



Bachelor-/Master-thesis

Themenbereich Messtechnik, Windkanal, Vibrationsanalyse

Characterization of pollen release from wind-pollinated species



PollenNet

Background: Pollen allergy prevalence has increased markedly over recent decades, affecting up to 30% of adults and 25% of children. Airborne pollen is a major trigger of allergic rhinitis and allergic asthma, imposing a significant burden on public health and quality of life. We are part of the Pollen-Net project, funded by the Carl Zeiss Foundation, an interdisciplinary group of researchers focused on pollen monitoring, identification, and forecasting. Our aim is to improve predictions of airborne pollen loads and their impacts on human health.

Motivation: Wind-pollinated plants are a major source of airborne pollen and play a crucial role in atmospheric pollen transport and allergen exposure. While considerable research has focused on pollination mechanisms in insect-pollinated species, the physical processes governing pollen release in wind-pollinated plants remain comparatively understudied. In particular, the response of catkins to aerodynamic forcing and their vibration dynamics under varying environmental conditions are not yet fully understood. Furthermore, the mechanisms governing pollen release from catkins remain insufficiently characterized, despite their importance for understanding airborne pollen dynamics. Therefore, robust frameworks for automated pollen analysis and improved characterization of pollen release processes are needed to enhance pollen forecasting and support public health applications.

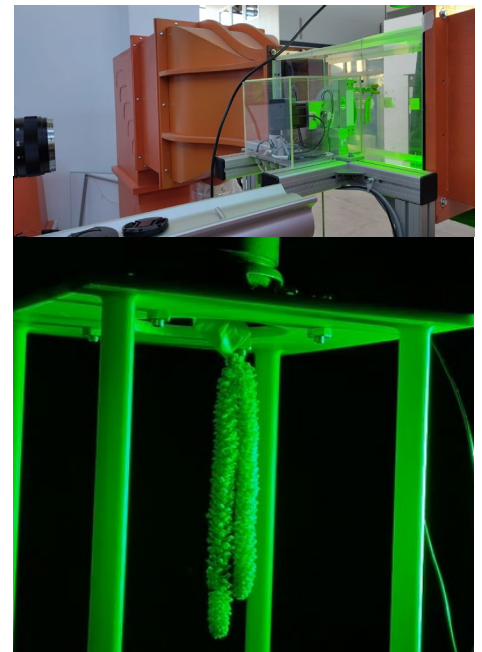


Fig: Catkin in the wind tunnel (top) and catkin attached to a speaker (bottom)

Goal: This work aims to develop a robust framework for characterizing pollen release from catkins under controlled wind and vibration conditions. Wind tunnel experiments and acoustic excitation with a loudspeaker will be used to investigate the influence of airflow and catkin vibration modes on pollen release. Event-based imaging will capture release dynamics, enabling quantitative analysis of the mechanisms governing pollen dispersal.

Requirement:

- Motivated to conduct experiments.
- Basic knowledge of Fluid Mechanics
- Basic knowledge of Python/MATLAB.

Target group: Bachelor's/Master's students in mechatronics or mechanical engineering

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