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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 #2

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In this study, the authors investigate the main source of Alternaria fungal spores in Copenhagen. They sampled air with the Hirst spore trap on a bi-hourly basis for a period of 10 years. Data analysis using the HESPLIT back trajectories model.The main conclusion of the authors is that most of the time the source of the spores is local agriculture activity and that long distance transport occur only occasionally. The authors also investigated the emission flux of spores by analysis of samples collected from the exhaust air of a harvesting machine. The results of this study can potentially have a potential for forecasting fungal spore concentrations in the studied area and might have important implication to asthmatic and allergy patients. Yet, there are some crucial points that need to be addressed and they are listed below. At the current

stage the paper lacks in several areas, as detailed below. General comments are that standard deviation and error bars should be added to all graphs. Apart of the scientific comments, the level of presentation and the English used in the text are not uniform and must be corrected. Some specific comments are listed below.

Title The main finding in the article is that the source of the spores in Copenhagen is local in most cases. The title does not reflect this concept.

Abstract

1. P. 14330 line 6 - change "alternaira" to "alternaria".

2. The authors do not mention which alternaria spores were checked. There are many alternaria species and not all of them cause health effects. The one that mostly effect human health is alternaria alternata and it can be only a small fraction of the entire specie. This should be discussed and weighted in when talking about the total population and the resulting health impacts. Without this, it is impossible to assess the health impacts.

3. The term "clinically relevant" is not a very common term in the literature; please consider changing it throughout the text to concentration that might induce health effects.

4. The claim that although fields were treated with fungal infections and still fungal spores were found is not clear. Which fungi species were treated? All of them? Maybe some of them are resistant or at least the spores are resistant.

Introduction

1. P.14331 line 5 – change "provides" to "provide".

2. Why does the Hirst trap only provide observation of fungal spores in the genus level? Isn't it a matter of the analysis? Is it possible to perform PCR for samples collected with the Hirst trap? If so, it would be interesting to investigate which fraction of the alternaria spores are relevant for human health.

3. P. 14331 line 12 – change "rare" to "rarely".

4. P. 14331 line 23-24 – rephrase sentence.

5. P. 14332 line 4 – please mention that aspergillus and penecilliun are also very common fungal species prevalent in the atmosphere.

6. P. 14332 line 7 – add that the specie of alternaria that can threat human health is alternaria alternate.

7. P. 14332 line 13 – the fact that alternaria peaks in the month before leaf fall does not mean that all fungi behave like this. In the study by Burshtein et al. the claim was that the vegetation is a confusing factor for some of the biomarkers and that general fungi peak is during autumn and spring only in the local scale. In the study by Escuredo et al. the claim was concerning the local behavior of the alternaria. This must be calrified in the text.

8. P. 14332 line 27 – unify the writing to p. meibomiae.

9. P. 14333 line 11 – rephrase sentence . . ."protocol that has been used in several similar European studies about"...

Methodology

1. P. 14333 line 26 – the authors refer to Mandroli et al. 1998, yet there is no such reference in the reference list nor can it be found on the web. The authors must explain how they determined the annual spore index and why it is dimensionless.

2. Error bars must be added to all the figures.

3. P.14334 the authors should explain shortly what is the 95% method since it is not clear in the reference they direct to.

4. P.14334 in the days that are not peak concentrations, what were the values of the spores? Were they significantly lower? Information about the background levels of the

spores should be added.

5. P. 14335 line 13 – in what conditions were the samples archived until analysis?

6. P. 14335 Line 17 – the authors say that they cleaned the pipes with a stream of air; did they assure that this is sufficient? Did they check that there is no contamination left in the pipes? Wouldn't it be preferable to clean the pipes with a solvent that will clear all the spores from previous sampling?

7. P.14336 line 13 – delete "for".

8. Regarding the use of the HYSPLIT model – please add the coordinates that you used in the model. The authors need to explain what is the advantage of calculating the back trajectories in altitude of 500m and why was it done in the matrix format.

Results

1. P. 14337 line 8 – delete "was".

2. Not all alternaria spores affect human health. The clinical threshold the authors stated is 100 spore m-3, why does this value represents the minimal level of the clinical threshold? There is no differentiation between the alternaria species in this work and it is possible that a very small fraction of the 100 spore m-3 can have health implications. Please discuss this issue.

3. P. 14337 lines 17-20 - Did the authors investigate correlation between the peak days and the harvesting times? There might be a simple connection. Moreover, how did the authors calculate the trajectories prior to 2006? (To my best information the HYSPLIT model in the GDAS mode has information only from 2006 till present day and the measurement period is 2001-2010).

4. Please change "Scania" to "Sweden" throughout the text.

5. P. 14337 line 25 – delete "an".

6. P. 14338 line 1 – delete "of".

7. P. 14338 line 5 – change "at" to "as".

8. P. 14338 line 25 – delete "to".

9. P. 14338 line 26 – rephrase to: "The weather in the study region and period had a high pressure. . ."

10. P. 14339 line 8 – why weren't the harvesting possibilities checked? If there is a way to retrieve this information it should be done to make the claim (that the harvest causes high spores concentration) stronger.

11. Please add information about the local wind speed and direction for sections 3.3.1-3.3.3.

12. P. 14340 line 4 – correct to "in the evening of the 16th".

13. P. 14340 lines 8-11 – rephrase sentence.

14. P. 14340 line 17 - If heavy rain was recorded for this period over Denmark, how do the authors explain the extreme high concentrations? Wouldn't they expect sedimentation of the spores by the rain to the ground before they reach the sampling site? Are they released from the ground? Explain and provide supporting information.

Discussion

1. P.14340 line 21 - It is a bit difficult to conclude that the 232 peak days have a strong diurnal pattern without standard deviation data. What about the day prior to the peak and the day that follows? The authors should investigate this relation as well and provide this data. In the "special cases" the authors claim that they did not see a pattern of the peaks change during the day. What happens to the pattern in regular days when the spore concentration is below 100 spore m-3?

2. P.14340 line 26 - One out of 23 peak days in a year peak, in average, is not enough

to conclude about the pattern of the diurnal cycle, please recalculate for all peak days.

3. P. 14341 line 5 – delete "then". The authors should display the information about the peak days with a different diurnal pattern that was analyzed with respect to air mass transport e.g. back trajectory map, meteorology etc.

4. P. 14341 line 8 – change "to" to "of".

5. P. 14341 line 12 – delete "in".

6. P. 14341 line 13 – delete "with".

7. P. 14341 line 13-15 – the author's claim that the air mass for these days could have arrived from Poland, because it rained heavily in Denmark at the same time. The trajectories calculated for these days are not consistent enough to conclude that there was a LDT event.

8. P. 14341 lines 18-19 – rephrase sentence.

9. P. 14341 line 28-29 – the author's claim that the fields were treated with fungicides and that no fungi infection was seen in the fields, yet samples collected from the harvesting machine showed high emissions of fungal spores. Did the authors check if the harvesting machine itself was not the source of the spores? In page 14335 line 16 the authors mention collection of negative controls from the field, yet the results are not shown. These are the background levels before harvest and it is not clear from the text what was done exactly and if the controls collected randomly in the field showed fungal spores concentrations.

10. P. 14342 lines 20-24 - Although fungi flourish after the rain, it does not happen instantly and since the ground is wet, it is predictable that uplifting of particles will be minimal.

11. P. 14344 line 4 – correct to "Friesen et al., (2001)".

12. P. 14344 lines 9-10 – it is not acceptable to reference Wikipedia, please find the

original reference for this information.

13. P. 14344 lines 21-23 – r2 = 0.67 is not a very strong correlation; please show this data and try to explain why is the correlation is not stronger if the 2 factors are dependent.

Conclusions

The authors should rewrite the conclusions after all corrections are made.

Overall changes in the English and presentation levels are needed.

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