There was effectively a mistake and the Figure 23 corresponds to the flight from Sardinia to the Gulf of Genoa. This is now changed in the text.***

25. Page 19661, Line 15: An AOD of 0.28 is not moderately high, especially for Lampedusa. Delete the word “high”.
***This is now modified in the new version.***

26. Page 19666, Line 24: Provide the information of the visible range wavelengths for each of the models in Figure 27.
***This information is now provided in the new version.***

27. Page 19669, Line 20: Delete “vegetation fires”, as no fires occurred during the campaign according to the previous sections of the manuscript.
***These terms are now removed in the new version.***

28. Page 19670, Lines 24-27: As it is written the phrase does not make sense to me, while I am looking at Fig. 29. Please provide more explicitly the type of surface (desert, sea, vegetation) after the word “TOA”.
***The sentence was effectively not so explicit. We have now modified it in the new version. The sentence is now the following: “Due to this gradient in the surface albedo, moderate absorbing dust aerosols emitted over Northern Africa (characterized by high surface albedo) decrease the shortwave radiations reflected at TOA, compared to a non-turbid atmosphere. When advected above low surface reflectance as marine or dense forest over Europe, dust aerosols increase the upward SW radiations at TOA, leading to a cooling effect.”***

29. Homogenize the boundaries of the maps in Figs. 1, 5, 6, 7, 9, 10, 11, 12, 27 and 29. The same for Figs. 2, 3 and 4.
***This is unfortunately quite difficult to homogenize all the figures as they have been prepared by using different products (models, satellites) with different horizontal resolutions and domains (for instance TRMM is limited to 50°N). For every figure, we have tried to represent as most as possible a similar domain, integrating the entire Mediterranean basin. If this is acceptable, we propose to keep the different figures in the present configuration.***

Technical comments

1. Page 19621, Line 20: Crete is a Greek island, please modify accordingly.
***This is now modified in the introduction.***

2. Page 19622, Line 19: The citation Kubilay et al. (2003) is missing from the References.
***This is effectively right and now added in the references.***

3. Page 19623, Lines 19 and 27, Page 19624, Line 1, Page 19625, Line 6, Page 19659, Line 7, Page 19660, Line 16: Delete "D" from the citation "D. Meloni et al., 2015" and write to which of the two papers you are referring.
***This is now corrected in the text. We have now distinguished the Meloni et al. (2015) paper to the article in preparation in the ChArMEx special issue; referenced as Meloni et al. (in prep. in this special issue).***

4. Page 19623, Line 21: di Sarra et al. (2011) examine dust aerosols not polluted, so delete.
***This is now removed.***

5. Page 19624, Line 15, Page 19661, Line 6: Nabat et al. (2015), which of the three?
***This is now indicated: Nabat et al. (2015a).***

6. Page 19628, Line 12: Insert "in" between "reported" and "Table 1".
***This is now inserted.***

7. Page 19629, Line 11, Page 19652, Line 6: The citation Formenti et al. (2015) is missing from the References.
***This reference is now added in the new version.***

8. Page 19636, Line 11: The citation Petzold et al. (2013) is missing from the References.
***This citation is now added in the new version.***

9. Page 19636, Lines 15-16: The citation Moonsmuller et al. (2012) is missing from the References.
***This citation is now added in the new version. We did a mistake, the good reference is:***
***Moosmüller, H., Chakrabarty, R.K., Arnott, W.P.: Aerosol light absorption and its measurement: A review, Journal of Quantitative Spectroscopy & radiative transfer, 100, 844-878, 2009.***

10. Page 19636, Line 22: The citation Karol et al. (2013) is missing from the References.
***This citation is now added.***

11. Page 19638, Line 28: The citation Vialard et al. (2015) is missing from the References.
***The correct citation is Vialard et al. (2009) and is referenced at the end of the manuscript.***

12. Page 19647, Line 26: Renard et al. (2015), which of the two?
***This corresponds to Renard et al. (2015b). This is now indicated in the text.***

13. Page 19651, Line 12: The citation Vaishya et al. (2012) is missing from the References.
***This reference is now added in the new version.***

14. Page 19653, Line 25: Change "Fig. 13" with "Fig. 14".
***This is changed.***

15. Page 19656, Line 24: Provide the wavelengths for the "Angstrom exponent".
***The Angstrom exponent has been calculated from the AOD at 440 and 870 nm. This is now indicated in the text.***

16. Delete the papers Sicard et al. (2006, 2011) and Ramanathan et al. (2009) from the References as they do not appear in the text.

***We have now removed the two Sicard et al. (2006, 2011) references. For the other one, the reference is Ramanathan et al., 2001, which is referenced in the text.***

17. In Tab. 1 (2nd column) change the wavelength of the Leosphere lidar from 350 to 355 nm.
***This point is corrected.***

18. In Tab. 2 the number of observations should be hours (or 15 mins periods), but not days.
***This is effectively true. We have removed this column in the new version.***

19. In Tab. 5 for 16 Jun, 09:58 replace "LOA" by "LOAC" in the 2nd column.
***Thank you, this point is now corrected.***

20. Rotate Fig. 8.
***This is done in the new version.***

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