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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Crop harvest in Central Europe causes episodes of high airborne *Alternaria* spore concentrations in Copenhagen" *by* C. A. Skjøth et al.

Anonymous Referee #1

Received and published: 3 July 2012

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:

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.

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

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

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?

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

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%

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of the 232 days with concentrations exceeding the 100 spores per m3 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 m3. This seems to weaken the authors' conclusion 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)

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?

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

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colors or symbols.

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.

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.)

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

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".

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

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

p. 14331, line 10: delete comma after "more"

p. 14331, line 15: "Editorial" -> "editorial"

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

p. 14331, line 23: rephrase for sentence structure

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

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

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

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

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.

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

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.

p. 14337, line 5: “with” -> “over/by”

p. 14337, line 8: delete “was

p. 14337, line 21: “3” -> “three”

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

p. 14338, line 15: “3”-> “three”

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.

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

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)

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

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

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

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.

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”.

p. 14340, line 24: peaking -> peaked

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

p. 14341, line 3: “show” -> “shows”

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.

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

p. 14343, line 5: delete “then”

p. 14343, line 6: “have” -> “has”

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

p. 14343, line 12: delete “with”

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

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

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

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

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

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

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 agriculatural sources”?

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

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

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

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

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

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

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

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

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

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

p. 14344, lines 9-10: remove Wikipedia references, these are unnecessary

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p. 14344, line 19-20: “The main characteristics . . . show that the annual variations . . . varies” – this is unclear to me, please rephrase.

p. 14344, lines 23-24: “are highly correlated . . . which is not surprising as these numbers are highly dependent.” This seems redundant, please clarify / rephrase.

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

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

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

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

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”

p. 14345, line 26: “as in” -> “in”

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

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

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

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

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

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

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

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

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p. 14347, line 2: “to” -> “of”

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

p. 14347, line 6: “show” -> “shows”

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

p. 14347, line 12: “shows” -> “show”

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

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

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

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

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.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 14329, 2012.