Impact of urban trees on local urban climate by CFD modeling

Record number : OPR-1123

Overview

RESEARCH DIRECTION

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INFORMATION

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ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie civil et de génie du bâtiment
Département de génie mécanique

LEVEL(S)

2e cycle
3e cycle
Stage postdoctoral

LOCATION(S)

Campus de Sherbrooke

Project Description

People are increasingly aware of the health risks of being exposed to extreme urban heat. Particularly city residents are affected due to the urban heat island effect showing higher temperatures in cities than in the rural surroundings. Urban vegetation, like trees, is believed to be a flexible way to cool cities because they provide shade and release moisture through evaporation, cooling the surrounding environment. However, trees can also block air currents, reducing cooling in nearby areas, and trap the accumulated heat at night due to reduced radiation from the ground to sky.
In some cases, placing well-selected plants and trees in wind corridors can enhance their cooling effect, but dense canopies can slow down wind and reduce cooling. On the other hand, in densely built-up areas, wind corridors without trees can become “hot air corridors” because the sun heats up the non-shaded dark surfaces like asphalt. This makes it challenging to design cool walkways for pedestrians, requiring a balance between the positive and negative effects of trees.
We use a CFD-based model to simulate at a very fine spatial resolution for wind sheltering and shading by buildings and trees, radiative exchanges between the sun, urban surfaces and sky, heat and moisture storage in materials like pavements and facades, cooling by evapotranspiration from vegetation. The impact of trees is quantified, among other indicators, in terms of heat stress affecting pedestrians.

Applicants should have a background in building, civil or mechanical engineering, or applied physics. Candidates should be curious, creative, rigorous and highly motivated. Given the international nature of the project, fluency in English is essential. Candidates will acquire knowledge in building and urban physics, CFD, advanced modeling, urban heat islands and the impacts of climate change on cities and their inhabitants.

This project can accommodate one or more students in the following programs :
- Postdoctoral fellowship
- Doctoral thesis
- Research-type master's thesis

Discipline(s) by sector

Sciences naturelles et génie

Génie civil, Génie mécanique

Funding offered

Yes

25 000$ annual

The last update was on 15 October 2024. The University reserves the right to modify its projects without notice.