

# **Running of stand-alone town energy balance experiment**

**SURFEX-TEB group**

**Teacher:**

**Laura Rontu**

**Assistant:**

**Andres Luhamaa**

**Students:**

**Inna Khomenko**

**Alina Semergei-Chumachenko**

**Achim Drebs**

**Evgeny Kadantsev**

**MUSCATEN Summer school 2011 OSENU, Odessa, 3-9 July 2011**

# **Steps of a TEB experiment**

**Install the SURFEX export code**

**Prepare the atmospheric forcing**

**Prepare the town description**

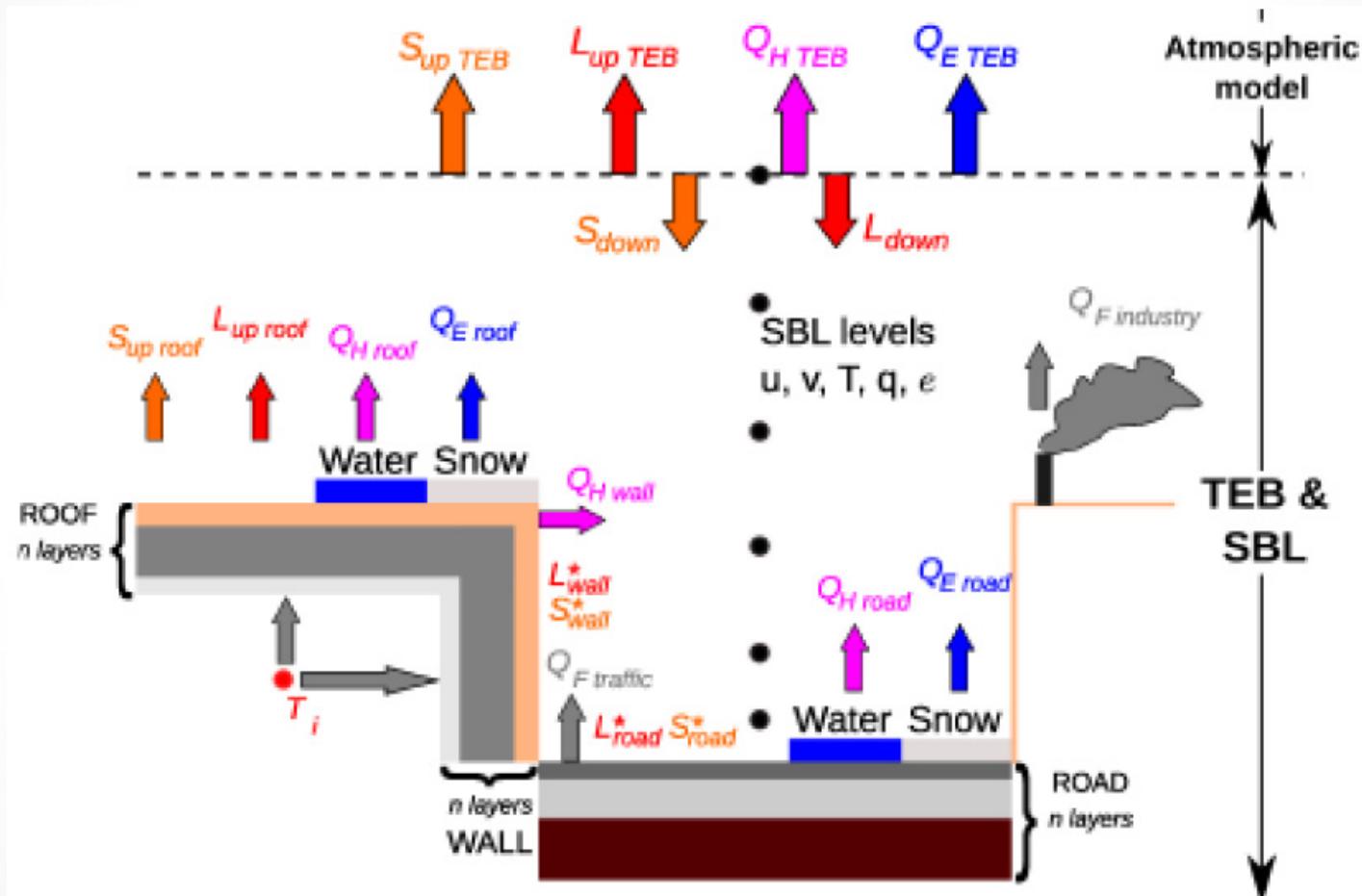
**Prepare the initial values of predicted variables**

**Run the experiments**

**Prepare the output for GrADS**

**Draw and analyze the results**

# SURFEX-TEB model



Source: [www.cnrm.meteo.fr/vurca/IMG/pdf/teb\\_surfex\\_overview.pdf](http://www.cnrm.meteo.fr/vurca/IMG/pdf/teb_surfex_overview.pdf)

# SURFEX input and output

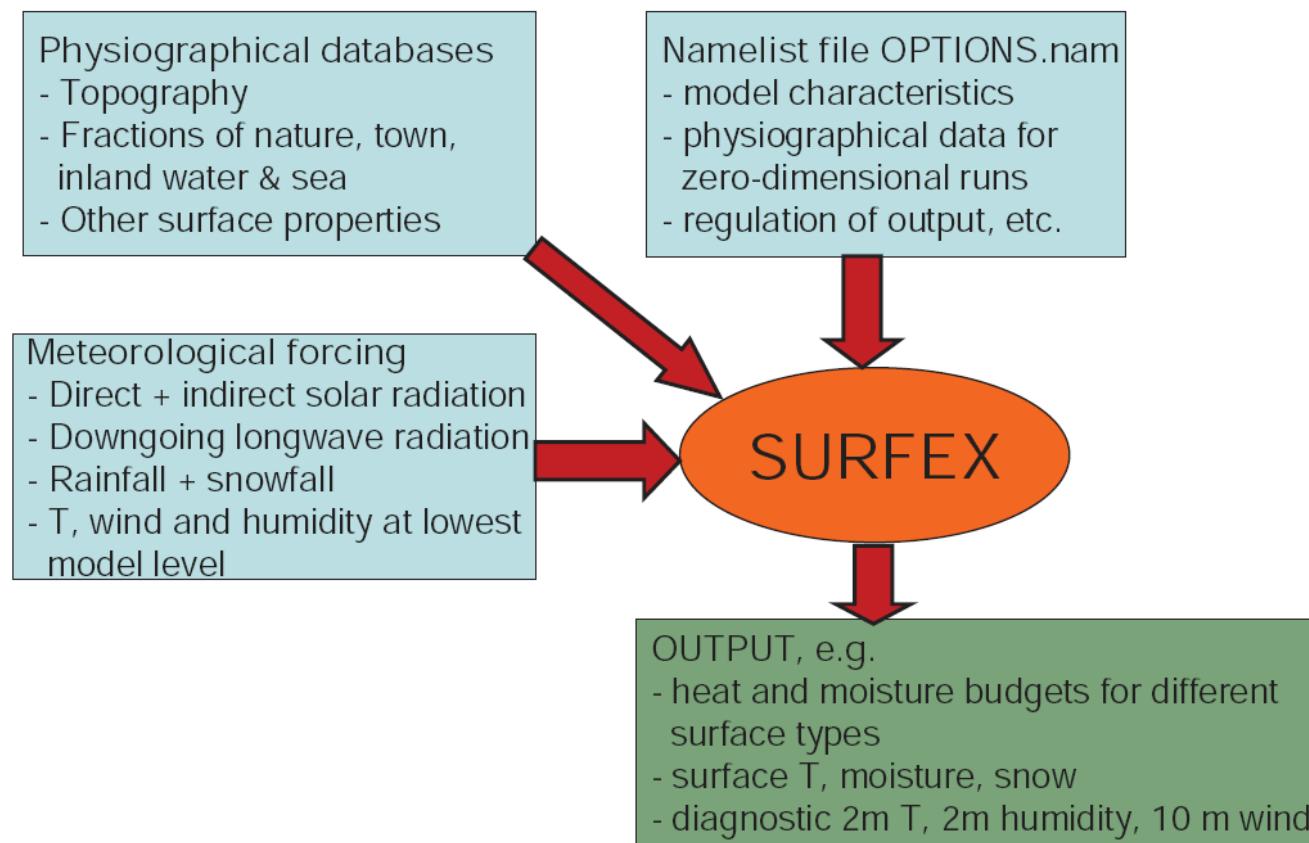


Diagram by Jouni Räisänen (University of Helsinki)

# Town parameterization

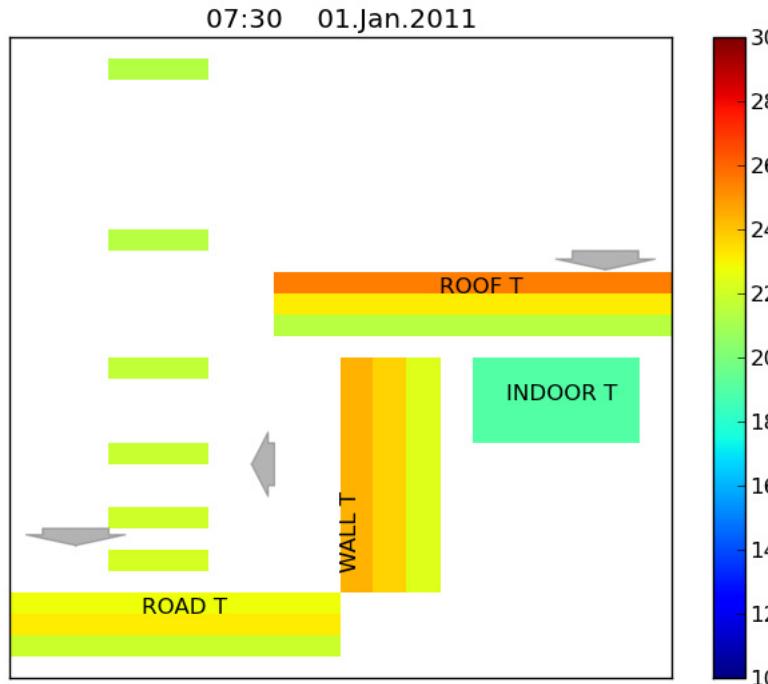
Properties:

- urban/vegetation ratio;
  - buildings/roads ratio;
  - road, wall, roof layers;
  - building height;
  - domestic heating and cooling;
  - traffic regime;
- etc.



Odessa satellite photo by Google maps

# Helsinki example

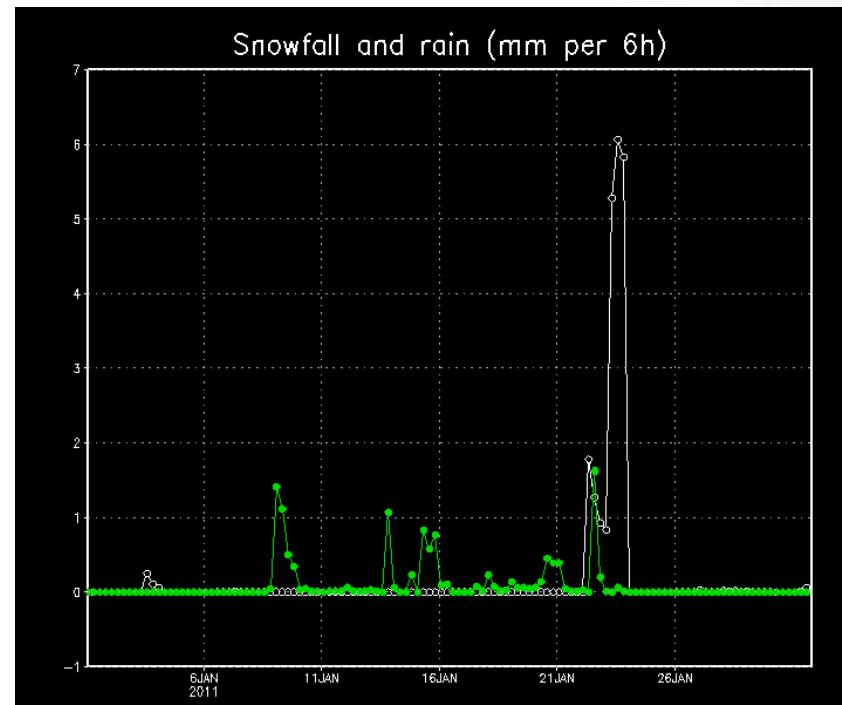


hel\_apt\_may.mpg

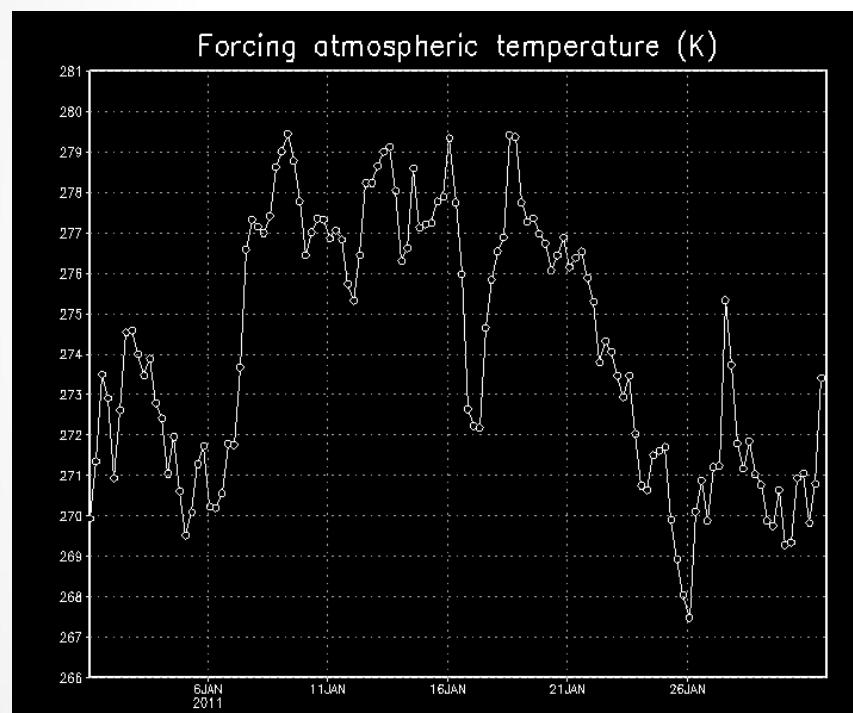
Video by Andres Luhamaa, data by Carl Fortelius and Achim Drebs

# Odessa experiment

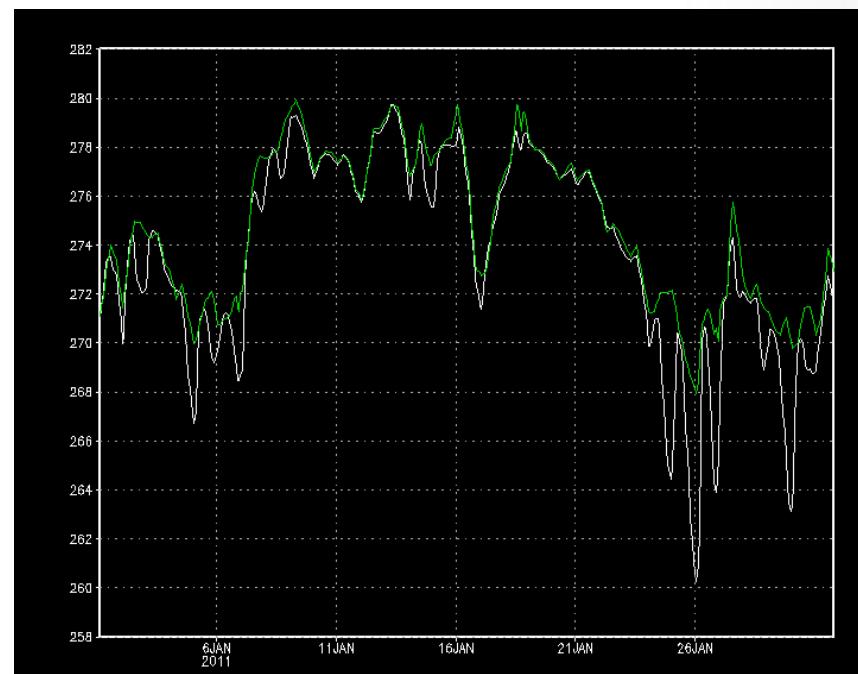
Starting date	01.01.2011
Ending date	31.01.2011
Coordinates	30.73 E 46.47 N
Forcing time step	6 hours
Output time step	1 hour
Buildings/roads ratio	30%/70%
Height of buildings	20 m
Number of layers	3
Domestic heating	19 C



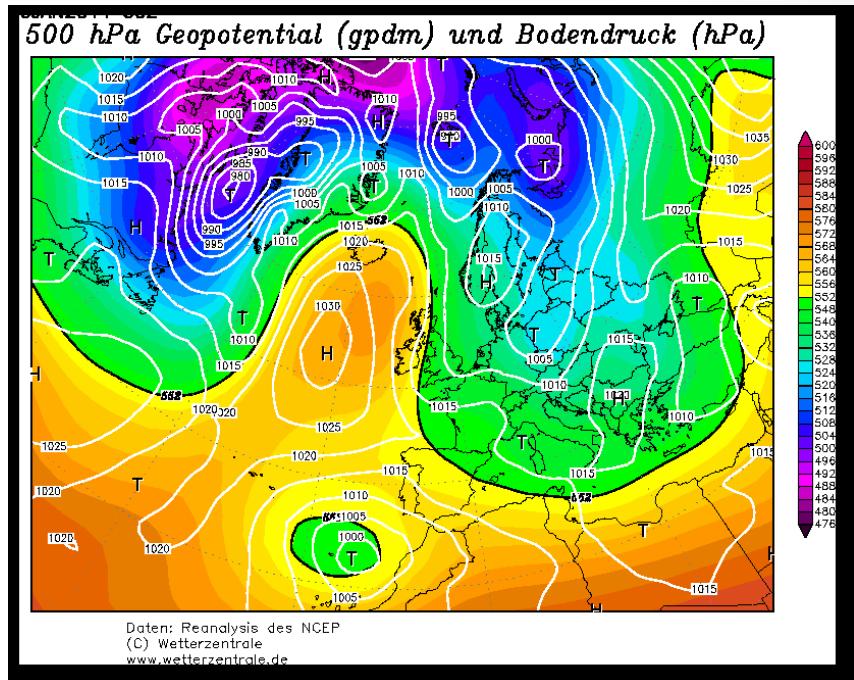
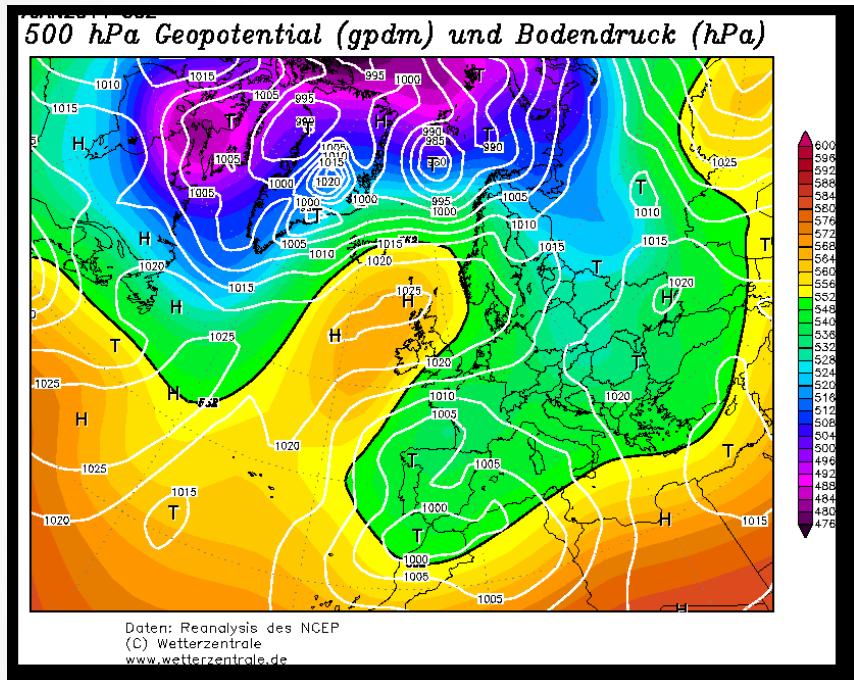
# Odessa experiment



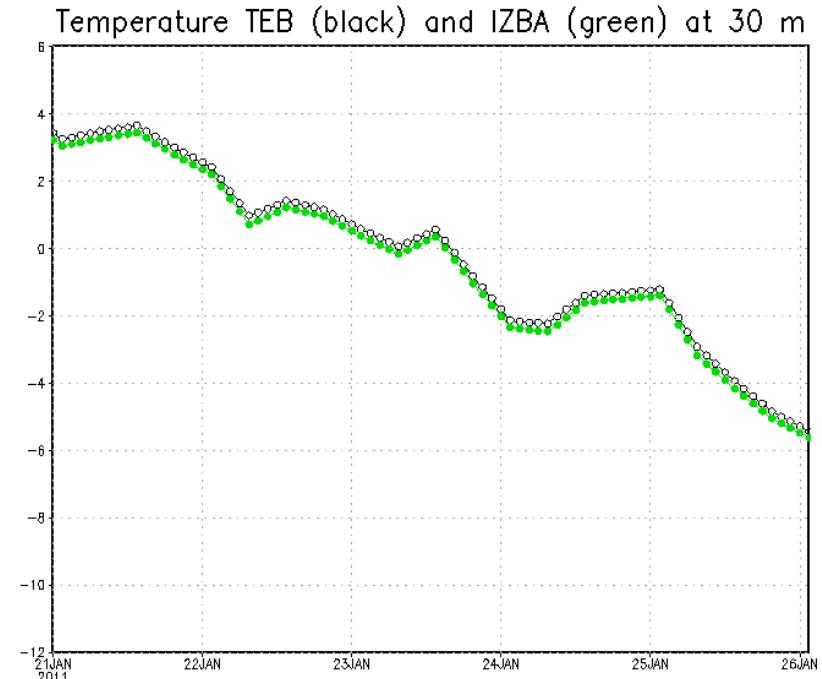
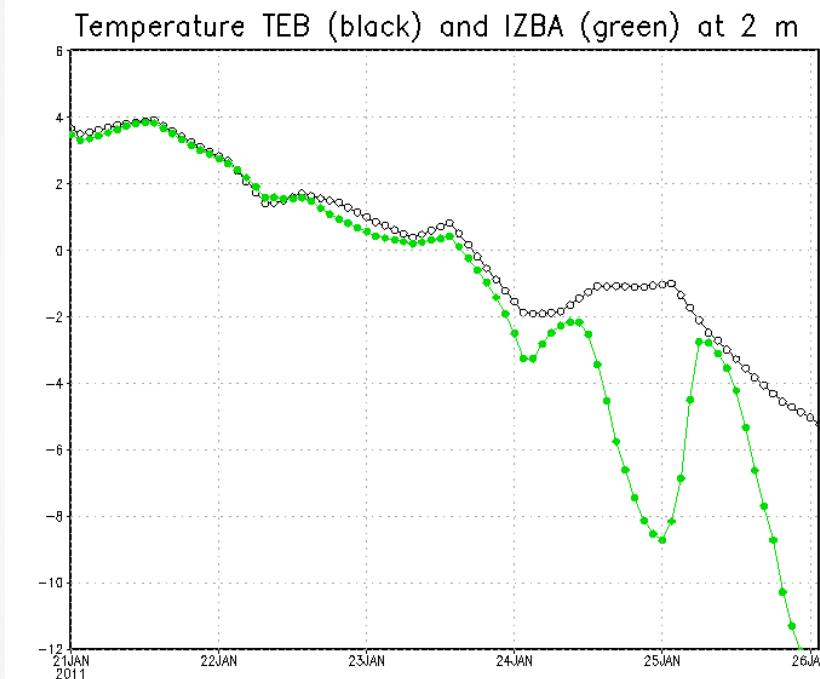
**Town and vegetation (green)  
Temperature by SURFEX**



# Odessa experiment

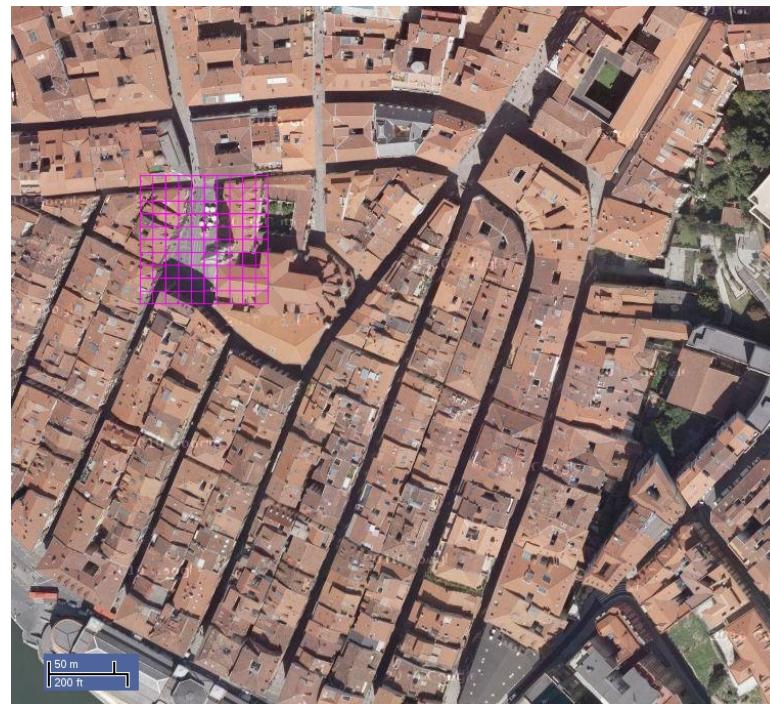


# Odessa experiment

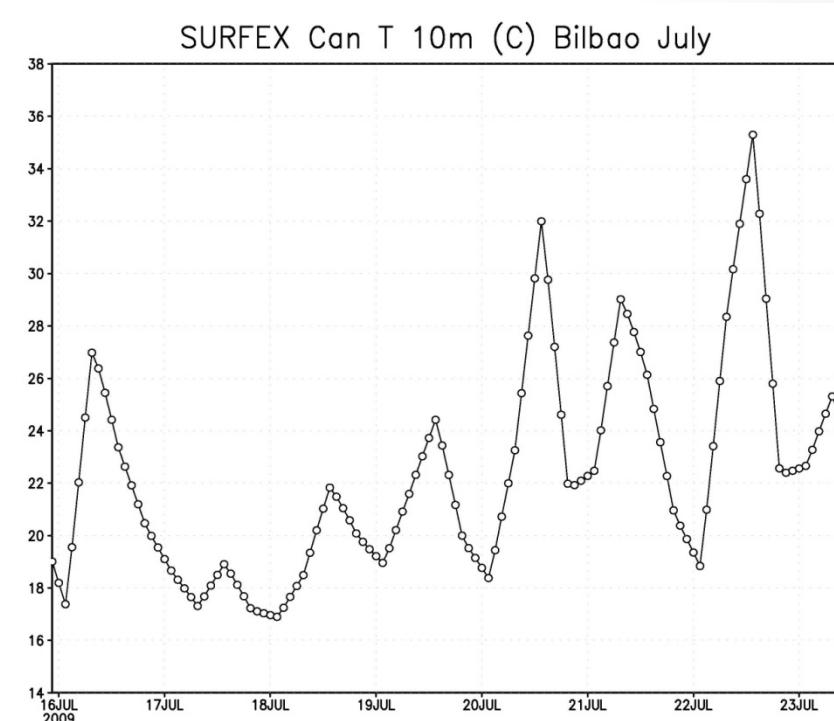
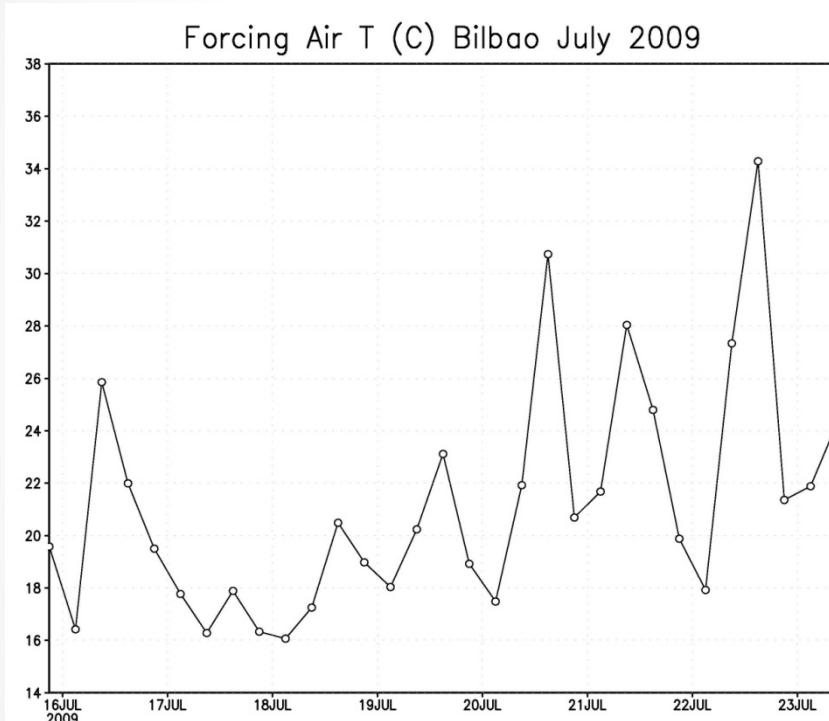


# Bilbao SURFEX - TEB experiment

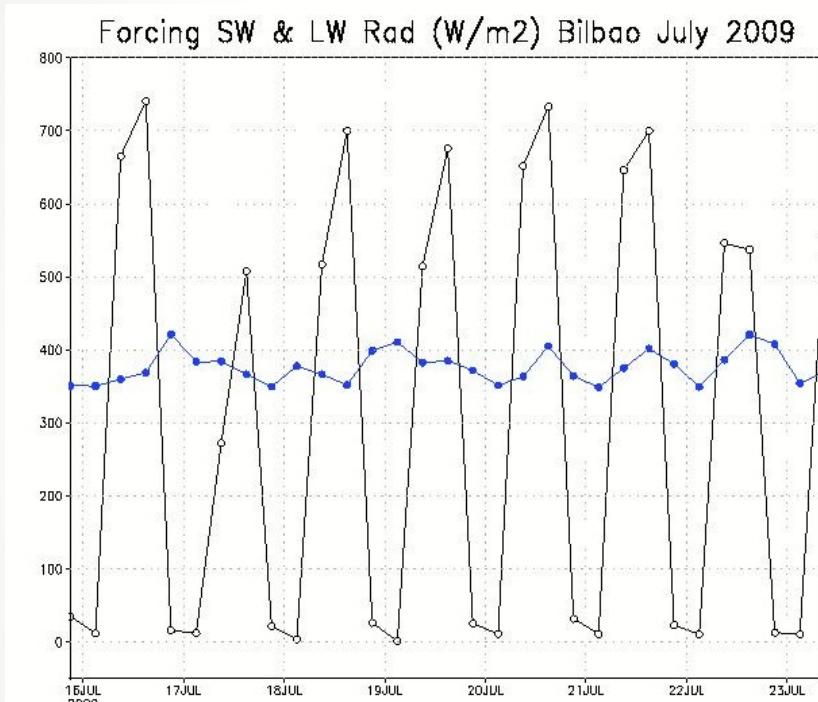
Starting date	01.07.2011
Ending date	31.07.2011
Coordinates	2.96 W 43.28 N
Forcing time step	6 hours
Output time step	1 hour
Buildings/roads ratio	57%/43%
Height of buildings	15.2 m
Number of layers	3
Domestic heating	19 C



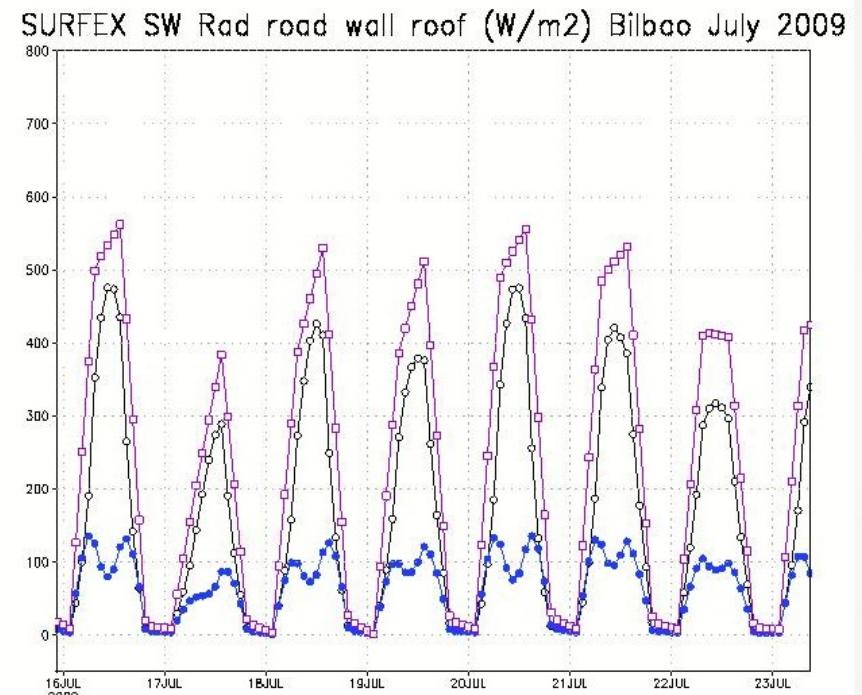
# Forcing and SURFEX Temperature



# Forcing and SURFEX Radiation



black line – direct and indirect solar radiation  
blue line – downgoing longwave radiation



black line – shortwave radiation, road  
blue – walls, purple – roofs

# Extreme experiments

## Max-Extrem values at Bilbao

XUNIF\_Z0\_TOWN = 2.500 ,  
XUNIF\_BLD = 0.850 ,  
XUNIF\_BLD\_HEIGHT = 100.000 ,  
XUNIF\_WALL\_O\_HOR = 2.300 ,  
XUNIF\_H\_TRAFFIC = 15.000 ,

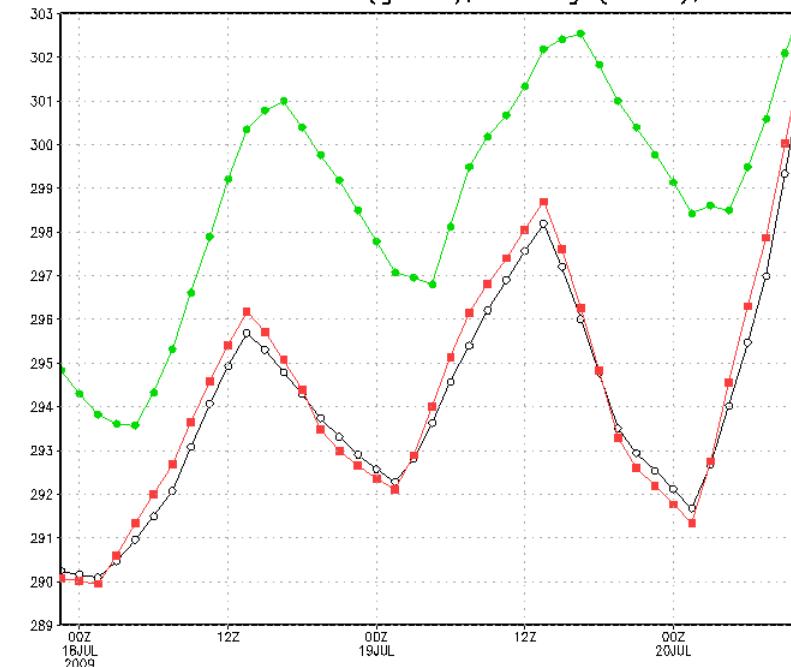
## Normal values at Bilbao

XUNIF\_Z0\_TOWN = 1.240 ,  
XUNIF\_BLD = 0.572 ,  
XUNIF\_BLD\_HEIGHT = 15.200 ,  
XUNIF\_WALL\_O\_HOR = 0.577 ,  
XUNIF\_H\_TRAFFIC = 4.400 ,

## Min values at Bilbao

XUNIF\_Z0\_TOWN = 0.800 ,  
XUNIF\_BLD = 0.572 ,  
XUNIF\_BLD\_HEIGHT = 9.000 ,  
XUNIF\_WALL\_O\_HOR = 0.360 ,  
XUNIF\_H\_TRAFFIC = 2.000 ,

Bilbao T2m extreme tmb (green), average(black), isba (red)



# What was learned?

- How to install SURFEX and run experiments
- How to prepare town definitions parameters
- Understood the role of atmospheric forcing
- How to use graphical analysis tools for results
- Obtained SURFEX software for further application and development

# Thank you for attention!

