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Allergies: Europe's ragweed pollen counts to quadruple by 2050?

Airborne concentrations of common ragweed pollen, a potent allergen, could increase fourfold in Europe by 2050. Researchers believe climate change will be responsible for two thirds of this increase, while the remainder will be due to the plant's spread, as a result of human activity. These estimates by researchers[1] from the CNRS, CEA, INERIS and RNSA[2], in collaboration with several European institutes, show that it is now necessary to implement coordinated management of this invasive plant on the European level, through long-term pollen monitoring and mapping of the weed's distribution. These estimates were published in the journal *Nature Climate Change* on May 25, 2015.

Ambrosia artemisiifolia is a plant of North American origin, whose pollen is a potent allergen. he primary clinical manifestations of the allergy caused by this plant are rhinitis, conjunctivitis, tracheitis, and often-serious asthma attacks. The peak pollination period of this plant, which in France has already spread to Burgundy, Auvergne, and the Rhône-Alpes region, takes place in August and September, thus extending the allergy season until the autumn for those who are prone to it. Several studies have already shown that global warming will allow ragweed to spread to previously unsuitable areas, but without quantifying the increase of its airborne pollen concentration.

The geographic evolution of air contamination by pollen depends on a number of factors: the plant's ability to reach new land through various seed dispersal processes, along with climate change, which enables the weed to blossom in new areas. In order to predict the effect of climate and seed dispersal mechanisms on the atmospheric concentration of pollen, researchers used different types of numerical models. The first simulated climate change based on the amount of greenhouse gases that could be emitted by human activity in years to come, while the second charted plant invasion, as well as the production, release, and airborne dispersion of pollen. These models, which made it possible to test different scenarios for seed dispersal and climate change, enabled researchers to determine that by 2050, ragweed pollen concentration would increase by a factor of four on average. To confirm the announced trends, which necessarily entail a degree of uncertainty, it is necessary to implement long-term monitoring of ragweed pollen, and to map the evolution of the plant's presence in Europe.

In this study, the scientists also determined each factor's individual responsibility in the increase of airborne pollen. Seed dispersal, whether from natural sources (runoff water or waterways), or from human

[1] From the Laboratoire des sciences du climat et de l'environnement (CNRS/CEA/UVSQ), the Laboratoire de météorologie dynamique (CNRS/Ecole Polytechnique/UPMC/ENS Paris)—both of which are part of the Institut Pierre Simon Laplace—the Centre d'écologie fonctionnelle et évolutive (CNRS/Université de Montpellier/EPHE), and the Institut national de l'environnement industriel et des risques (INERIS) in collaboration with the University of Vienna, the *International Center For Theoretical Physics*, and *Rothamsted Research*.

[2] Réseau national de surveillance aérobiologique.

activity (agriculture and road or rail transport) causes one third of the rise in pollen concentration. Climate change is responsible for the other two thirds, as it fosters the expansion of ragweed, notably into Northern and Northeastern Europe, while mostly boosting pollen production by increasing CO_2, which has a favorable effect on the development of vegetation.

These results, which were obtained in the context of the European project ATOPICA[3], also open the way for a new generation of short-term forecasting tools for pollen concentration, and should eventually make it possible to include ragweed in preventive alerts against allergies.

On the same topic: two French-language articles from CNRS le journal on allergies and the impact of climate change on health.

Bibliography

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