Biogeosciences Discuss., 12, C10493–C10496, 2016
www.biogeosciences-discuss.net/12/C10493/2016/

Biogeosciences Discussions

Interactive comment on "Estimates of common ragweed pollen emission and dispersion over Europe using RegCM-pollen model" *by* L. Liu et al.

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Received and published: 13 April 2016

Anonymous Referee #2

Received and published: 25 February 2016

This paper presents a model aimed at estimating the emission and density of ragweed pollen over Europe. Estimating these parameters is important as ragweed pollen is highly allergenic. Furthermore, ragweed is an invasive species and its pollen can be transported by the wind over large distances, which undelines the need for accurate modelling of the flowering phenology and pollen concentration in the atmosphere. And overall, the paper focuses on these points.

Author's response: We would like to thank Referee #2 for the valuable comments and

suggestions that help improving the manuscript. Thanks a lot for the positive comment on our research objective and significance. Please find the specific responses below and a revised version of our manuscript.

1. However, my first cconcern is that I cannot evaluate the quality of the model , as i am not a specialist of modeling. Although the different parts of the model setup and the parameters used seem correct to me, I cannot make valuable comments on this part of the ms.

2. My second concern deals with the accuracy of the model in predicting the pollen season and the model's performance over short time scales. The model reproduces the pollen season quite well in the main regions where ragweed is abundant, but performs much less satisfactotily in regions where ragweed is less common. This might be a problem if these regions where the species is not common represent areas that are under colonization by ragweed: indeed, it is in these regions that the prediction should be the most accurate. About the model's performance over short time scales, I think this is also a concern because daily or weekly variations of pollen contents in the atmosphere are the ones that hae the biggest impact on public health. The authors clearly underline these weaknesses in the discussion and conclusions, but they should provide more clus and avenues of research to overcome these problems in future models.

Author's response:

We fully agree with Referee #2' comments in these regards.

About the lower accuracy of pollen season in areas with lower ragweed infestation, larger errors mainly exist in predicting ending dates and partly in starting dates. We think three main reasons might explain these:

1) Some stations stop pollen measurement before the actual end of pollen season which leads to a lower accuracy of ending date;

We tried to address this issue by using Gaussian central dates instead of ending dates (Eq. 5) in order to calculate flowering probability. It avoids to some extent the larger error on simulating airborne pollen concentration induced by lower accuracy on ending dates. We give details to determine pollen season in Sect.2.7.2.

2) The patchy local ragweed distribution in these regions and the possible relative importance of long range transported pollens possibly introduce errors in the determination of local pollen season dates;

This point is very difficult to adress. The ideal would be to have a accurate and diverse observation of ragweed phenology. It is of the essence to better represent local flowering with local measured environmental variables. We cannot do more than giving suggestions in Sect. 4 Summary and conclusions.

3) The phenology model itself we used which relies on fitting biological day thresholds for these dates.

Here, we validate the phenology model using pollen observations for 2011 and 2012 (Table 2), which shows no big differences between fitting and prediction errors. However extending this fitting to several years of observation may contribute to improve the stability and robustness of the fitted threshold for biological days and further improve the phenology modelling of ragweed. Please see the modification in the revised manuscript Sect. 3.2.

About the model's performance over short time scales, we agree that they are the most relevant for pollen impact and also are directly connected to model skills. We therefore use the best possible calibration based on all observations available to maximize the model performance. In addition to a better characterization of ragweed spatial distributions and biomass, a better understanding of phenological process and the dynamic response of release rate to meteorological conditions is needed to reduce the uncertainties and further improve model performance over short time scales. Again there is a need for experimental observations to better constrain the release model. Please note

also that the modelling framework is initially designed for running over long time period and that the simulated local daily meteorolgy shows also quite a lot of uncertainties. Please see the modification of Sect. 4 Summary and conclusions.

3. Despite these concerns, I think the paper gives valuable simulations of the ragweed pollen contents in the atmosphere. The manuscript I have reviewed already mentions that the paper has been accepted for publication and published on November 3, 2015, so I do not think my review should include recommendations concerning the publishing (by the way, I did not fully understand why I had to review a paer that seems to be alreday published?)

Author's response: Thanks a lot for the positive comment on this manuscript. Our manuscript was published on November 3 2015 as a discussion paper in Biogeosciences Discussion, which is the scientific discussion forum for Biogeosciences. Your review is crucial for the paper to access BGD final stage.

More specific comments: A few spelling and grammatical erros in the ms. but overall the English is very satisfactory and the paper reads easily and is clearly written.

Author's response: Thanks for the comment. We have double checked the manuscript and correct spelling and grammatical errors as much as possible.

Interactive comment on Biogeosciences Discuss., 12, 17595, 2015.