

Modeling of mesoscale phenomena using WRF-BEP-BEM-CIM in a complex region

S. Labedens^{1,2}, Dr. D. Mauree¹, Prof. J-L. Scartezzini¹

¹Ecole Polytechnique Fédérale de Lausanne, Solar Energy and Building Physics Laboratory, Station 18, CH-1015, Lausanne, Switzerland

²ISA-BTP, Université de Pau et des Pays de l'Adour, Allée du Parc Montaury 64600 ANGLET France

dasaraden.mauree@epfl.ch; +41 21 693 55 56

Context

Urban planning strategies must be investigated to reduce the building energy consumption and increase the thermal comfort in cities. The evaluation of the impact of **future climate change** on urban planning strategies are needed to help **urban planners and policymakers** face this new challenge particularly in a future where heat waves are going to become common at mid-latitudes.

Objectives

Models currently used have to be robust enough in **complex regions (with lakes and mountains)** to evaluate future planning scenarios.

Simulations are performed over Switzerland at **high resolution** using the Weather Research and Forecast model (**WRF V3.6**).

Climate
change



Urban
Planning



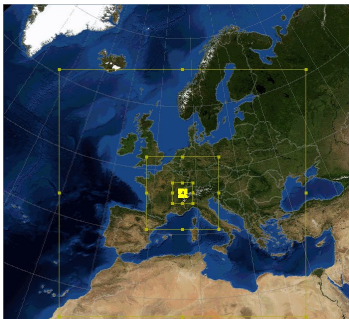
Heat
waves



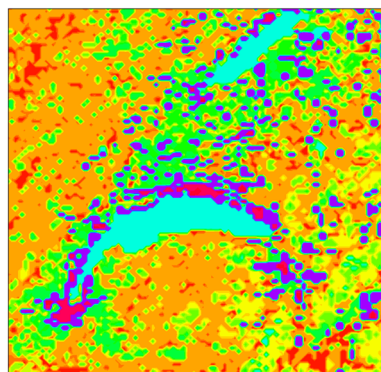
CO₂
emissions



Case study : Lemanic region



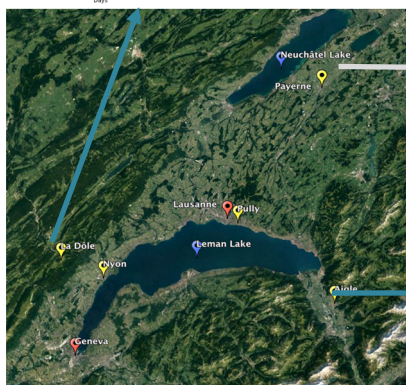
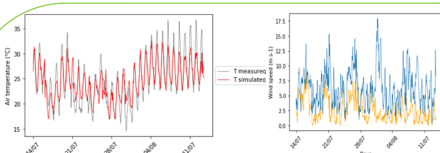
Domains centred over Lemanic region:
4 domains : 45km, 15km, 3km, 1km
Time:
14 July 2003 to 14 August 2003



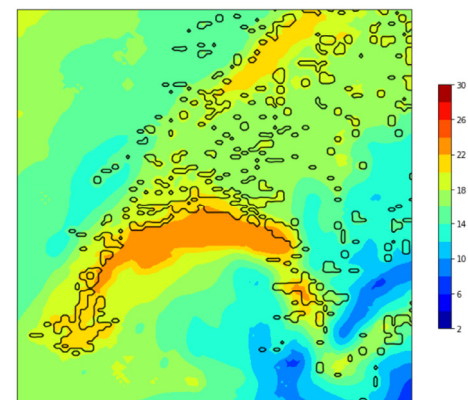
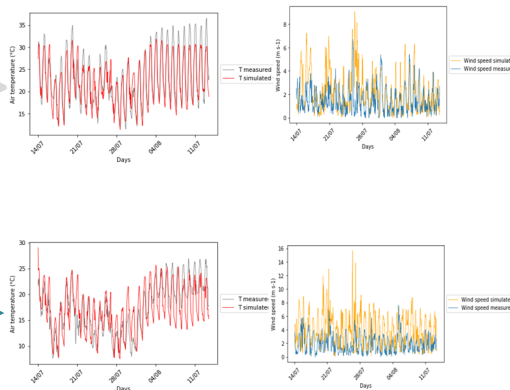
Land use: 33 categories (Global Land Cover - MODIS)

Value	Label
0	Water
1	Evergreen Needleleaf forest
2	Evergreen Broadleaf forest
3	Deciduous Needleleaf forest
4	Deciduous Broadleaf forest
5	Mixed forest
6	Closed shrublands
7	Open shrublands
8	Woody savannas
9	Savannas
10	Grasslands
11	Permanent wetlands
12	Croplands
13	Urban and built-up
14	Cropland/Natural vegetation mosaic
15	Snow and ice
16	Barren or sparsely vegetated

Results



Mountain → Rural



Mean monthly 2m air
temperature (°C) at 05:00

Discussions

- Model performs well over rural areas ($r^2=0.81$, $\sigma = 0.1$)
- Accumulation of heat over the lake during summer nights
- Significant deviation for mountainous regions ($r^2=0.56$, $\sigma = 0.5$)

Conclusions / Perspectives

- Improve the representation of the surface in atmospheric model
- Canopy Interface Model (Mauree et al., 2018) can be used
- Decrease overestimation of the wind in urban areas and increases air temperature.

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