

The authors would like to thank both reviewers for the very constructive and helpful comments which are important to improve the manuscript. In general we have followed most recommendations including improvements on the language. In our opinion, this has resulted in a manuscript that has considerably higher quality. Corresponding to the relatively long list of questions and suggestions for corrections, we have implemented numerous minor changes throughout the manuscript. We sincerely hope that the editor and the reviewers will be satisfied with the improvements and will consider the manuscript to be published in ACP. Furthermore, due to the extensive and very constructive review by both reviewers, then the authors sincerely wish to acknowledge the two anonymous reviewers for their constructive reviews.

Please find below our replies to both the general remarks and the specific comments by both reviewers

## **Reviewer 1**

### General comment by reviewer 1:

This study presents findings from long-term measurements of *Alternaria* spore concentrations in Copenhagen, Denmark, and from samples of particulate matter produced during harvesting. The measurements are made using a Hirst spore trap, and maps are presented of potential source regions, as well as back-trajectories calculated with the HYSPLIT model.

The results of the study may have implications for public health, as they provide information about likely sources of a group of fungal spores that can cause allergic reactions in sensitized individuals. The authors make suggestions for measures to improve the forecasting of fungal spore concentrations, including the possibility of simulating long-distance transport episodes with atmospheric transport models.

This is an interesting contribution to the literature on aerobiology, particularly regarding the source attribution and episodic long-distance transport of allergenic particles. I recommend this study for publication in ACP, however, the presentation of the data should be improved somewhat, in particular, the measurement uncertainties should be stated and discussed as appropriate. Also, there are a large number of technical errors in the writing that should be corrected before publication, in order to improve readability (I have provided some corrections and suggestions in the technical comments below). Specific comments:

### Comment by reviewer 1:

Title: One of the main findings of the paper is that peaks in fungal spore concentration attributable to LDT are actually quite rare events, and that the vast majority of the time, local sources dominate. The title of the manuscript, however, focuses on these occasional to rare episodic events. I would strongly suggest indicating the rare nature of these events in the title to better reflect the main finding of the paper: that local agricultural activity is the dominant source of *Alternaria* spores the vast majority of the time.

### **Reply:**

We agree that a different title could be appropriate. Although it should be noted, that after we have modified table 1 and added more material, it has become much more clear, that the fungal spore

load in Copenhagen is dominated by episodes, where some of these episodes can be identified primarily as LDT while others cannot be identified - neither LDT nor local. The new title we suggest is therefore:

“Crop harvest in Denmark and Central Europe contribute to the local load of airborne *Alternaria* spore concentrations in Copenhagen”

Comment by reviewer 1:

Throughout this paper, the statistical uncertainties in the data should be presented and explained as appropriate.

**Reply:**

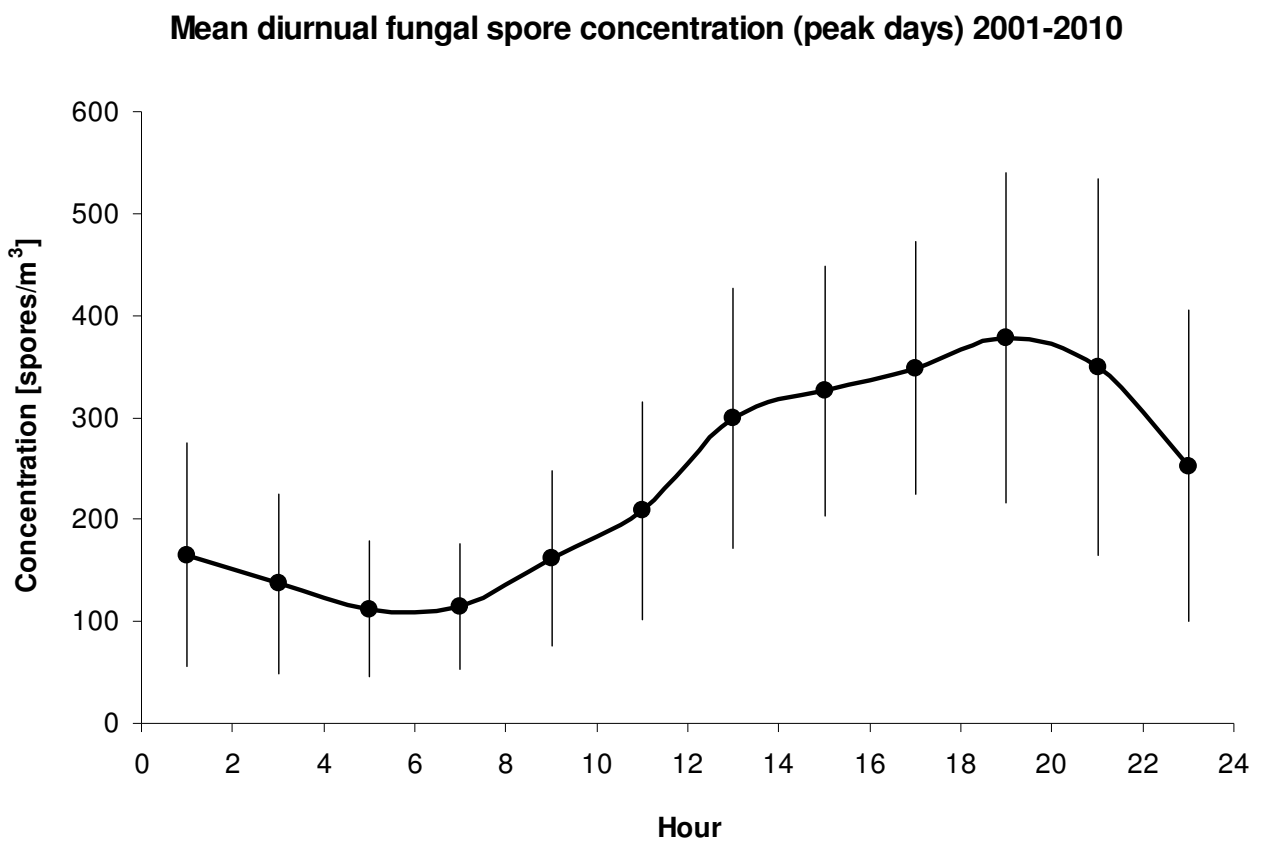
We have corrected the manuscript wherever this is appropriate, especially concerning Figure 1. Please see also our reply to a corresponding comment by reviewer 2.

Comment by reviewer 1:

Figure 1: The uncertainties in the data points should be shown.

**Reply:**

We agree. We have modified Figure 1 so that it includes error bars that correspond to 1 standard deviation. Figure 1 now looks as follows



Comment by reviewer 1:

p. 14337: How does the mean diurnal cycle in fungal spore concentrations observed in Copenhagen compare to the mean diurnal cycle at other sites, or of other bioaerosols?

**Reply:**

To our knowledge, this is the first long term study on *Alternaria* spores that includes bi-hourly data. So a direct comparison to similar studies cannot be made. Recently the scientific community that use the Hirst trap has moved from daily mean observations to bi-hourly observations. About 10 years ago studies on bi-hourly values as in Emberlin et al (1991) were very rare. In fact it was only one or two years ago that the community data base was upgraded so that it could contain bi-hourly values. However a number of recent studies on bioaerosols (pollen) from Denmark (Mahura et al., 2007; Skjøth et al., 2007; Skjøth et al., 2008), UK (Skjøth et al., 2009), Poland (Stach et al., 2007), Serbia (Sikoparija et al., 2009) and Spain (Hernandez-Ceballos et al., 2011) have shown a strong diurnal pattern, quite similar to the one we have found. The main reason is that the concentrations are strongly connected to the emission process of pollen, which related to drying on the flowers, usually in the early morning (Bianchi et al., 1959; Ogden et al., 1969)

Comment by reviewer 1:

What criteria were used in distinguishing the non-typical peak days from the typical daily pattern?

**Reply:**

We used both visual inspection of each individual day, correlation analysis and an inspection of the day before and the day after the period in a similar methodology as given in other studies (Sikoparija et al., 2009; Skjøth et al., 2009) and used in the 10th basic course on aerobiology in 2011 (e.g. <http://hoefeber.astma-allergi.dk/basiccourseonaerobiology> )

Comment by reviewer 1:

Are the peak concentrations significantly higher on the non-typical peak days (attributed to LDT), compared to the typical peak days? It might be interesting to point out that these are only 16 days out of a ten-year period (<2% of all days), and only 7% of the 232 days with concentrations exceeding the 100 spores per m<sup>3</sup> threshold. This suggests that including modeling of long distance sources into fungal spore concentration forecasts would only slightly improve the accuracy of prediction of days with peak concentrations exceeding 100 per m<sup>3</sup>. This seems to weaken the authors' conclusion

**Reply:**

The reviewer has clearly found a weakness here. This is however not related to peak days having low influence in the fungal spore load. On the contrary, peak days constitute the majority of the fungal spore load. And this is the case although low days are much more frequent than peak days. Additionally, the identification of 16 LDT episodes does not mean that the rest of the episodes are

due to local sources. These 16 episodes were the most obvious ones that could be identified with a very simple trajectory model. It is very likely that there are more episodes, but the identification of these requires a more sophisticated method than the one we use. Finally, the very local area of Copenhagen, where atmospheric dispersion is the governing process, does not contain agricultural areas. Within this near domain (about 10km from the source) it is possible to simulate the concentration by using gaussian principles (Geels et al., 2012), which however also is the limit for this approach. For Copenhagen, then most agricultural areas are more than 10km away. This suggests, if field areas and harvesting is a major source to *Alternaria*, then both dispersion and advection of the spores from remote source areas should always be taken into account in Copenhagen.

To take into account the missing information, we have modified Table 1 so that it includes 4 additional columns. The new table 1 looks like this

Table 1. Maximum daily *Alternaria* spore concentrations (spores/m<sup>3</sup>), day of season start, day of season end and day of maximum spore concentration (days from 1<sup>st</sup> January) and number of days with concentrations above 100 pollen spores/m<sup>3</sup> recorded in Copenhagen during 2001-2010. Sum of spores, sum on low days and sum on peak days all correspond to the total accumulated catch during the season (the days that cover 95% of the entire catch) and not the entire year.

Year	Seasonal Spore Index	Day of season start	Day of season end	Day of peak concentration	Peak value Spores/m <sup>3</sup>	Sum of spores in season	Sum, low days in season	Sum, high days in season	Days above 100 (high) spores/m <sup>3</sup>
2001	9431	06Jul	20Sep	17Aug	1016	8966	1875	7091	23
2002	7046	05Jul	12Sep	29Jul	567	6686	1877	4809	21
2003	4488	18Jul	18Sep	19Jul	279	4257	1291	2966	17
2004	5651	02Jul	08Sep	06Aug	607	5321	1266	4055	18
2005	8141	21Jun	20Sep	10Aug	468	7565	1600	5965	20
2006	10781	01Jul	21Sep	11Aug	682	10251	2164	8087	27
2007	7813	20Jun	28Aug	17Jul	588	7386	1735	5651	22
2008	5276	26Jun	11Sep	31Aug	313	5006	2208	2798	17
2009	10511	01Jul	15Sep	09Aug	595	9989	1780	8209	31
2010	7519	08Jul	08Sep	03Aug	689	7178	1651	5527	27
Mean	7946	01Jul	12Sep	06Aug	580	7261	1745	5516	23
SD	2239	7 days	7 days	13 days	208	2044	315	1917	5

The updated table also requires additional text in the results section, discussion and conclusion. We therefore suggest to change following in the results section from

“The contribution from individual years ranged from 17 days in 2003 and 2008 to 31 days in 2009”

Into

“The contribution from individual years ranged from 17 peak days in 2003 (with 70 days) and 2008 (with 60 days) to 31 days in 2009 (with 76 days). The contribution of the high days vary from about 55% to the total seasonal load varies from about 55% in 2008 to more than 82% in 2009”

And following addition to the discussion section, first paragraph after “ .. of the day or night (Mahura et al., 2007; Skjøth et al., 2007; Skjøth et al., 2008). “:

into

“.. of the day or night (Mahura et al., 2007; Skjøth et al., 2007; Skjøth et al., 2008). The number of peak days are outnumbered by low days (Table 1), but the overall load during the season has every year been dominated by the peak days corresponding with up to 82% of the entire *Alternaria* load during the season (Table 1).”

And from following in the conclusion section

“.. that the source to the overall load is mainly local, but with intermittent LDT from more remote agricultural areas. This hypothesis is supported by the analysed data of the 10 year bi-hourly record”

Into

that the source to the overall load is mainly local, but with intermittent LDT from more remote agricultural areas. These LDT episodes contributed to a large degree to the total annual load of *Alternaria* spores. In fact, the peak days dominate the overall *Alternaria* load, although peak days are always outnumbered by low days. The hypothesis is supported by the analysed data of the 10 year bi-hourly record

#### Comment by reviewer 1:

as stated e.g. on p. 14347, lines 16-17, that “forecasting of fungal spore quantities relevant to allergy patients in Denmark must take into account long-range transport.”Shouldn’t we expect, based on the results presented here, that improvements in forecasting the local agricultural contribution of fungal spores would almost certainly lead to larger and more immediate improvements in forecasts of spore concentration than could be attained by forecasting LDT events? Perhaps the forecasting of local sources is already so well developed that it is difficult to improve further, but this seems unlikely, since the authors state that “the Danish information system on fungal spores is very simplistic and is based on information from Copenhagen alone.” (p. 14347, lines 20-12)

#### **Reply:**

The reviewer is to some degree right here. A forecast of spores from Danish agriculture would probably be a large improvement. But the Danish forecast system does not include that either. Furthermore after the modification of the manuscript and the expanded Table 1, then it should be much more clear that the main load of *Alternaria* spores in Denmark is due peak days. Furthermore, as written in the reply, then we argue that advection is likely to be an important parameter in the forecasting of *Alternaria* in Denmark. This suggest that an atmospheric transport model is needed for a forecast. Such models can handle advection in general and can simulate transport from both Danish and non-Danish sources, where the latter includes LDT.

#### Comment by reviewer 1:

Figures 2-5 and accompanying text on p. 14336-14337: It isn't clear to me what the potential source percent means on the maps shown here. Is that the percent of the land surface that is a potential *Alternaria* source, or the percent of agricultural land that is currently being harvested out of the total land area, or something else? Are the three types of agricultural areas mentioned from the CLC2000 dataset (which I believe is first mentioned here, and should be defined / cited) all treated as equivalent, or are they treated differently in calculating the potential source maps? I also don't understand how the precipitation data are used in generating these potential source maps – or are they only used in interpretation?

**Reply:**

The legend and figure say exactly as what reviewer 1 suggests: density of agricultural areas under rotation – the potential *Alternaria* source. It is our impression that the reviewer must have overlooked the writing in the legend. The three types of agricultural land are indeed a permanent fraction of the CLC2000 data set (European Commission, 2005). We agree that we have not given the reference for the CLC2000 data set. We have therefore added the following reference: “European Commission, 2005, Image2000 and CLC2000 *Products and Methods* European Commission, Joint Research Center (DG JRC), Institute for Environment and Sustainability, Land Management Unit, I-21020 Ispra (VA), Italy.”

With respect to the precipitation, then following has been added to the methods section: “Measured precipitation from weather and climate stations have been used as an estimate for potential *Alternaria* spore release due to harvest in the potential source regions (Fig 2 and Table S2) by assuming that dry weather and dry fields are required for intense harvesting.”

As such the precipitation data are only used in the interpretation as the reviewer suggests. In fact it would have been better if we used reanalyzed precipitation fields. However, we only have access to high resolution data of this kind over the Danish area, which makes this method less usable. We have therefore used observations from rain gauges instead.

Comment by reviewer 1:

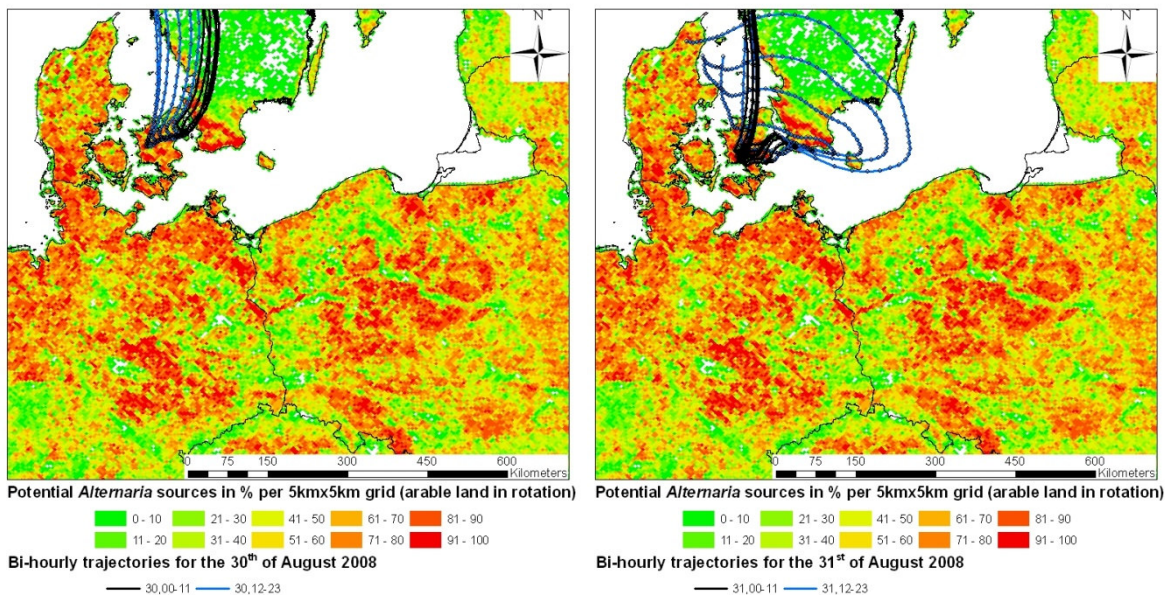
Each map in Figures 3-5 shows a set of several back-trajectories. If I understood correctly, these are calculated backwards from times that correspond to the fungal spore sampling times (bihourly)? This could be described a bit more clearly in the text and/or figure caption. If possible without cluttering the figure too much, it might also be informative to visually distinguish some of the trajectories from each other with different colors or symbols.

**Reply:**

The reviewer is right. Each trajectory corresponds to a bi-hourly sample. We have tried distinguishing the trajectories so that each of the trajectories can be identified. This made the figure too cluttered. This was the case if we made individual patterns or just added a number to each trajectory on the map. One reason was that a number of the trajectories such as on Fig 3 are more or less on top of each other. In fact this was the reason why we produced two figures for each episode instead of just one. Although a good idea, it is difficult to carry out in a printed journal. So we suggest an alternative, which is to group the trajectories into 00-11UTC and 12-23 and draw the trajectories using different colours. This will not require a change in the text or add additional

figures. We believe, that this is the limit with respect to graphical identification of individual trajectories in this particular case.

We have shown the two new maps that are part of Figure 3 below:



Similar changes have been made to figure 4 and Figure 5

#### Comment by reviewer 1:

If I understand correctly, the concentration data in the upper panels of these figures represents discrete data points from sampling in hourly (according to the caption; or bihourly, according to p. 14336, line 21?) intervals. It would be more appropriate to show the individual data points, possibly connected by a line (preferably with sharp corners), rather than a smoothed line, which could mislead the casual reader. Furthermore, the uncertainty in the measurement should be shown, e.g. as an error bar in these figures.

#### **Reply:**

The reviewer is right. We have therefore changed the upper panel in Figure 3, Figure 4 and Figure 5 to contain sharp lines instead of a smoothed curve.

We have also changed the words in the legend(s) of Figs. 3 –5 to specify bi-hourly variation.

However, bi-hourly samples from the Hirst trap are usually not accompanied with uncertainty bars, which is a limitation in this observational method. The observational error from the Hirst trap is known to be related to both counting method (Pedersen and Moseholm, 1993; Sikoparija et al., 2011), environmental variables and the concentration of pollen and spores (Skjøth and Sommer, 2012). Time series of bi-hourly or daily values from this trap (as shown in in figure3, figure 4 and figure 5) are therefore in general never accompanied with error bars in scientific literature. A major reason is that the production of error bars requires additional observations and calculations that are not part of the observational protocol in the European Aeroallergen Network. Although we are strong supporters of error bars, we kindly decline this particular request in order for the figures

(figure 3 to figure 5) to be consistent with existing scientific literature. But we have added error bars to Figure 1.

Specific comment by reviewer 1:

Technical comments and corrections:

The format of dates should be checked throughout and corrected as needed. (Should be corrected to either the format “the 20th [or 31st, etc.] of January” or “20 January”, and in many cases a preposition is needed – and missing – preceding the date.)

**Reply:**

The format of the dates followed formats like 15<sup>th</sup> and 16<sup>th</sup> in the original manuscript. It seems as some of this formatting has been changed during the editorial handling. We will investigate these changes in detail, in case the final manuscript is accepted for publication in ACP.

Specific comment by reviewer 1:

p. 14330, line 1 and throughout: “source to [spores]”-> “source of” [spores]

**Reply:**

The requested change has been implemented throughout the manuscript

The first sentence of the abstract seems at first glance to imply that formal hypothesis testing is conducted. Since this is not the case, I suggest replacing the word “tests”, for instance with “examines”.

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14330, lines 2-3 and throughout: “source to the overall load” -> “contribution to the overall load”

**Reply:**

The requested change has been implemented throughout the manuscript

Specific comment by reviewer 1:

p. 14331, line 3: delete comma before “that” (or replace “that” with “which”)

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14331, line 10: delete comma after “more”

**Reply:**

The requested change has been implemented in the manuscript



Specific comment by reviewer 1:

p. 14331, line 15: “Editorial” -> “editorial”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14331, line 19: “have shown” -> “showed”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14331, line 23: rephrase for sentence structure

**Reply:**

The structure has been rephrased from:

“Observations from Hirst traps have the last 5–10 yr improved knowledge of aeroallergens concerning the temporal distribution and possible source locations to aeroallergens. These studies include source-receptor studies on pollen from *Fagus*

Into:

“Observations from Hirst traps have the last 5-10 years been used to improve knowledge of aeroallergens, especially concerning possible source locations to these aeroallergens. These studies include source-receptor studies on pollen from *Fagus*”

Specific comment by reviewer 1:

p. 14332, line 27: “Soybean” -> “soybean”, “has” -> “have”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14333, line 2: delete comma after “likely”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14331, line 17: insert “as” after “such”.

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14333, line 23, and throughout: p. 14339, lines 1-2: “southern Sweden” – here and throughout the paper analogously

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14334, line 18: “grab sample” seems to be a common term for water samples, but as an atmospheric scientist I encountered it here for the first time. It might be helpful to provide a short definition, although the meaning can be guessed from context.

**Reply:**

We have added following after grab samples “(i.e. a small but representative sample)”

Specific comment by reviewer 1:

p. 14334, line 22: suggest replacing “informed” with “reported”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14336, line 21: “2 h steps” – does this refer to the time interval between the plotted points on each individual trajectory, or something else? Please clarify.

**Reply:**

No, the 2 hour time interval corresponds to the time interval between each trajectory.. We have therefore modified the sentence from:

“Air mass trajectories were plotted 48 h back in time with 2 h steps,”

Into

“Air mass trajectories were plotted 48 h back in time with 2 h steps between each trajectory,”

The distance between two dots on the trajectories corresponds to one hour of air mass transports. In atmospheric studies, trajectories are often displayed as lines. However, a trajectories can in some atmospheric studies also be used to track history of the air masses. Two good example are when air masses where over a certain areas or the air mass wind speeds, when the air masses passed certain areas (Skjøth et

al., 2009; Smith et al., 2008). We have therefore added following to the caption in Figure 3, Figure 4 and Figure 5:

“The distance between two dots on a trajectory corresponds to one hour of atmospheric transport”

Specific comment by reviewer 1:

p. 14337, line 5: “with” -> “over/by”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14337, line 8: delete “was

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14337, line 21: “3” -> “three”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14338, line 3: delete comma after “suggests”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14338, line 15: “3”-> “three”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14338, lines 25-26: It would seem more idiomatic to me to put the phrase “during the study period” at the beginning of the sentence. Otherwise, I think it should be set off by commas.

**Reply:**

We have rephrased the sentence from:

“During the study period, the weather in...”

Into

“The weather in ...”

Subsequently we have also deleted “during the study period” on p. 14339, line 15 and on p 14340, line 5.

Specific comment by reviewer 1:

p. 14339, line 3: insert comma before “wind speeds”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14339, line 4: “Scania” -> “Scania, the southernmost province of Sweden” or similar (the province name will probably not be familiar to most readers outside of northern Europe)

**Reply:**

As suggested, we have implemented the phrase “the southernmost province of Sweden”

Specific comment by reviewer 1:

p. 14339, line 5: “Similar situations” (plural)

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14339, line 20: “Eastern, westerns and southern: : :” -> “The eastern, western, and southern: : :”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14340, line 7: insert comma after “time”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14340, lines 8-10: sentence structure needs to be corrected, and it is not clear to me which time frame is meant by “the beginning of the period” here.

**Reply:**

The sentence has been rephrase from

“This caused in the beginning of the period that air masses from the East and the Baltic states were pushed towards Denmark, arriving at Copenhagen from the North West passing northern over parts of Scania.”

into:

“This caused air masses from the East and the Baltic states to be pushed towards Denmark in the beginning of the period.”

Specific comment by reviewer 1:

p. 14340, lines 12-13: “passed” and “passing” probably should be “crossed” and “crossing”? Also, “from the Sea” -> “from the sea” or “from the Baltic Sea”.

**Reply:**

The requested changes have been implemented so that the sentence now reads:

“These air masses crossed the Baltic Sea and arrived to Copenhagen either directly from the sea or by crossing the southern parts of Scania in Sweden.”

Specific comment by reviewer 1:

p. 14340, line 24: peaking -> peaked

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14340, line 25: insert comma after “In fact”

**Reply:**

The sentence has been rephrased due to the edditional material in Table 1. Due to this, “In fact” has been removed

Specific comment by reviewer 1:

p. 14341, line 3: “show” -> “shows”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 2: The authors present an estimate of mean fungal spore emissions during harvest, based on grab samples from the exhaust air stream of the harvesting machine. They refer here to

“emission flux measurements” and use other similar terms here and elsewhere in the text. Since they have actually not measured fluxes (e.g. via eddy covariance method), but only concentrations in the plume emitted from a strong point source, I suggest replacing “emission flux measurements” with “emission estimates”, “source strength estimates” or some similar term, here and anywhere else in the text it may also appear.

**Reply:**

We agree with the reviewer. Fluxes are in atmospheric sciences in general reserved words that refer the specific sampling techniques such as eddy covariance. We have therefore changed the text in order to reflect this tradition in scientific writing. The word flux has either been removed or replaced by “estimates” or similar terms as suggested by the reviewer.

Specific comment by reviewer 1:

p. 14342, line 4: “even though” -> “even when” (?)

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 5: delete “then”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 6: “have” -> “has”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 11: insert comma after “rain”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 12: delete “with”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 13: insert comma after “Overall”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 14: “near local” -> “nearby” (?)

**Reply:**

We have replaced “near local” with the term “regional”. According to our knowledge then there is no strict definition of local and regional scale in atmospheric science. But the term “near local” is in general not used. Here we use the term regional as the geographical area that go beyond local scale but does not cover several countries such as Denmark, Germany and Poland.

Specific comment by reviewer 1:

p. 14343, line 15: insert comma after “Poland”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 18: “Common for” -> “Common to”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 28: “barly” -> “barley”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 14: insert comma after “However”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 16: “on local scale” -> “on the local scale”. Or, instead of “atmospheric transport on the local scale”, maybe something like “transport from nearby agricultural sources”?

**Reply:**

The sentence has been rephrased from:

“This suggests the importance of atmospheric transport on local scale.”

Into:

“This suggests the importance of atmospheric transport from nearby agricultural sources”

Specific comment by reviewer 1:

p. 14342, line 17: replace semi-colon with comma

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 18: suggest revising the phrase “that it does not require a large sample size” to e.g. “small number of samples”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 21: “To the contrary,” -> revise, perhaps to “Rather,” or “Instead, the opposite is true:”

**Reply:**

“To the contrary” has been replaced with “Instead”

Specific comment by reviewer 1:

p. 14342, lines 22-23: “Similar observations as ours” -> “Observations similar to ours”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 2: insert “the” before “northern”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14342, line 4: insert “the” before “southern”; “have been identified to have” -> “have



been identified as having”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 13: “relations” -> “relationships”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 16: insert comma after “Poland”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 18: insert comma after “2001”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14343, line 20: insert comma after “Denmark”, “relations” -> “relationships”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14344, lines 9-10: remove Wikipedia references, these are unnecessary varies” – this is unclear to me, please rephrase.

**Reply:**

As requested, we have removed the references to Wikipedia.

Specific comment by reviewer 1:

p. 14344, lines 23-24: “are highly correlated : : : which is not surprising as these numbers

are highly dependent.” This seems redundant, please clarify / rephrase.

**Reply:**

After the additional data in Table one, we believe this is more clear. We have therefore added following after the sentence. “: The main load *Alternaria* spores in Copenhagen is due to episodes of peak days (Table 1).”

Specific comment by reviewer 1:

p. 14344, line 24: “Iberian Peninsula Spain” -> “Iberian Peninsula of Spain”

**Reply:**

The requested change has been implemented in the manuscript with slight modification so that it reads “Spanish part of the Iberian Peninsula”

Specific comment by reviewer 1:

p. 14345, line 3: “the geographical region had large variations” -> “large geographic variations exist in the spore count” (?)

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 8: delete comma after “show”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 9: why “biogeographical region” and not just “geographical region”?

**Reply:**

A geographical region is very often defined through country borders or large scale features such as the Carpathian basin, France or central Europe. A biogeographical region is a combination of geographical features and overall climate that promotes certain types of vegetation. One example is France that contain a number of different biogeographical regions. Another is Denmark that contains two: the western part that is mainly influenced by the Nordic Sea and the Easter part that has stronger influence from Scandinavia (European Topic Centre on Biological Diversity, 2006).

Specific comment by reviewer 1:

p. 14345, line 9: “can vary with more than a factor of 10 in between years” -> “can differ by more than a factor of ten between years”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 26: “as in” -> “in”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 27: insert comma after “Krakow”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 28: insert comma after “afternoon”, delete “and with”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14345, line 29: insert comma after “observations”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14346, line 1: insert comma after “morning”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14346, line 20: suggest revising “broken down by asthma”, this sounds like “statistical slang” to my ear

**Reply:**

We have removed the words “broken down by asthma”. They are not needed at all.

Specific comment by reviewer 1:

p. 14346, line 24: delete comma after “observed”; “towards” -> “to”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14346, line 25: “larger” -> “more intense”/ “stronger” (?); “compared to” -> “than”; “towards” -> “to”

**Reply:**

The requested change has been implemented in the manuscript using the words “stronger than”

Specific comment by reviewer 1:

p. 14346, line 27: insert comma after “Lancet (2008)”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14347, line 2: “to” -> “of”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14347, line 5: typo in spelling of Alternaria

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14347, line 6: “show” -> “shows”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14347, line 8: “a potential source region” -> “potential source regions”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14347, line 12: “shows” -> “show”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14348, line 1: please rephrase “remain to be identified”

**Reply:**

The sentence has been rephrase from

“This approach might however be very difficult as all relevant *Alternaria* sources remain to be identified and also because this and other studies suggest, that the emission pattern is related to both biology and agricultural production methods.”

Into

“This approach might however be very difficult as all relevant *Alternaria* sources remain to be identified. Furthermore, this as well as other studies suggest, that the emission pattern is related to both biology and agricultural production methods.”

Specific comment by reviewer 1:

p. 14348, line 2: delete comma after “suggest”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14348, line 7: insert comma after “Furthermore”

**Reply:**

The requested change has been implemented in the manuscript

Specific comment by reviewer 1:

p. 14348, lines 7-8: what is meant here by “allow for”?

**Reply:**

We mean “that the definition of a source makes it possible to make studies using source based models” We have therefore rephrased the sentence from

“Furthermore, such studies allow for additional studies using source based models such as DEHM (Brandt et al., 2012), SILAM (Sofiev et al., 2006) and COSMO-ART (Zink et al., 2012) for improved understanding of aeroallergens and ultimately better information to the public.”

Into

“The development of emission models and inventories therefore makes it possible to use source-based models such as DEHM (Brandt et al., 2012), SILAM (Sofiev et al., 2006) and COSMO-ART (Zink et al., 2012) for improved understanding of aeroallergens and ultimately better information to the public.

Specific comment by reviewer 1:

p. 14348, line 8: “source based” -> “source-based”

In Table 1, (and on page 14337, lines 7-8) I would find it easier to read if the “Day of season start” and “Day of peak concentration” were presented in a conventional day-month format.

The requested change has been implemented in the manuscript.

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