Reply to the referee on the paper: "Variability of mineral dust deposition in the western Mediterranean basin and South-East of France" by J. Vincent et al.

Dear Prof. Mihalopoulos,

You will find attached a revised version of our manuscript "Variability of mineral dust deposition in the western Mediterranean basin and South-East of France" [Paper # acp-2015-751]. We would like to thank the three referees for their insightful and constructive comments on the manuscript. Hereafter, our responses to the referee's comments are marked-up in bold. The marked-up manuscript is joined, right after the author's responses. Only the main corrections are marked-up. The modifications in the manuscript are indicated in red.

Interactive comments on "Variability of mineral dust deposition in the western Mediterranean basin and South-East of France" by J. Vincent et al.

M.-D. Loÿe-Pilot (Referee)

This paper deals with the spatio-temporal variability of mineral dust deposition to the Western Mediterranean. Five sites were monitored over 3 years. A good data set is given and its analysis is interesting. However any points are to be discussed more thoroughly and any conclusions should be more cautiously given.

Specific comments

1. Mineral deposition versus Saharan dust deposition.
The protocol used gives the mineral particles deposition. Along the text, mineral dust seems to become more or less equivalent to Saharan dust, especially when annual fluxes are reported (§4-1). Saharan dust weekly deposition events are chosen among most intense weekly mineral deposition (MID) defined as being above a threshold. There is no true significance for this threshold value. Don't you have any criteria (filter color, mineralogical composition) to separate local/regional terrigenous contribution from long range transported dust? Are the authors sure or did they check that even with low deposition you don't have got Saharan dust. And the opposite seems verified (one case at Le Casset). In fact the question of local / regional mineral dust contribution is not clearly posed and it should be.

In this paragraph, the referee addresses different questions that will be answered separately below:

1- **Concerning the use of the term "Saharan Dust" in our paper, we took care to use it only in the second part of our manuscript, i.e. when additional information such as air-mass trajectories and satellite images were used to confirm or not the African origin of the deposited mass. In the first part of the manuscript, when only MIDD were selected, we used only the term of "mineral dust deposition".**

2- **The threshold we used was not chosen to select Saharan dust episode but only for selecting the highest mineral dust deposition events. Thus, we considered that the highest deposition events should be located in the upper 16.6% (called the sextile) of the distribution of deposition fluxes. We verified that such a selection led to retain for each station at least 50% of the total deposited mass over the sampling period. We add the following sentence in the revised text: "The MID represent at least more than half of the whole deposition flux measured at each station (Table 2)".**
3- **The goal of this procedure is not to select all the Saharan dust deposition events but only the most intense events. Thus, as mentioned by the referee and in our manuscript ("the most intense Saharan dust deposition…. will be discussed Saharan deposition events of lower intensity were not retained for further analysis.**
4- **I is well known that all deposition measurements, whatever the technique used for sampling can be subject to local contamination, especially during high wind periods by soil particles remobilization. For minimizing this effect, the funnel of the CARAGA collector was installed 2.5 m above the surface. It is also for this reason that we only selected the highest deposition events for which the contribution of possible local contamination is reduced. To better underline this point, we add in the text the following sentence: "We cannot exclude that local mineral contribution, especially during high wind speed periods at the station, may affect some samples, in particular those for which the deposition due to long-range transported dust is the lowest. Moreover, for the station located the farest from the African coasts such as Frioul or Le Casset, the anthropogenic background in refractive material may also contribute for a limited part to the insoluble mineral deposition".**

2. Adequacy of the data set to the goal of the paper.
Due to the gaps in the monitoring at the different sites over the 3 years, the spatio-temporal pattern of Saharan dust deposition cannot be ascertained with the strong confidence displayed in the conclusions: for example for the South- North deposition gradient, the seasonality of the MIDD for each station (in spite of a partial reduction of the uncertainty: beginning of the paragraph 4.3) and the implicit comparison between the sites displayed in figures 5 and 6.

The data recovery rate of our data set varies between 77% and 91% depending on the station. Moreover, at least 1-yr of continuous measurements is available for each station. Obviously, the results and our conclusions correspond to the situation observed for the investigated time period at the locations where the samplings were performed.
Nevertheless, our results support the fact that a strong temporal variability is observed: the deposition fluxes measured at a station can vary over two orders of magnitude. The deposition fluxes measured at the different sites illustrate clearly the spatial variability of the dust deposition in the Western Mediterranean basin. Part of the conclusion was rephrased: "A South to North decrease of the intensity of the deposition fluxes is noticed. Moreover, during the investigated period, different source regions contribute to the dust deposition in different locations of the central and western Mediterranean in relation with different dust transport pathways. Our results suggest a seasonal pattern of the Saharan high dust deposition within the western Mediterranean basin for the investigated period, which could be refined with longer time series of deposition measurements".

3. Wet versus dry deposition.
Weekly sampling is not very adequate to check the mode of deposition. However the authors have mitigated this drawback by using dust plumes trajectories and times of arrival. There is, as noted by the authors, an imprecision in the arrival time, but offset by checking rain data 24h before the arrival date. Rain data are checked up to 24h after the arrival of the dust plume: that means that the episode is assumed lasting 24h at the most; but many dust events last more than 24h. This is a first source of uncertainty. The second source of uncertainty comes from the fact that dust deposition may occur only with a few drops which are not recorded either by automatic or manual rain gauges. This leads to an overestimation of dry deposition So the figures given for dry deposition must be looked on with some cautiousness.

The referee is right: dust events can last more than 24h. In order to better account for the duration of the dust events, the number of MIDD were computed for three time periods (24h, 48h and 72h) after the arrival time of a dust plume at the sampling sites according to the air-mass trajectories. These results are now reported in Table 4. The following sentences were added in the text: "Thus, a dust deposition event for which no precipitation is recorded at the station 24 h before and up to 72 h after the dust plume arrival is defined as "dry". The 72-h time period after the arrival of the dust air mass over the sampling site is splitted in three periods (24, 48 and 72 h) in order to take into account for the duration of the dust events that can last more than one day (Table 4)".

		Number of MIDD				MIDD cumulated mass			
	Time period after dust arrival	Total	Wet deposition	Dry deposition	Wet + dry deposition (mixed)	Total mass (g m^{-2})	Wet deposition (%)	Dry deposition (%)	Wet + dry deposition (mixed, %)
Le Casset	24h	15	12	3	-	1.2	77	23	-
	48h		13	1	1		82	14	4
	72h		13	1	1		82	14	4
Frioul	24h	17*	10	6	1	2.7	61	27	12
	48h		11	5	1		66	22	12
	72h		11	5	1		66	22	12
Corsica	24h	11	7	3	1	1.9	69	15	16
	48h		7	3	1		69	15	16
	72h		8	2	1		74	10	16
Mallorca	24h	20	12	6	2	7.6	36	15	49
	48h		14	4	2		41	10	49
	72h		14	4	2		41	10	49
Lampedusa	24h	34	18	15	1	13.5	51	46	3
	48h		18	15	1		51	46	3
	72h		18	15	1		51	46	3

Table 4: MIDD during which DDE occur only by dry, by wet or by mixed (wet + dry) deposition. The wet (or dry) conditions are defined considering the precipitation occurrence (or not) during the 24 h before the arrival time of a dust plume at the sampling sites according to the air-mass trajectories and 24, 48 and 72 h after its arrival time. * Precipitation data was not available for one MIDD at the Frioul station.

Concerning the second part of the referee's comment, we agree that rain gauges are not sufficiently sensitive and/or rapid to detect very short rain event or periods during which fog can occur. This is a general problem and thus we add in the text a sentence indicating such a possible artefact: "As mentioned by Löye-Pilot and Martin (1996), significant deposits can occur in almost "dry conditions", i.e. very low and short rain events and/or fog periods that classical meteorological rain gauges cannot detect. As a consequence, in these cases, the deposition is considered as dry and this leads to a possible overestimation of the contribution of the dry-only deposition to the total deposited flux". The following comment was also added in the abstract: "the contribution of dry deposition **(in the sense that no precipitation was detected at the surface)".**

Technical comments

- Representation of dust provenance areas (figures 6 and 8). The Saharan dust sources areas are now relatively well known. They are more or less displayed in the figure 7. So a more realistic representation of Saharan dust sources is possible. If the authors prefer this geometric representation they should at least exclude the Northern fringe of Western Maghreb.

According to their limited accuracy, backward trajectories and satellite AOD only provide information that allow to define an area from which the dusts are coming. This is the reason why we selected such a representation (not so precise but consistent with the accuracy of the information we had) of the regions of provenance of the dust. However, we agree with the referee concerning the Northern fringe of Western Maghreb which is now excluded from the DPA 7 region.

- Small points
. page 34682, lines 24-25. The deposition reported by Loÿe-Pilot et al (1986, 1996), Guieu et al (2010) and Ternon et al (2010) is Saharan dust deposition, not indifferentiated mineral dust. Idem for the deposition values quoted from these papers.

The sentences were rephrased: "In the late 1980s and 2000s, the mean annual Saharan dust deposition measured in Corsica by Loÿe-Pilot et al. (1986), Loÿe-Pilot and Martin, (1996) and Ternon et al. (2010) were of 14.0, 12.5 and 11.4 g m^{-2} yr^{-1}, respectively".

. According to the point 1, the title of §4.1 should be more precise "... deposition of mineral dust ..." and the title of §4-4 and 4.5 be "... Saharan dust deposition events".

The titles of the paragraphs were modified following the referee's comment: "4.1 Weekly mineral dust deposition in the western Mediterranean basin", "4.4 Identification of Saharan dust deposition events, "4.5 Transport routes of the Saharan dust deposition events".

. page 34678, line 15. Quote the reference: "... in Corsica on 11 years (Loÿe-Pilot and Martin 1996)".

Done. "... but also a strong inter-annual variability with deposition fluxes ranging from 4 to 26 g m^{-2} yr^{-1} in Corsica over an 11-year period (Loÿe-Pilot and Martin, 1996)".

. page 34682, line 11. "...located in the northern western Mediterranean..."

Done. "The maximum deposition recorded for the stations located in the northwestern Mediterranean basin and South of France (Corsica, Frioul and Le Casset) …".

Anonymous Referee #1

The paper by Vincent et al summarizes the results of a monitoring study on atmospheric deposition in the Western Mediterranean, covering a south to north transect from Lampedusa to continental France.

General comment:
The authors measured weekly deposition samples by using a new automatic device (CARAGA) able to collect and filter atmospheric deposition onto filters. They performed the study at 5 different locations (4 islands and one continental site, all regional background), during almost three years but with several gaps, and they focused only in the insoluble fraction (mostly attributed to mineral dust). In their study the authors display a North to South increasing deposition gradient related to the higher impact of Saharan dust towards the South, as expected from airborne measurements. Furthermore, they investigated when (in seasonal terms) deposition amounts are more intense at each location, and from where the dust is dominant (in terms of source regions). The study of atmospheric deposition is essential to know the transfer of nutrients and pollutants to waters, sediments and ecosystems, and therefore a study of these characteristics is necessary.

We agree with these general comments but we would like to also underline that the measurements and study of dust deposition are also of high interest for the validation of dust transport models which simulate, besides the AOD and the dust concentration, the deposited mass of dust. This will allow us to provide additional information on the dust mass budget in the models, which is presently only poorly constrained.

Specific comments:
-The authors only considered the insoluble fraction, which is not a criticism by itself, but given the effort realized in setting up the network it would be desirable also to measure the soluble fraction, especially concerning the N deposition.

As mentioned above, the goal of this paper is mainly to study over a quite long period of time and at different stations the deposited mass of Saharan dust events. Obviously, it would be very interesting to be able to also measure the soluble fraction and its content in nutrients and/or pollutants. However, deposition samplers allowing collecting both insoluble and soluble fractions are not automatized and not autonomous for long periods. This constitutes for us a strong limitation. By focusing only on the total insoluble mass of deposited dust, the sampling device could be significantly simplified (especially concerning the procedure to change and store of the samples). As mentioned in Laurent et al. (AMT, 2015), in order to estimate the deposited mass, collecting only the insoluble part of the Saharan dust deposition is justified by the very large fraction that the insoluble matter represents in the Saharan dust deposition over the Mediterranean basin.

-They did not perform any chemical speciation study, and consequently the transfer of specific nutrients contained in mineral dust such as Fe and P is unknown. The availability of this desirable information would add an enormous value to this work.

We again agree with the added value that chemical speciation in deposition could provide. However, as mentioned above, the whole procedure (especially the only collection of the insoluble material) was thought to allow us to collect dust deposition over a long period of time and at different stations as simultaneously as possible. The soluble fraction of the deposition being not collected, the information on the chemical composition will not allow to directly and simply discuss the transfer of specific nutrients such as Fe and P.

-The design of the experimental network is adequate in terms of geographical distribution but one of the sites (Frioul) is really close to a big populated region (Marseille city and its industrial surroundings). Actually, it seems that a constant mineral dust input (most probably reflecting the influence of that urban area) occurs (see Fig. 3), which makes that place not fully comparable with the others (but at the same time interesting).

The Frioul and Le Casset sites are the sites the farest from the African coasts and thus the Saharan dust deposition can be quite low and not so higher than the mineral particulate background. This is one of the reasons for which we decided to focus our study on the highest dust deposition events for which we assumed that the local contribution and/or background remain low compared to the long range transported material. We also selected a measurement procedure based on calcination which allows to destroy almost all the organic particulate matter that can be significant at a site like Frioul not so far from urban and industrial areas. Thus we add in the text the following sentences: "We cannot exclude that local mineral contribution, especially during high wind speed periods at the station, may affect some samples, in particular those for which the deposition due to long-range transported dust is the lower. Moreover, for the station located the farest from the African coasts such as Frioul or Le Casset, the anthropogenic background in refractive material may also contribute for a limited part to the mineral deposition".

-It would be nice to find (even in the supplement) a comparison between airborne measurements (dust in PM10 or TSP, as in some works cited in the paper) and deposition fluxes where both measurements are available (namely Lampedusa, Mallorca, Corsica).

It is well known that the link between PM10 concentration at the surface and dust deposition is far to be direct, especially because:
- PM10 concentrations included other species than mineral dust. For exemple, Marconi et al. (2014) underline that sea salt can contribute significantly to the PM10 concentration measured at Lampedusa.
- wet and dry deposition have not the same efficiency and dust transport over the Mediterranean basin can occur frequently above the surface layer making difficult to link dust deposition and surface PM10 concentrations (for example Marconi et al., 2014).
Nevertheless, we tried to look at the link between PM10 and dust deposition at Le Casset and Lampedusa but, as expected, no significant correlation was found between dust deposition and PM_{10} concentrations.

-Data coverage is good (over 77%) but important gaps are evident at specific locations, putting in risk some of the conclusions, especially those concerning seasonal patterns and source regions of dust. I encourage the authors to discuss deeper on this when appropiate.

The data recovery rate of our data set varies between 77% and 91% depending on the station. Moreover, at least 1-yr of continuous measurements is available for each station. Obviously, the results and our conclusions correspond to the situation observed for the investigated time period at the locations where the samplings were performed.
Nevertheless, our results support the fact that a strong temporal variability is observed: the deposition fluxes measured at a station can vary over two orders of magnitude. The deposition fluxes measured at the different sites illustrate clearly the spatial variability of the dust deposition in the Western Mediterranean basin.
Concerning the seasonality of the MIDD occurrence, because each month of the years has not been sampled with the same frequency at each station, we weighted the number of weeks for each month and for each station as mentioned in section 4.3. The seasonal patterns of dust deposition we found are in agreement with previous studies performed in the north-western Mediterranean basin.
Part of the conclusion was rephrased: "A South to North decrease of the intensity of the deposition fluxes is noticed. Moreover, during the investigated period, different source regions contribute to the dust deposition in different locations of the central and western Mediterranean in relation with different dust transport pathways. Our results also suggest the seasonal pattern of the Saharan dust deposition within the Western Mediterranean basin which could be refined with longer time series of deposition measurements".

Anonymous Referee #3

The present study shows the result of the quantification of dust deposition obtained for a 3 years period in a network integrated by 5 sites in the Western Mediterranean basin. The study is based on the weekly sampling of the insoluble fraction of dust (deposited by both dry and wet mechanisms) by using the same sampler, the CARAGA collector, devised for automatic collection at remote sites. The study is of high interest and deserves publication. However, the sampling methodology presents some limitations that should be taken into account in the conclusions.

Saharan dust events have a clear impact on mineral dust loadings in particulate matter and on dust deposition. Deposition of mineral dust is a topic of high interest as a source of nutrients. Magnitude of dust deposition may considerably vary depending on sources, transport mechanisms, distant to the source, and deposition processes (wet/dry). Saharan dust is an important source of nutrients to the Mediterranean Sea. However, the local or regional dust contribution may also be relevant in semi-arid areas (such as those in the Mediterranean region). Contribution of other sources of mineral dust seems to be relevant at the northern sites (Frioul).

The CARAGA collector was devised for automatic sampling of the deposition in remote areas, thus permitting to cover a wide spatial area. As a major limitation, the CARAGA collector permits to sample only the insoluble fraction of deposition. Although, a major fraction of dust is insoluble; solubility may increase during transport by different chemical and physical processes. Moreover, an important fraction of relevant nutrients (nitrogen or phosphorous compounds) is water soluble and therefore is not sampled by using this method. It should be considered by the authors to modify the CARAGA collector in order to sample also the soluble fraction in the future.

The aim of this study is to document the Saharan dust deposition in terms of mass, mainly because data on deposition are limiting to validate dust transport models. And 3D models only simulate the mass of the deposited material. Thus, providing relevant information for numerous cases of desert dust deposition in this area is of large interest to better constrain the dust mass budget in dust transport models. The whole procedure (especially the only collection of the insoluble material) was thought to allow us to collect dust deposition over a long period of time and at different stations as simultaneously as possible. The soluble fraction of the deposition being not collected, the information on the chemical composition will not allow to directly and simply discuss the transfer of specific nutrients.
The following sentence was added in the paper to recognize the potential wider use of the sampling device after adapting the collector and the protocols: "The CARAGA system is best suited for the collection of the non-soluble fraction of dust, but it could be used for evaluating other inorganic or organic particles after adapting the sampling and lab protocols".

In this study, some of the sites selected for this study are relatively close to urban/industrial areas; this is a good opportunity for comparison of results obtained by CARAGA with other conventional methods for sampling deposition. CARAGA doesn't permit to differentiate wet/dry deposition. Samples are collected in a filter and washed at the end of the sampling period (defined as a week). Therefore it is no possible to quantify the fraction of deposition accounted by wet or dry processes. As suggested by the other referees, this limitation should be taken into account in the conclusions.

The following sentences were added in the text: "In this study, no direct measurements of dry-only or wet-only deposition are performed. However, in order to provide information on the relative importance of dry and wet deposition to the MIDD, the daily precipitation measured at the sampling stations were analyzed in combination with the forward dust air mass trajectories starting from the identified provenance areas and reaching the sampling sites. When no precipitation is recorded we consider that dust deposition is driven by dry deposition processes. As mentioned by Löye-Pilot and Martin (1996), significant deposits can occur in almost "dry conditions", i.e. very low and short rain events and/or fog periods that classical meteorological rain gauges cannot detect. As a consequence, in these cases, the deposition is considered as dry and this leads to a possible overestimation of the contribution of the dry to the total deposition".

As reported in section 3.1, a number of studies have demonstrated that 1 single strong episode of Saharan dust may account for a high percentage of the total annual deposition of mineral dust. Therefore, it is important to sample continuously in order to have continuous register of deposition without gaps. The use of unattended CARAGA instruments may help to avoid gaps during sampling. However, simultaneous samples were very low during the study period (only 17 weeks –out off 75- with simultaneous samples at more than one site. Is there any explanation for these sampling gaps?

We agree with the referee that it is important to obtain continuous registers of deposition with limiting gaps for documenting sporadic strong episodes of Saharan dust. Depending on the site, the data recovery rate of weekly atmospheric deposition samples ranges from 77% to 91% for the sampling period.
82% of the MIDD were recorded when at least 4 stations were simultaneously operating (i.e. 62 weeks out of 75 with simultaneous samples when at least 4 stations were simultaneously operating). The sentence was not correctly written leading to a misunderstanding. Only 17 MIDD (out of 98) are observed simultaneously at more than one site. The sentence was rephrased: "98 MIDD have been collected during 75 different weeks of sampling and 82% of these MIDD were recorded when at least 4 stations were simultaneously operating. However, only 17 of these MIDD have affected more than 1 station during the same sampling week (12 at 2 stations, 4 at 3 stations, and 1 at 4 stations)".

Methodology: Filter ash. This method has been used by J.M. Prospero and coworkers since the mid-1960s for ambient particulate matter; see Prospero, J.M., 1999 (JGR, 104, 15917–15927): These authors performed the chemical characterization of dust. In the present paper, dust was not analyzed. It could be interesting to characterize the samples in order to evidence variations between the different sites and periods.

The reference to the J.M. Prospero's work was added in the text: "Prospero (1999) collected atmospheric particles on filters which were placed in a muffle furnace during 14h at 500°C, the ash residue weighted being assumed to be mineral dust". In our study, we focus on the mass deposition in order to constrain this parameter which is commonly simulated by 3D atmospheric models. The discussion on the mass deposition presented in the paper points out the variation of the deposition observed at the different sites and their temporal variability. As mentioned above, chemical analyses are interesting but require a different procedure of sampling (e.g. to collect both soluble and insoluble fraction).

Minor comments

L202: What is the % of retention of these filters for particles of 1 µm?

Regarding the specificities of these filters, Sheldon (Limonology and Oceanography, 1972) pointed out that "all cellulose ester membranes (Millipore) retained particles much smaller than the stated pore size, even from small samples with low particle concentrations". Sheldon (1972) also presented very satisfying retention curves for Millipore filters: up to 80% for particles of 0.5 µm in diameter with 0.45 µm filter porosity, and up to 90% for particles of 1 µm in diameter with a 1.2 filter porosity (estimation based on Figure 2 published in Sheldon R.W., Size separation of marine seston by membrane and glass-fiber filters, Limnology and Oceanography, 17, 3, 494–498, 1972). A sentence was added in the text: "Moreover, Sheldon (1972) indicated that Millipore© cellulose esters filters, with porosity ranging from 0.45 to 8 µm, have high percentages of retention of particles of 1 µm ranging from 80% to 100%".

L221 L222 L224: add wk-1 to the weekly deposition rates: 3.2 g m-2 wk-1

The correction was done when the weekly deposition was mentioned in the text: "… 3.2 g m^{-2} wk^{-1} and 2.7 g m^{-2} wk^{-1} were measured at Mallorca and Lampedusa".

L232: a gradient of dust with the latitude has been also observed by Pey et al 2013.

The Pey et al.'s work is now cited in the text when the gradient of dust with the latitude is mentioned: "Previous observations also pointed out a gradient of dust content in the western Mediterranean atmosphere (see for example Barnaba and Gobbi, 2004; Pey et al., 2013)".

L234-L250: taken into account that the present study only considered the insoluble fraction, when comparing with other studies it should be indicated the fraction sampled at each case: bulk deposition; soluble+insoluble …

The indications of the fractions sampled (bulk, insoluble and/or soluble…) for the different studies were added in Table 1.

L305. Delete "studies"

Done.

L300-L313: this paragraph (and this from L317-L324) could be moved to the Method section

This paragraph presents the Hysplit backward trajectories and the satellite data used to identify Saharan dust events. The section "3. Experimental setup" was renamed "Materials and methods". A new section "3.4 Air mass trajectories and satellite observations" was added. The paragraph mentioned by the reviewer and the presentation of the satellite products was moved into this new section.

L364-L367: I wonder these differences can be explained by the precipitation events. Wet deposition of Saharan dust can be very important. During these wet episodes, ambient air concentrations not necessarily high. There is a number of papers showing the meteorological scenarios of Saharan dust resulting on wet or dry events. For Lampedusa, as shown in Figure 5, this seems not to be the explanation. AOD reflects the concentration of dust in the whole column; however, as concluded by Marconi et al., Atmos. Chem. Phys., 14, 2039–2054, 2014, at Lampedusa, "Saharan dust transport occurs above the marine boundary layer, and no significant mixing of the dust below and above the boundary layer takes place; resulting in high difference between boundary layer and free tropospheric dust evolution;

Wet deposition due to precipitation, which can be very intense as mentioned by the referee, could explain a part of these differences, as well as dynamical conditions of dust transport and their vertical mixing. Following the comment of the referee, the study of Marconi et al. (2014) is now mentioned to illustrate this point. A sentence was added to point out these works: "Marconi et al. (2014) mentioned that in Lampedusa no significant correlation between aerosol optical thickness and PM10 or non-sea-salt Ca is found for the period June 2004-December 2010. These authors suggested that even when the dust is very likely present in the lower and mid-troposphere simultaneously, the aerosols observations at the surface are generally decoupled from what takes place above in the atmospheric column".

Figure 3. It will help the interpretation to mark the periods with influence of SDE at each site.

Done. The time periods with influence of SDE were marked for each site on Figure 3 and the caption of the figure was rephrased: "The numbers of most intense dust deposition for each station as described in §4.3 are indicated by black bars above the deposition flux values: 34 in Lampedusa, 20 in Mallorca, 11 in Corsica, 18 in Frioul and 15 in Le Casset".