

332 Development of a Broad-Based Pollen Identification Dataset via Genomic and Image Analyses

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RATIONALE: The collection and identification of pollen are still conducted manually or through automated devices that are inefficient, costly, and labor-intensive. A multi-faceted database with genetically confirmed pollen and respective images can be integrated to provide collected images for rapid real-time accurate analysis of sampled pollen species in an artificial intelligence (AI) model.

METHODS: Images of pollen were collected via different forms of microscopy (standard light, phase contrast, scanning electron and organized by species, highlighting different features of the pollen exine ranging from 100x to 3500x magnification. Each species imaged was then mechanically ruptured and the pollen DNA isolated and sequenced and was cross-referenced with imaging data of the expected species of each pollen type. Sequencing was performed on PCR amplification fragments of the trnL intron ubiquitous among plant species chloroplasts.

RESULTS: A dataset consisting of images (n>5000) was compiled, comprising all intended levels of magnification, and 41 unique pollen species (grasses including Bermuda, Rye, Blue, Fescue; trees including Birch, Oak; weeds including Ragweed) were sequenced; 39 samples matched their respective species; 2 differed significantly from labeled species.

CONCLUSIONS: This represents the first major dataset for a real-time accurate analysis of pollen species that may form the basis of an object detection algorithm that can and will be accordingly adjusted and expanded with the use of AI and the addition of international-based pollen species.

333 Ambrosia (Ragweed) Pollen Significantly Contributed to the Biological Pollution in the late Spring and early Summer of 2023 in an Urban Community with high Asthma Rates in Jacksonville, Florida.

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RATIONALE: *Ambrosia* (ragweed), a member of the *Asteraceae* family, is very allergenic and its pollen is clinically important because its immunogenic components can exacerbate airway allergic diseases. Investigators have demonstrated that ragweed flourishes more in urban than rural areas because of the increase levels of atmospheric CO₂. From the recent weather reports of unusually high temperatures in Florida, we hypothesized that anemophilous ragweed pollen will increase significantly in 2023.

METHODS: A 7-day Burkard volumetric sampler on the roof of a 5-story dormitory at Edward Waters University in Jacksonville Florida collected daily pollen from December 2020 to August 2023. However, the spore trap was inoperable during the late spring of 2022 through the summer of 2022. Pollen samples were analyzed as specified by the NAB of the AAAAI.

RESULTS: Previously, we observed only moderate (>10<50 grains/m³) levels of *Ambrosia* pollen during the late Spring and Summer of 2021. In 2023, high levels were observed as the difference between the median *Ambrosia* pollen concentrations from the 2021 and 2023 seasons was statistically significant (p<0.001) and estimated to be 4.32 (95% CI 2.16 to 6.48).

CONCLUSIONS: The significant increase in concentration of *Ambrosia* pollen grains from moderate in 2021 to high in 2023 are important aerobiological data to assist the allergists for the treatment of patients with pollinosis especially from the vulnerable urban communities. The unusually high temperatures in 2023 may be partially responsible for the observed significant increase in pollen concentration levels in Jacksonville Florida.

334 Pollen Rupture and Wall Deposition in Turbulent Pipe Flow

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RATIONALE: Ruptured pollen can release many micrometric antigen-carrying granules that can reach lower airways and induce asthma. Rupture from osmotic swelling has been well-studied, but mechanical rupture such as caused by wind turbulence and impaction is less understood.

RMT is developing a new pollen exposure chamber for allergy research. To this end, it is important to understand the conveyance behaviour of various pollens to minimize rupture and losses. Here, we investigate the deposition and rupture of three pollen species in turbulent pipe flow.

METHODS: Ragweed (*A. artemisiifolia*), birch (*B. populifolia*), and Timothy grass (*P. pratense*) pollen were conveyed in dry air (RH<5%) at velocities between 1.4 m/s and 18 m/s through a transparent acrylic pipe (L = 2m, D = 2.54cm). Pollen deposition in fully-developed turbulent pipe flow was imaged. Ejected pollen collected on glass slides was inspected under magnification for rupture.

RESULTS: Wall deposition increased with increasing airspeed up to a maximum, beyond which it decreased due to re-entrainment. Average airspeed for minimal deposition without detecting grain rupture was 12 m/s (27 mph, Reynolds number (Re) = 2.0x10⁴) for ragweed and 10.5 m/s (23 mph, Re = 1.8x10⁴) for birch and grass. Grass rupture was observed at 12 m/s.

CONCLUSIONS: Mechanical stresses exerted on pollen grains such as experienced in turbulent pipe flow can cause pollen rupture. Ongoing testing will characterize pollen rupture at multiple conveyance velocities. Future work could examine the relative effects of fluid stresses and particle collisions, mechanical stresses in humid conditions, and other pollen species.

335 Tree Pollen Seasons in SW Ontario Amidst 25 years of Climate Change

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RATIONALE: The World Allergy Organization (2015) and various scientists have forecasted longer and more intense pollen seasons resulting from climate change in northern latitudes of the USA (Ziska et al, 2011). Our NAB station is in SW Ontario near the northern US border. Typically our four month season begins in mid-March and is finished by the end of June.

METHODS: Tree pollen counts for SW Ontario from 1998 to 2023 were analyzed. The start and end dates of each season, the duration (# days), total tree pollen production, and other parameters were analyzed. Season length was determined using three different criteria.

RESULTS: Our data show that the occurrence of the tree pollen season has not shifted in time. While there is considerable variability from year to year there is no overall change in the start or end points; duration of the season is unchanged over the past 25 years with a slight decrease in the total tree pollen.

CONCLUSIONS: There are many signs of climate change affecting ecology. Instead of longer, earlier, more intense pollen seasons, we observed almost no change in the last 25 years. Our seasons have started, ended, and lasted about the same length of time, producing approximately the same amount of total tree pollen on average. For individual tree species, however, seasonal contribution has experienced many extremes, as previously reported.