OPEN ACCESS

Copenhagen: A harbinger for ragweed (*Ambrosia*) in Northern Europe under climate change?

To cite this article: Carsten Ambelas Skjøth et al 2009 IOP Conf. Ser.: Earth Environ. Sci. 6 142031

View the article online for updates and enhancements.

You may also like

- Revealing trends in extreme heatwave intensity: applying the UNSEEN approach to Nordic countries S Berghald, S Mayer and P Bohlinger
- <u>Nighttime heat waves in the Euro-</u> <u>Mediterranean region: definition,</u> <u>characterisation, and seasonal prediction</u> Verónica Torralba, Stefano Materia, Leone Cavicchia et al.
- How does the CMIP6 ensemble change the picture for European climate projections? T E Palmer, B B B Booth and C F McSweeney





DISCOVER how sustainability intersects with electrochemistry & solid state science research



This content was downloaded from IP address 3.144.33.41 on 26/04/2024 at 23:50

Climate Change: Global Risks, Challenges and Decisions

IOP Publishing doi:10.1088/1755-1307/6/4/142031

IOP Conf. Series: Earth and Environmental Science 6 (2009) 142031

P14.19

Copenhagen: a harbinger for ragweed (Ambrosia) in Northern Europe under climate change?

<u>Carsten Ambelas Skjøth(1)</u>, H Petersen(1,2), J Sommer(2), M Smith(3)

(1) NERI, Department of Atmospheric Environment, Aarhus University, Roskilde, DK

(3) National Pollen and Aerobiological Research Unit, Worcester, UK

Pollen grains from the genus *Ambrosia* spp. (ragweed) are considered to be very potent aeroallergens. The threshold value for clinical symptoms for ragweed pollen grains for the

majority of sensitised patients is below 20 grains/m³ (Jäger, 2000; Taramaracaz et al., 2005). *Ambrosia* pollen appears to induce asthma about twice as often as other pollen (Jäger, 2000; White and Bernstein, 2003). *Ambrosia* is present in the Czech Republic, Slovakia and Hungary, which may serve as source areas for long range transport to Poland and maybe also Denmark (Smith et al., 2008). As such *Ambrosia* pollen grains reported in the Danish pollen and spore traps have mainly been ascribed to long distance transport.

The growth season in Denmark has until now been considered to short for *Ambrosia* to flower and produce seeds. *Ambrosia* seeds have been found in significant quantities in imported bird seed in Denmark. Despite the limited growth season, *Ambrosia* is therefore found every year in urban areas such as gardens. However, with the climate changes observed over the last 20 years growth season for Ambrosia has most likely been extended. Furthermore, due to the urban heat island effect, the growth season in Copenhagen is likely to be extended compared to rural areas. It is therefore likely that *Ambrosia* has the potential to flower in Denmark, especially Copenhagen. This paper examines the hypothesis that *Ambrosia artemisiifolia* has established itself as a flowering species in Copenhagen. *Ambrosia* pollen data were collected by volumetric spore trap at Copenhagen (1979-2007) following the standard method of the Danish Asthma-Allergy Association. All available bihourly *Ambrosia* pollen counts where combined with results from a flexible trajectory model (e.g. Skjøth et al., 2008). A phenological model for *Ambrosia* was applied to study the potential pollen release within Copenhagen and supplemented with phenological field studies for the year 2008.

Ambrosia was counted with certainty since 1997. The annual count varied from 8 to 120 in 1998 and 2002. Two years with high counts seems to be related to long distance transport and the years with the low counts show an increasing tendency.

Bihourly pollen records were examined and each bihourly record of Ambrosia is analysed with respect to arrival times and correlated with a back trajectory analysis. The majority of single pollen grains are found in the afternoon records, suggesting a possible local population, as Ambrosia pollen are released during daytime (Ogden et al., 1969). The majority of back-trajectories for the bihourly records of Ambrosia show a westerly wind approach passing the Copenhagen area. For bihourly records above 1 grain this tendency is less pronounced. On the other hand, the two possible long distance transport episodes have a more southerly direction suggesting Ukraine, Poland and the Pannonian plain as possible source areas. Pollen grains arriving in the morning mainly approached from the south east, where as those arriving at night time have no predominating source areas. The results from the phenological model suggest an increased growth season for Ambrosia during the 30 year period within the Copenhagen area, thus increasing the possibility for Ambrosia to flower. This was verified with the field study, which showed a population of flowering Ambrosia plants in Copenhagen in 2008. The hypothesis that Ambrosia artemisiifolia has established it self as a flowering species in Copenhagen is therefore supported. The annual pollen counts show an increasing tendency, indicating an increased local population. The bihourly counts show a larger number of observations during the daytime compared to night time. This also indicates a local population. The back trajectories indicate long distance transport from the South and such episodes are found in 1999 and 2002. Back trajectories correlated with low daytime pollen counts show that air masses have passed the Copenhagen area, again supporting the hypothesis. The phenological flowering model indicates increased length of growth season for Ambrosia during the 30 year period. This increases the possibility of Ambrosia flowering in Copenhagen. The result from the phenological model is further supported by the observations of a flowering Ambrosia population in Copenhagen in 2008.

The combination of observations and model calculations support the hypothesis that *Ambrosia* is a systematically flowering species in Copenhagen. The main source to *Ambrosia* seeds is likely to be birdseed imported from countries such as Hungary. Whether *Ambrosia* has the potential to reproduce by seed in Denmark is not known. However, future climate projections for Denmark are similar to the current climate found in areas such as France and the Pannonian Plain. These areas are the most severe *Ambrosia* polluted

⁽²⁾ Asthma-Allergy Association, Roskilde, Denmark

Climate Change: Global Risks, Challenges and Decisions

IOP Publishing

IOP Conf. Series: Earth and Environmental Science 6 (2009) 142031

doi:10.1088/1755-1307/6/4/142031

areas in Europe (Smith et al., 2008). It is therefore very likely that *Ambrosia* in time will be able to reproduce in Denmark by seed. The establishment of ragweed as an aeroallergen in Denmark is likely to have a significant health impact by extending the pollen season with a very potent aeroallergen.

References

Jäger, S., 2000, Ragweed (Ambrosia) sensitisation rates correlate with the amount of inhaled airborne pollen. A 14-year studyin Vienna, Austria: Aerobiologia, **16**, 149-153.

Ogden, E. C., Hayes, J. V., and Raynor, G. S., 1969, Diurnal Patterns of Pollen Emission in Ambrosia Phleum Zea and Ricinus: American Journal of Botany, **56**, 16-21.

Skjøth, C. A., Sommer, J., Brandt, J., Hvidberg, M., Geels, C., Hansen, K., Hertel, O., Frohn, L., and Christensen, J., 2008, Copenhagen – a significant source of birch (Betula) pollen?: Int. J. Biometeorol., **52**, 453-462.

Smith, M., Skjøth, C. A., Myszkowska, D., Uruska, A., Malgorzata, P., Stach, A., Balwierzg, Z., Chlopek, K., Piotrowska, K., Kasprzyk, I., and Brandt, J., 2008, Long-range transport of Ambrosia pollen to Poland: Agricultural and Forest Meteorology, **148**, 1402-1411.

Taramaracaz, P., Lambelet, C., Clot, B., Keimer, C., and Hauser, C., 2005, Ragweed (Ambrosia) progression an its health risks: will Switzerland resist this invasion?: Swiss Med. Wkly, **135**, 538-548.

White, J. F. and Bernstein, D. I., 2003, Key pollen allergens in North America: Ann. Allergy Asthma Immunol, 91, 425-435.