

Abstract

The objective of this paper is to present a field study on the thermal comfort of university buildings subjected to the Harmattan in order to analyze the evolution of thermal perceptions of students between morning and afternoon. Buildings investigated were university buildings located in Bambey University-Senegal in which 4 buildings were included in the field study an amphitheater and 3 classrooms. Classrooms had the same architecture but their main facades with the largest opening area were oriented differently. Subjective and objective comfort indicators were determined. Results show that classrooms and the amphitheater are uncomfortable in the morning and afternoon. Between the morning and afternoon the level of discomfort was tripled. Results suggest that the level of classrooms discomfort was correlated with the orientation of the main classroom facade.

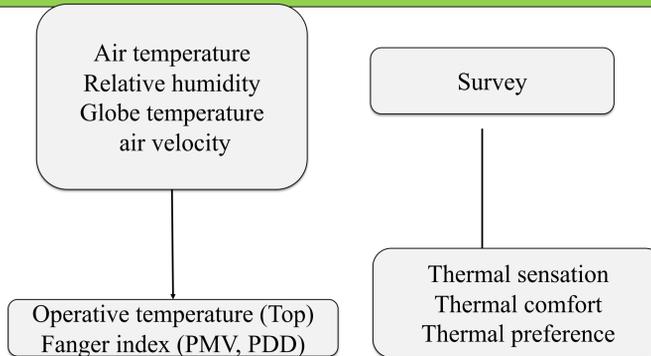
Introduction

In tropical countries, extreme summer heat waves are frequent and last longer. The risk of overheating in buildings is high. Overheating of a building can quickly become a source of discomfort for the occupants and lead to the need for cooling. To reduce the use of air conditioning systems, it is therefore necessary to reconsider the design of buildings in order to better adapt them to their environment. In this work, the thermal comfort of university buildings subjected to the Harmattan wind was evaluated during the working day of April 10, 2022 in order to propose recommendations later.

Materiel and methods



Fig-1: Measuring device



Results

Table-1: Operative temperature of the amphitheater

Measurement period	Top (°C)
Morning	30.10
Afternoon	34.15



Fig-2: Amphitheater

Table-2: Operative temperature of classroom with main facade orientation

Classrooms	Top (°C)
A (facing east)	34.13
B (facing west)	35.68
C (facing north)	32.92

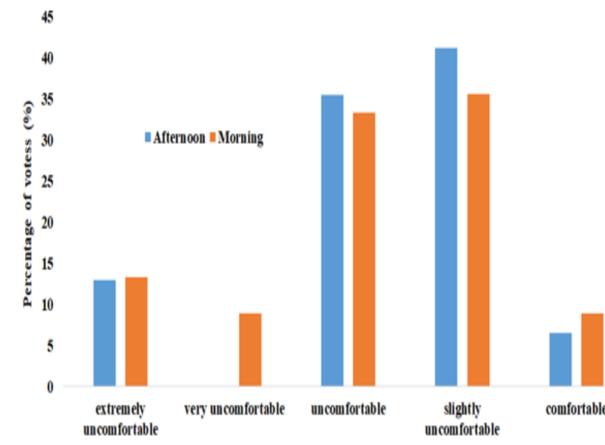


Fig-4: Thermal comfort votes

Table-3: Predicted percentage discomfort

Classrooms	Predicted percentage discomfort (%)
Morning	22
Afternoon	68

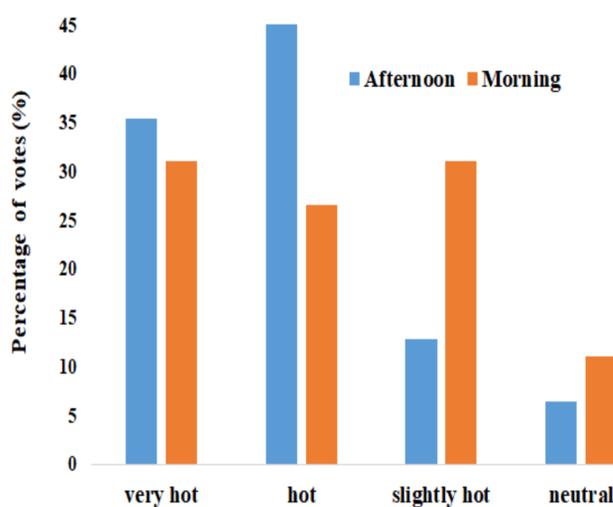


Fig-3: Thermal sensation votes

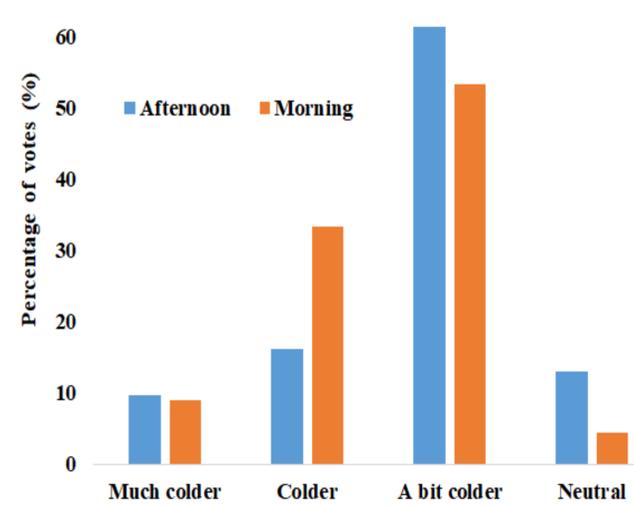


Fig-5: Thermal preference votes

Conclusion and perspectives

- Operative temperatures of the amphitheater are increased to 4°C between the morning and afternoon
- The northern orientation of the main facade has reduced the level of discomfort
- Between the morning and afternoon the level of discomfort was tripled.
- The study showed that the 4 buildings of Bambey University are uncomfortable during the working day of April 10, 2022.
- 53% and 61% occupants would like to have bit cooler in the morning and afternoon, respectively.

In perspective, this study will be extended to all the buildings of the university and on all the season of the harmattan