

## Pollen and Allergic Airway Disease on the Rise

Cases of asthma and other allergic airway diseases such as hay fever are on the rise in the U.S., and people who suffer from these health issues will likely be negatively impacted by global climate change and land use decisions in the 21<sup>st</sup> century. Growth patterns of weeds, grasses and trees are directly linked to climatic conditions and land use. These plant sources produce allergens that can enter human respiratory systems, and exposure depends on the amount of allergens and their length of time in the atmosphere.

STAR-funded research has found that people may suffer from pollen season five to six days earlier in the western U.S. Dr. Richard Flagan and his team from the California Institute of Technology have partnered with other regional institutions to study the relationships among global change (including climate change and land use shifts), pollen occurrence and respiratory health effects. Linking global change and human health impacts from respirable allergens requires many tools and areas of expertise. Flagan's group is using laboratory experiments, statistical analysis and modeling to project how the severity and frequency of allergic airway disease will change in the future.

A new pollen model called the Simulator of the Timing and Magnitude of Pollen Season (STaMPS) has been developed by team members from the Na-

tional Center for Atmospheric Research in Boulder, Colo., taking into account meteorological variables, wind dispersal, climate zones and a variety of vegetation types. The initial application of the model focused on simulating pollen production potential from allergenic species of Southern Californian trees and grasses that flower between March and June each year. In the future the model may be adapted to other geographic areas

Based on future meteorological conditions expected for California and Nevada in 2045-2054 (assuming a 1°C temperature increase), the simulations performed by a team at Washington State University using the STaMPS model project that pollen season for selected allergenic species will start five to six days earlier than it did in 1995-2004. An earlier start for allergy season will negatively impact those who suffer from allergic airway disease.

To figure out just how much children in particular are affected by the magnitude and seasonality of pollen allergens, team members at the University of Southern California are analyzing statistical data from their institution's Children's Health Study (CHS). Pollen measurements made by Flagan's group

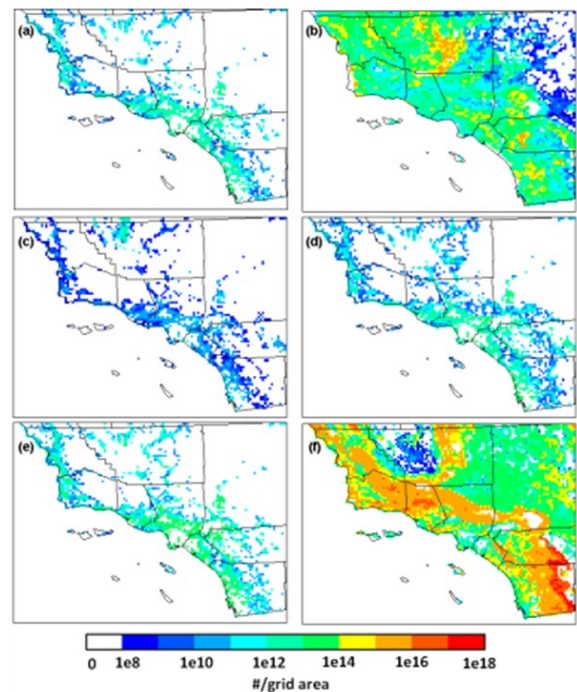


Fig. 5. Simulated spatial patterns of total pollen emission potential during March–June 2010 for (a) birch, (b) grass, (c) walnut, (d) mulberry, (e) olive, and (f) oak. (Zhang, et al., 2013)

are being correlated with health outcomes and air pollutant measurements made by the CHS, which will lead to a better understanding of how pollen concentrations relate to health effects in the study area. Laboratory measurements will further clarify how respirable allergen levels relate to pollen production in various plant species.

By looking at how global change will affect severity and incidence rates of allergic airway disease, Flagan's team is focusing on an important issue at the intersection of climate and health, leading the way to a more prepared population in the coming decades.

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