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

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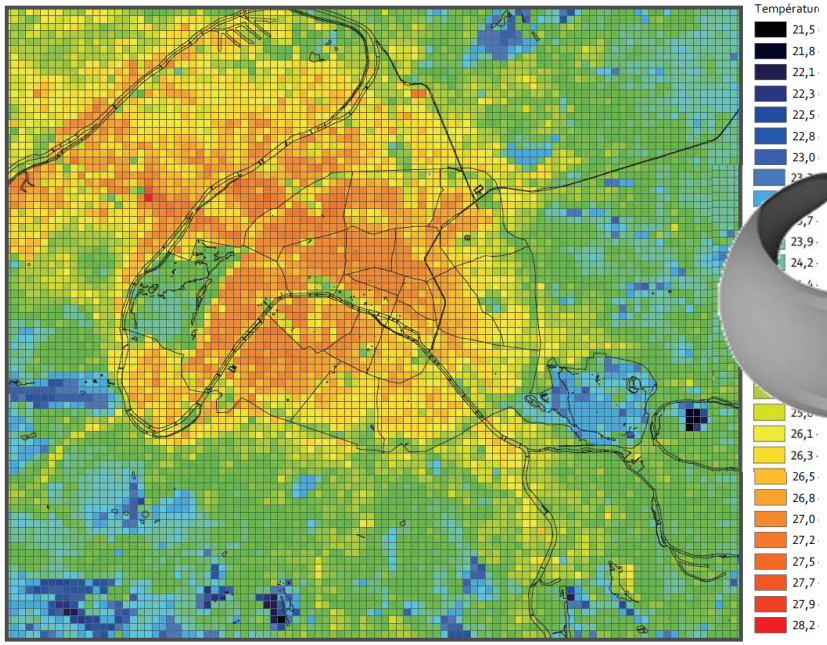
Context and motivations

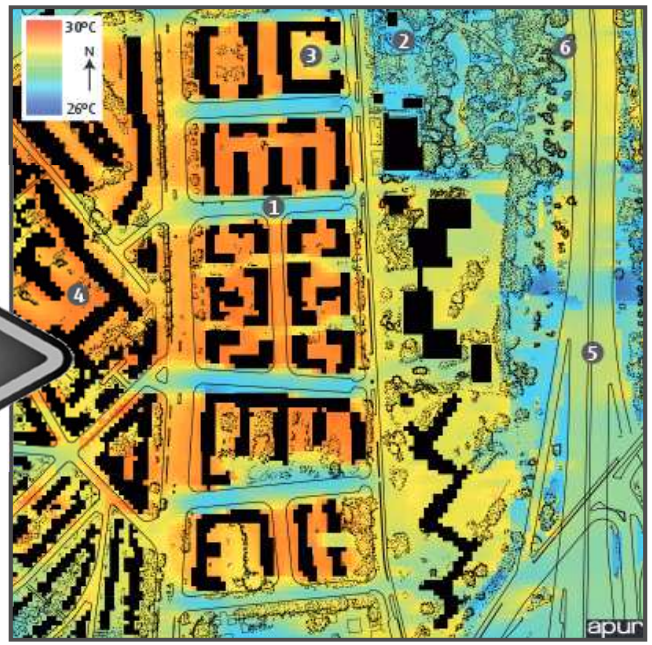
Urban heat island at city scale



25 km

Source: EPICEA Project

Microclimate variability at neighbourhood scale



500 m

Source: APUR

Context and motivations

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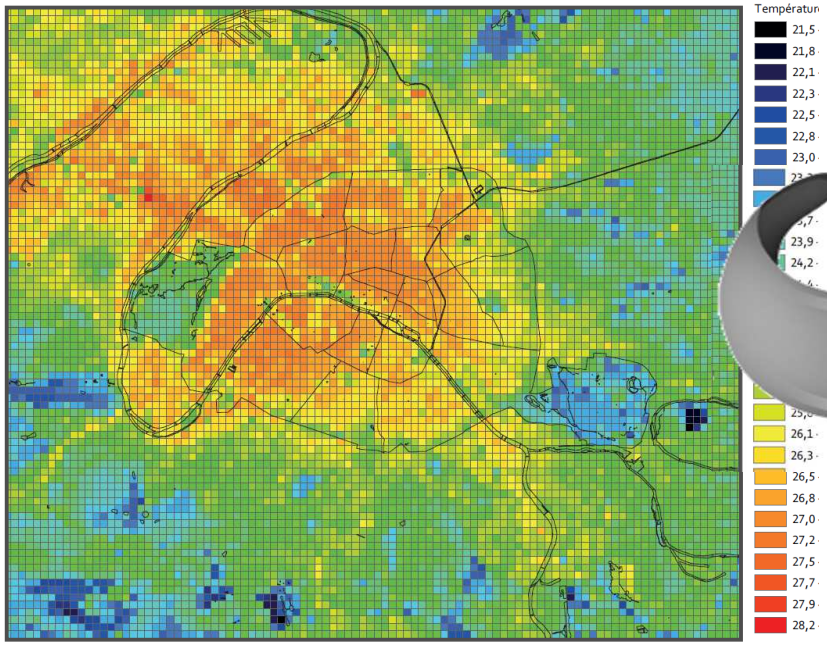

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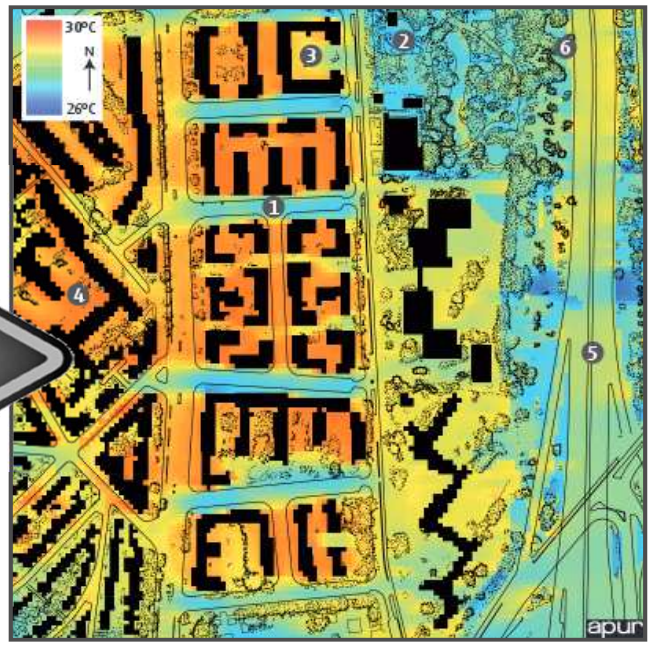
Microclimate variability at neighbourhood scale



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Source: APUR

Interest for urban planning!

Context and motivations

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

  - **Physical approach**:
    Experimental quantification of the spatial variability of urban microclimate at neighbourhood scale
  - **Sensitive approach**:
    Consult people feeling about climatic comfort

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)

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- Focus on a district of 1 x 0.5km²

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Walking route (2km)

Stop point

Experimental design

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➲ **Sensitive approach:**

Social survey

	-1	+1
COMFORT	uncomfortable	comfortable
TEMPERATURE	cold	hot
WIND	windy	calm
HUMIDITY	humid	dry
SUNSHINE	shaded	sunny

Experimental design

- Interdisciplinary field experiment in Toulouse (France)
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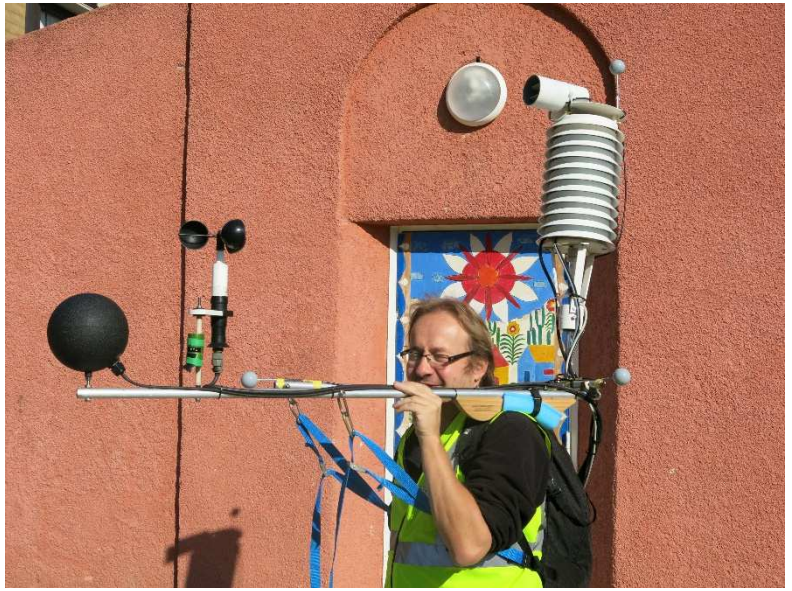
➲ **Sensitive approach:**

➲ **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

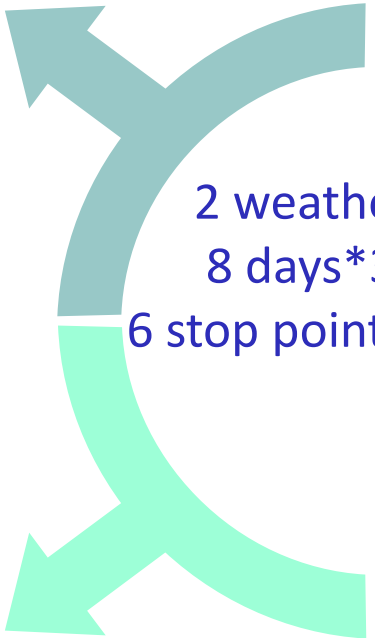
x **3 hours**: 10-16-19h

Emerging questions

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

Emerging questions

Sensitive distinction between the stop points?



2 weather types
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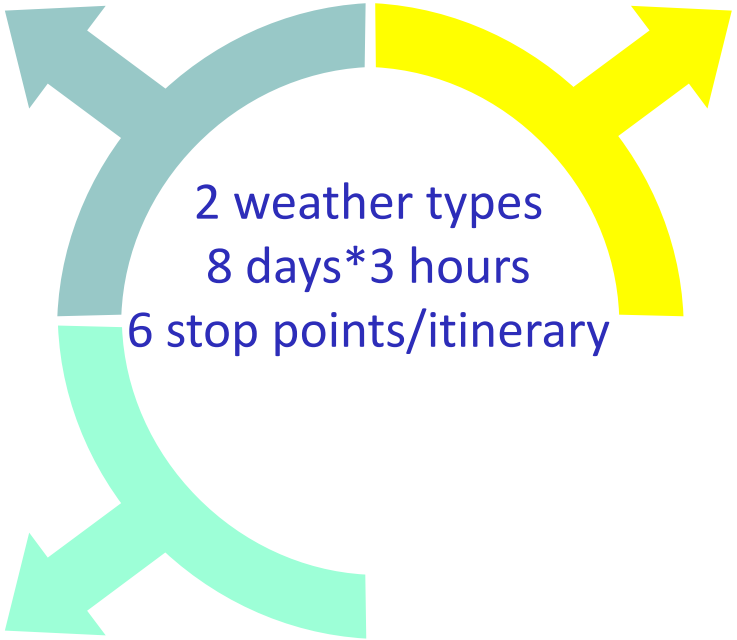
Social surveys

Link between climatic comfort and climatic parameters evaluation?

Emerging questions

Sensitive distinction between the stop points?

Objective differences between the stop points?



Social surveys

Meteorological measurements

Link between climatic comfort and climatic parameters evaluation?

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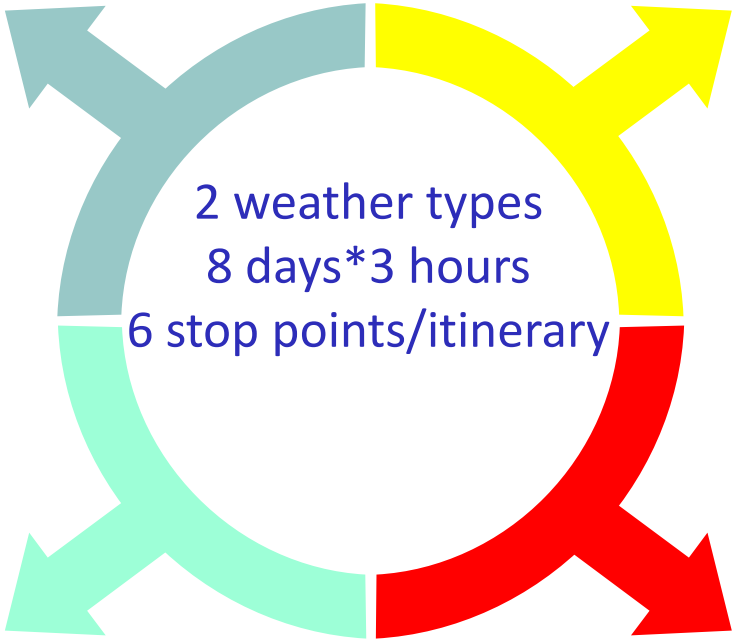

Social surveys

Meteorological measurements

Link between climatic comfort and climatic parameters evaluation?

Link between measurements and human perception

First results

- Meteorological measurements: **ANOVAs**

First results

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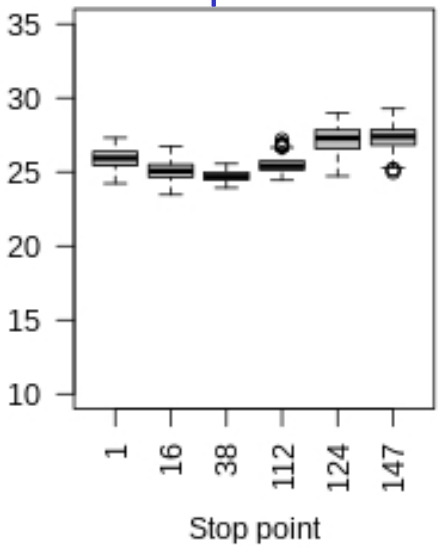
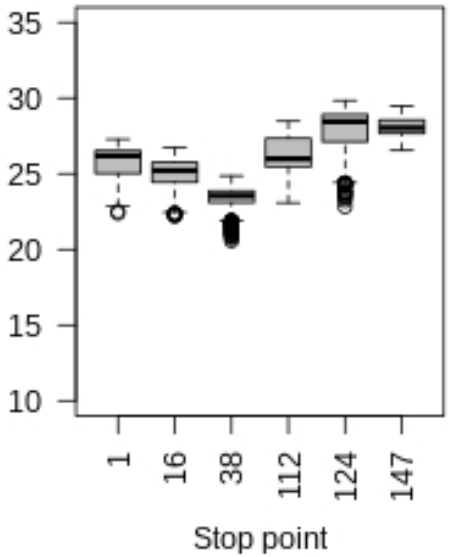
Ex. 18/06/2014, 16h

Significant differences between stop points

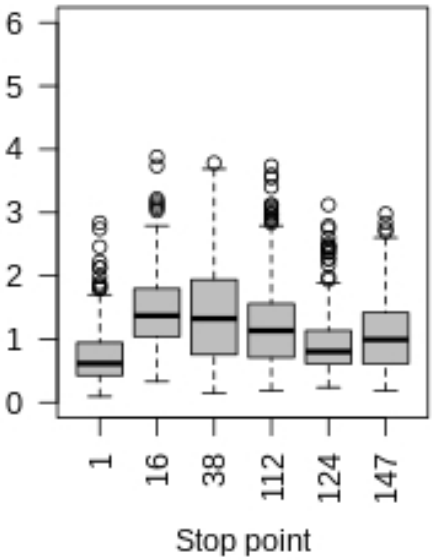
Temperature



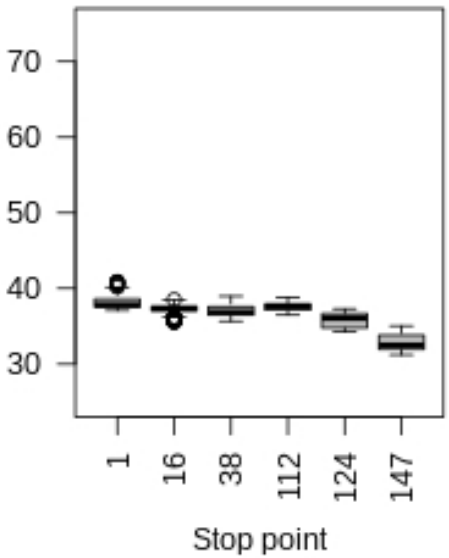
UTCI



Wind speed



Relative humidity



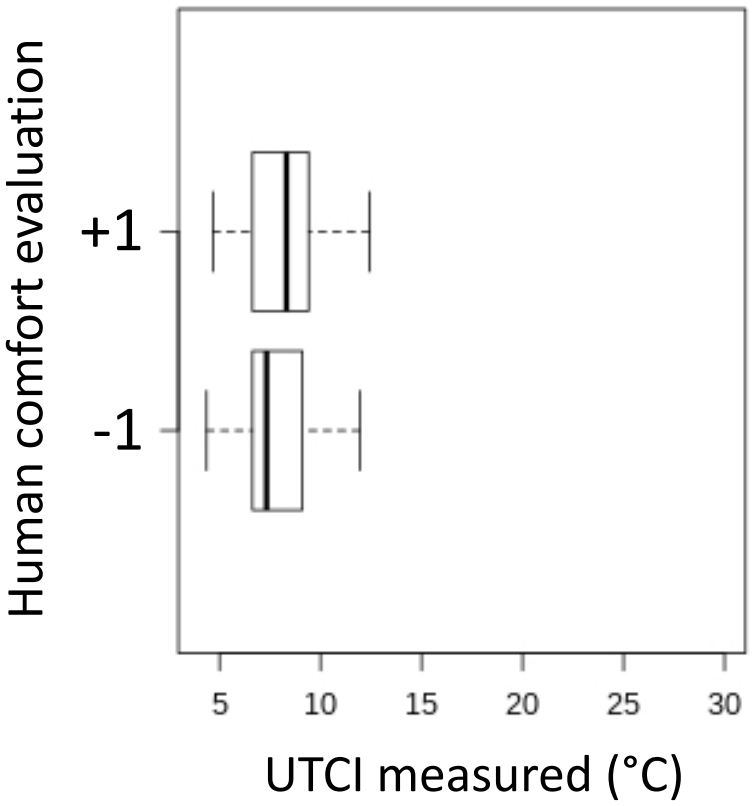
First results

- Social surveys: **qualitative approach**
- Focus on **climatic comfort**

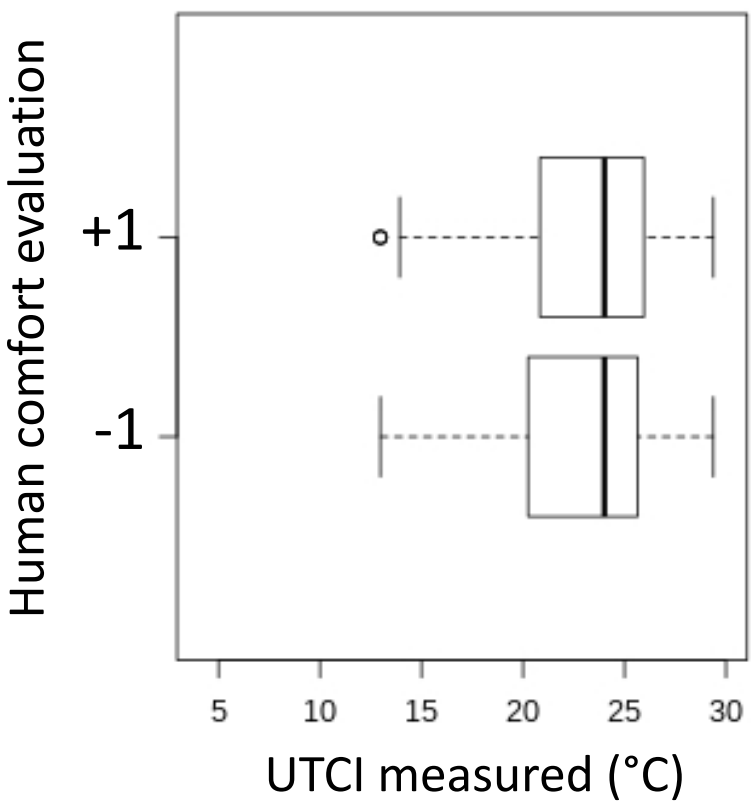
First results

No significant link between climatic comfort and measured UTCI

Comfort in Winter

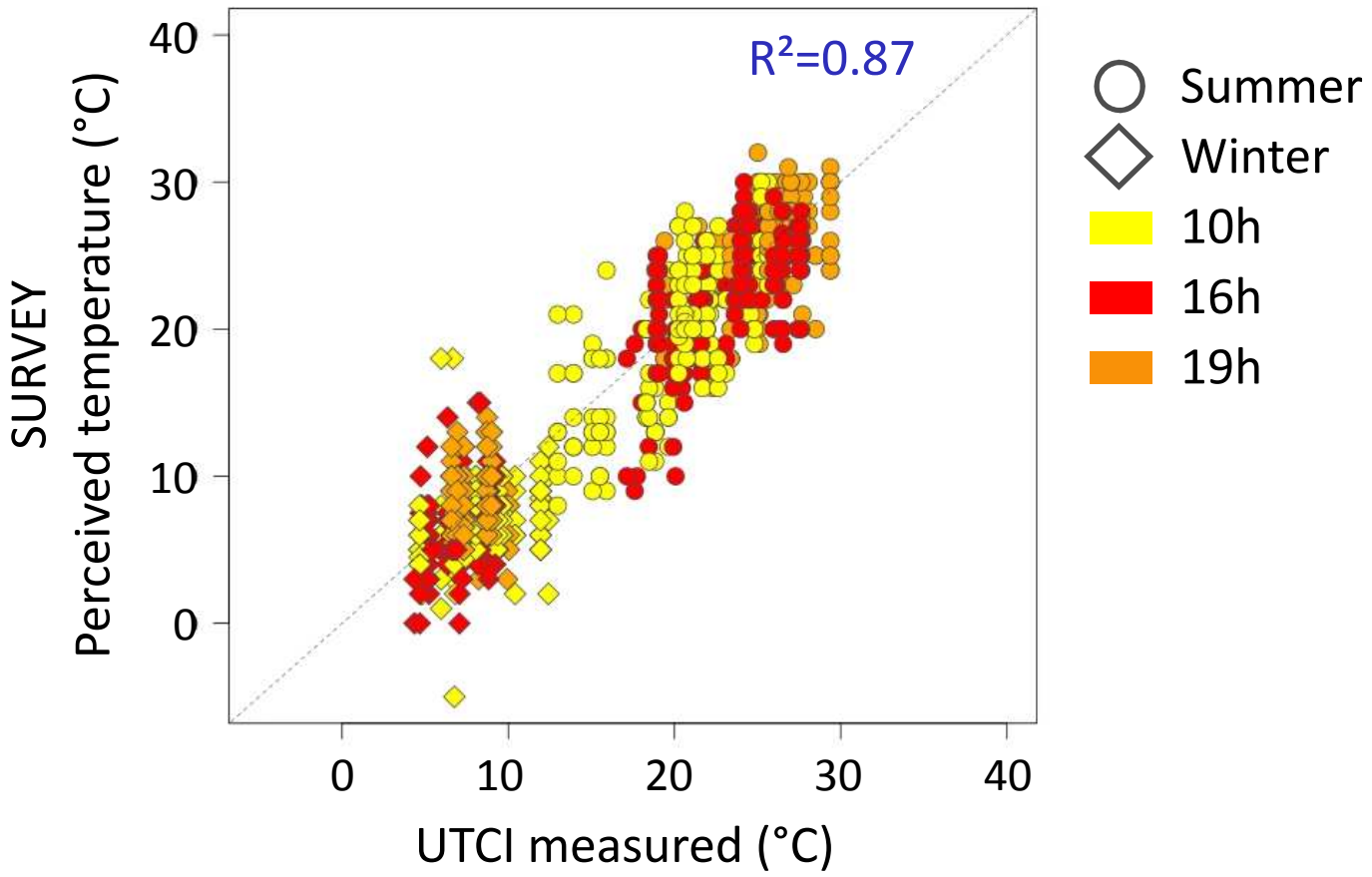


Comfort in Summer



First results

Temperature well evaluated by inhabitants



First results

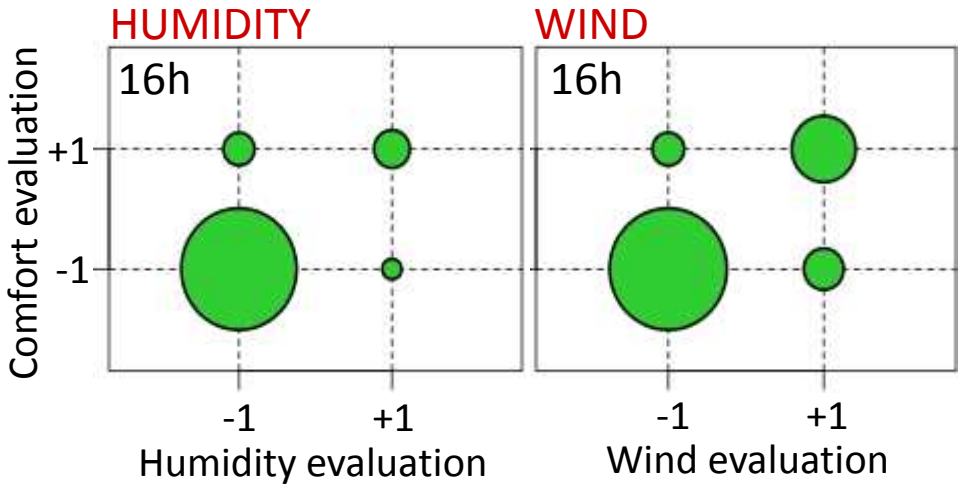
SEASONAL EFFECT

Comfort ↔ other meteorological parameters

First results

Winter

Climatic **discomfort**
↔
Wet and windy conditions



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First results

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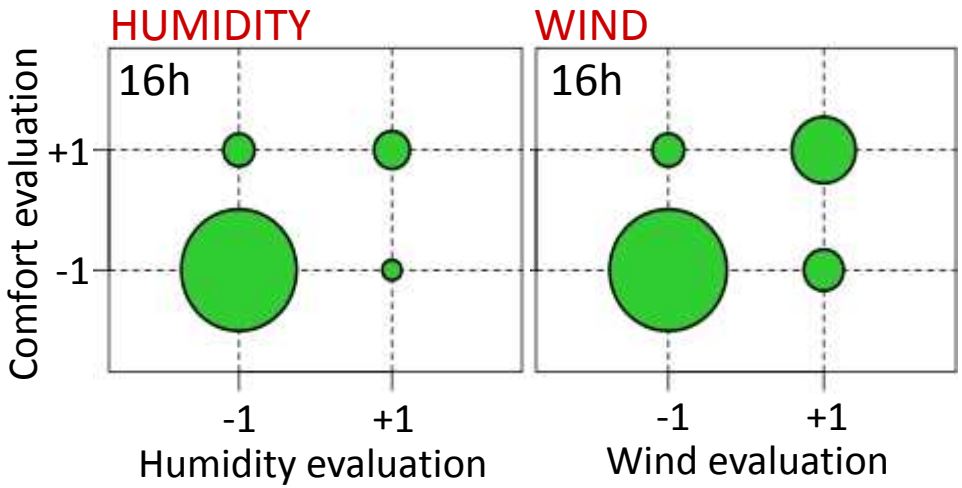
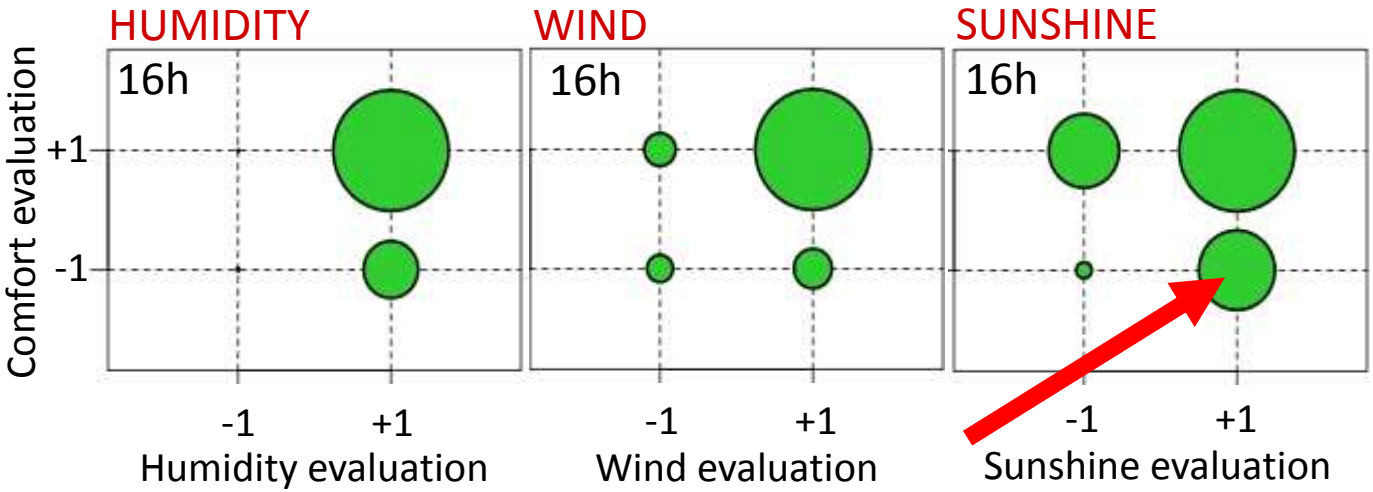


Summer

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