Internship offer (M2 student or engineering student) - 6 month long internship - March-August 2021

"Characterization of plants involved in urban cooling"

Context:

The fight against urban heat islands aims to improve the resilience of cities during increasingly frequent heat waves, in order to increase the cooling of the ambient air and reduce discomfort inside buildings. These topics are challenging and constitute social, environmental and energy issues.

Numerous research works have shown that the combination of water and plants improves the urban climate during hot weather by modulating local thermal balances. Numerous works on the revegetation of roofs have shown the role of this revegetation in the management of rainwater, the development of biodiversity or even urban cooling (fight against heat islands).

Dynamic thermal simulations making it possible to quantify the potential for urban cooling limiting urban heat islands (environmental gain) as well as summer comfort inside the building (energy saving in air conditioning) have shown the interest of using plants with high evapotranspiration capacity (ETP) on roofs. The energy flows in the vicinity of a green roof involve many parameters of plant physiology which will be modeled using dynamic thermal simulation software developed at the University of La Rochelle.

In this context of functional modeling, it is necessary to characterize canopy plants, their heat and water vapor transfer properties and the impact of water stress on their development. Thus a collaboration was established with the team of ME Chabouté / AC Schmit at the Institute of Molecular Biology of Plants (IBMP, Strasbourg), which is interested in the response of plants towards environmental stresses. More specifically, the team is carrying out a functional characterization of A. thaliana plants as well as new models in response to water and heat stress. This characterization is done at different scales: from the whole plant to the cellular and molecular levels by integrating multidisciplinary approaches (modeling, physics) through a network of international collaborations.

Project:

During the internship, a number of defined parameters will be measured on 6 plants of interest and a new model under controlled conditions at IBMP (greenhouse, culture chamber) but also *in situ* on a site outside Strasbourg. At the plant level, we will evaluate growth parameters (surface area covered by plants, height of plants, survival, and leaf index) but also parameters related to evapotranspiration (stomatal resistance). On this last point, additional analyzes at the cellular level are also envisaged (density and structure of the stomata) by scanning microscopy.

Ultimately, this should lead to a better understanding of the response mechanisms to water stress in these urban cooling plants and the identification of the species most suited to the cooling natural roof project.

This project is funded by the SOPREMA donation to the UNISTRA Foundation.

Candidate profile:

Master's degree in plant biology and physiology, plant ecology or agronomic engineering school.

Good knowledge of imaging and statistics will be required for data analysis.

Contact:

ME Chabouté IBMP - Marie-edith.chabouté@ibmp-cnrs.unistra.fr