IMPACT OF THE WEATHER DATA ON THE PERFORMANCE OF PASSIVE HOUSES : AN APPLICATION OF A GLOBAL SENSITIVITY ANALYSIS WITH TIME-DEPENDENT INPUTS

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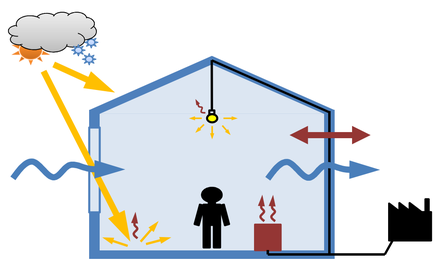
CONTEXT

- A need to **decrease the energy** consumption of the building sector

→ Represents 40 % of the European final energy demand

- Development of **bioclimatic building**

→ Optimising environmental resources potentials



- Use of **building performance simulation** for the design process

→ Complex models, many uncertain inputs

- Transparency, **confidence** on the results ?

→ Global Sensitivity Analysis

EVALUATION OF THE IMPACT OF 6 WEATHER DATA VARIABLES ON A PASSIVE HOUSE PERFORMANCE

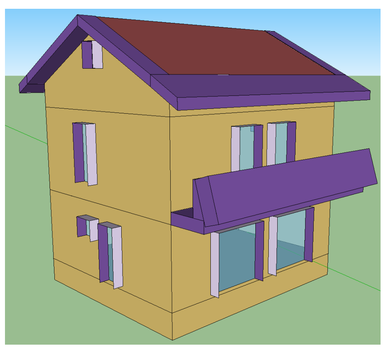
→ Outdoor temperature, relative humidity, direct and diffuse solar radiation , wind velocity and direction

CASE STUDY

Experimental House (hundreds of sensors)

A passive house in a continental climate

- Maximise solar gains in winter
- Minimize solar gain in summer
- High insulation (double wall, low infiltration rate)



Building energy model

Dynamic thermal simulation with EnergyPlus

Envelope behaviour

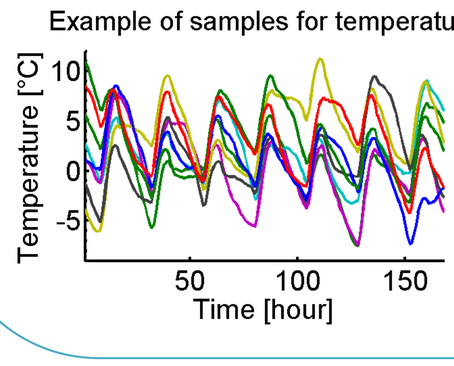
- 2 thermal heated zones
- Ideal heating
- No occupant
- Run period: **January**

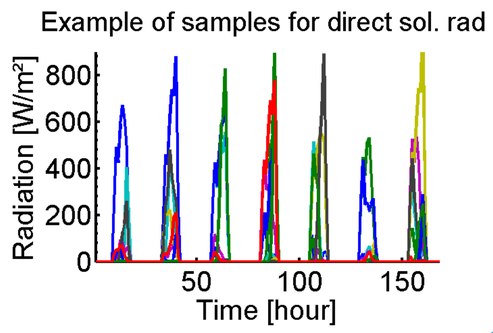
→ Empirical validation (Spitz et al.,2013, En. Build.)

METHOD: Dual correlation management

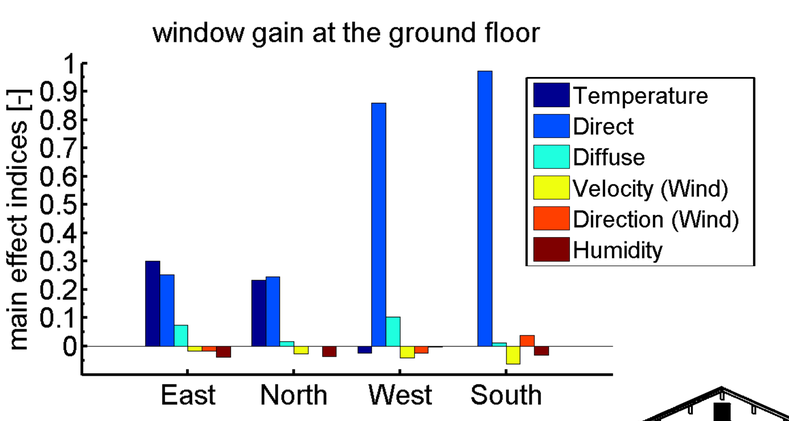
Autocorrelation	Cross correlation
Sobol by group: each variable is a group (Sobol et al., 2007, Rel. En. & Syst. Saf.)	Sampling based method (conserves the correlation in the mean)

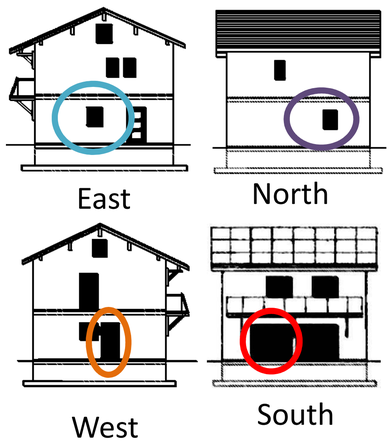
→2 samples of 1000 scenarios of January generated from Typical Meteorological Year (TMY) file

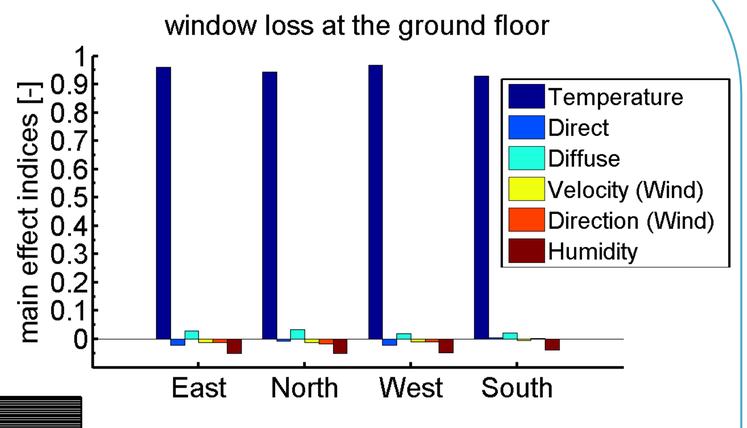




RESULTS : Indirect validation by windows gains and losses



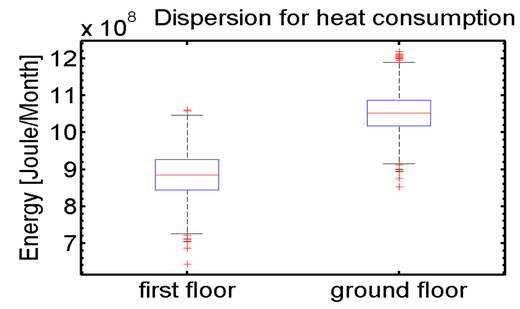




Coherent result

- Gain: solar radiation most influential
- Loss: only temperature is relevant
- Coherence of the building response regarding its orientation

RESULTS: More complex output Impact on consumption



Significant impact of solar gain for consumption in winter: ≈ 50 %

→Good passive design strategies

CONCLUSION AND PROSPECTS

- Satisfactory first results
- Results depend on the case study (building, climate, energy saving strategy) and also on the model : humidity is not relevant because of no coupled transfert in the model
- Development of a help decision tool , ex: shading design

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