Observation of urban climate variability at local scale and comparison with human perception

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Context and motivations

Urban heat island at city scale

Microclimate variability at neighbourhood scale

Source: EPICEA Project

Source: APUR
Context and motivations

Urban heat island at city scale

Microclimate variability at neighbourhood scale

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Source: APUR

Interest for urban planning!
Context and motivations

- Urban microclimate at the neighbourhood scale
- Take into account human perception

物理方法：
实验性量化都市微气候在邻里尺度的空间变异性

敏锐方法：
咨询对气候舒适度有感觉的人
Context and motivations

- Urban microclimate at the neighbourhood scale
- Take into account human perception

- **Physical approach:**
  Experimental quantification of the spatial variability of urban microclimate at neighbourhood scale

- **Sensitive approach:**
  Consult people feeling about climatic comfort

- **EUREQUA project (2012-2016):**
  Interdisciplinary project dealing with environmental quality of the districts
Experimental design

- Interdisciplinary field experiment in Toulouse (France)
Experimental design

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- Focus on a district of 1 x 0.5km²
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_sensitive approach_

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<tr>
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<td>dry</td>
</tr>
<tr>
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Experimental design

- Interdisciplinary field experiment in Toulouse (France)
- Focus on a district of 1 x 0.5km²

**Sensitive approach:**

**Physical approach:**

Temperature, radiative T, wind, humidity, UTCI (Universal Thermal Climate Index)
Experimental design

- Interdisciplinary field experiment in Toulouse (France)
- Focus on a district of 1 x 0.5km²

**Timescale:**

3 seasons = January, April, June 2014

x 3 consecutive days of mobile measurements

x 3 hours: 10-16-19h
Experimental design

- Interdisciplinary field experiment in Toulouse (France)
- Focus on a district of 1 x 0.5km²

- Two weather types (Hidalgo et al. 2015):
  - winter group (3 days)
  - summer group (5 days)

Timescale:
3 seasons = January, April, June 2014
x 3 consecutive days of mobile measurements
x 3 hours: 10-16-19h
Emerging questions

2 weather types
8 days*3 hours
6 stop points/itinerary
Emerging questions

Sensitive distinction between the stop points?

Social surveys

Link between climatic comfort and climatic parameters evaluation?

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8 days*3 hours
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Emerging questions

Sensitive distinction between the stop points?

Objective differences between the stop points?

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2 weather types
8 days*3 hours
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Social surveys

Meteorological measurements
Emerging questions

Sensitive distinction between the stop points?

Objective differences between the stop points?

Link between climatic comfort and climatic parameters evaluation?

Link between measurements and human perception

2 weather types
8 days*3 hours
6 stop points/itinerary

Social surveys

Meteorological measurements
First results

- Meteorological measurements: ANOVAs
First results

- Meteorological measurements: ANOVAs

Ex. 18/06/2014, 16h

Significant differences between stop points

- Temperature
- UTCI
- Wind speed
- Relative humidity
First results

- Social surveys: 
  qualitative approach
- Focus on 
  climatic comfort
First results

No significant link between climatic comfort and measured UTCI

<table>
<thead>
<tr>
<th>UTCI measured (°C)</th>
<th>Comfort in Winter</th>
<th>Comfort in Summer</th>
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Human comfort evaluation

Toulouse France
First results

Temperature well evaluated by inhabitants

![Graph showing temperature correlation with surveyed data and UTCI measured data with R² = 0.87. The graph distinguishes between summer and winter conditions at various times: 10h, 16h, and 19h.]
First results

SEASONAL EFFECT
Comfort ↔ other meteorological parameters
First results

Winter
Climatic **discomfort** ↔
Wet and windy conditions

Social survey

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First results

Winter
Climatic discomfort ↔ Wet and windy conditions

Summer
Climatic comfort ↔ Dry and calm conditions
Conclusion

- Large database of meteorological parameters and human perception of climatic comfort and parameters

- First results on the analysis of sensitive and physical approaches

- In progress... real cross-analysis of the sensitive and physical approaches