Full review on the paper (acp2016-1189):
M. Sofiev et al, “Multi-model ensemble simulations of olive pollen distribution in Europe in 2014”

General comments

The paper deals with the ensemble modelling of the olive pollen distribution, which can have practical application in allergy forecasting. This problem is not very often considered in the simulations performed by air quality community and has its own specifics. Therefore some additional efforts have to be spent in order to understand the processes, relevant parameters and data important for the preparation of such simulations. This is quite clearly described in the paper. The system based on multi-model ensembling has been set-up to perform simulations for a chosen period of 2014 year. Estimation of source term is based on the special modelling and is also described in the paper.
The ensemble setup is based on 6 models, 5 of them using the same meteorological data (ECMWF IFS). This means that this ensemble concerns, in principle, dispersion models – meteorological variety is practically disregarded. From statistics point of view such number of the models can be not enough in real application, but can be treated as a first step. It seems that adding models driven by different meteo data could be important in case of building operational system of this type modelling.
The authors proposed also an “optimized ensemble” model basing on properly chosen linear combination. This model has shown good skills although the choice of some parameters (like alpha, beta) seems to be rather art than to be based on pure mathematical approach.

The presented results have shown some capabilities of the constructed ensemble but also indicated problems like the shift of the whole season. This needs further research and is strictly related to meteorological forecast.

The paper meets requirements for including it into ACP with some minor corrections included into specific comments.

Specific comments

1. Paragraph at lines 186-197
This paragraph needs to be revised in order to precisely define the quantities in the formulas (1) and (2) . In the first formula the meaning of t is ambiguous: a_m(t) means coefficients depending on the interval t while c_m(….,t) means concentration at time t. I think it’s better to use parameter “tau” for the period (as in the second formula) and t for time point. Thus c_opt should depend on both tau and t and in the second formula A should depend on tau. There are no definitions of a_0 (bias depending on ?) in formula (1) and c_0 (observations I guess) in formula (2). Functional J should be rather a function of time t than the period tau (unless the average over time is considered – but even then the average period time can differ from the period tau used for the analysis).

2. Definition of SPI – Seasonal Pollen Index – is this follows the description given at the beginning of section 3.3 ? It would be good to know whether this index is related to exceeding some threshold limit used for allergy risk.

3. Relating to the previous comments what seems important is to show the agreement of the model predictions with the observations basing on the exceedance of threshold limit (as used, for example, in allergy forecast). Fig. 4 shows hourly olive pollen concentration – this picture could be accompanied by the other presenting agreement on threshold level with the observation.

4. As accumulation heat is one of the crucial parameter the question arises whether it can be somehow taken from observations and data assimilation technique can be applied to include such information into ensemble modelling.

5. A delicate matter is the calculation of the source term. Thus the question arises whether uncertainty of the source term could be a part of modelling i.e. the whether the models' simulation could be also performed with perturbations of source term. This, with no doubts, would be time consuming, nevertheless having an ensemble system with such capability would be an added value. This can be one of the possibility of further development of the system.

Technical remarks

1. Quality of some figures could be improved:
a) On Fig. 3 observation points are not well visible – some example locations could be shown on separate graph – for example the ones with high values.
b) Zooming maps on Figs 5 and 6 can improve quality.
c) parts of Figs 10 and 11 are not well visible.

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