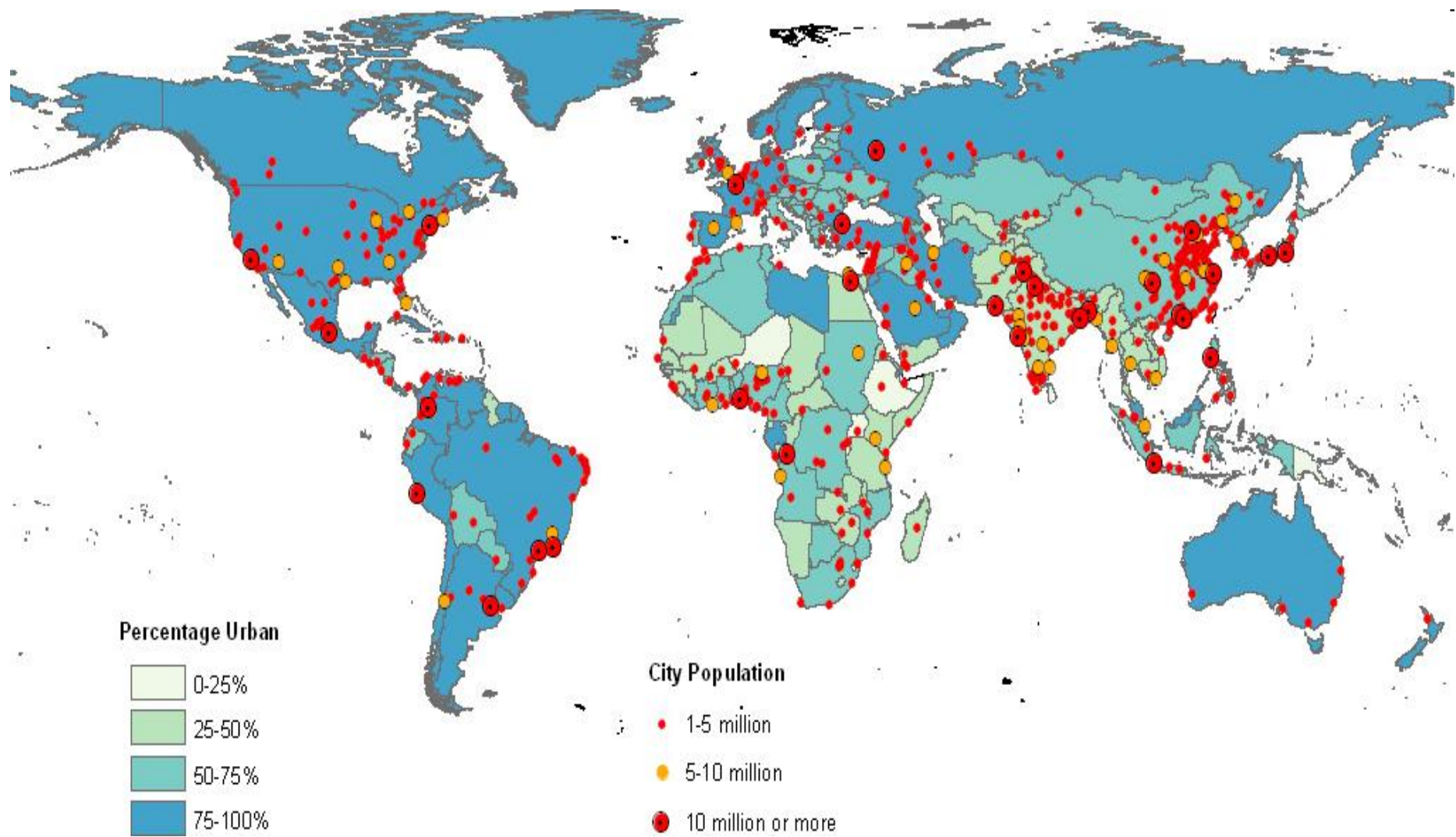


Comfort urbano e modellistica numerica

Casi di studio

Teodoro Georgiadis – CNR Istituto Biometeorologia





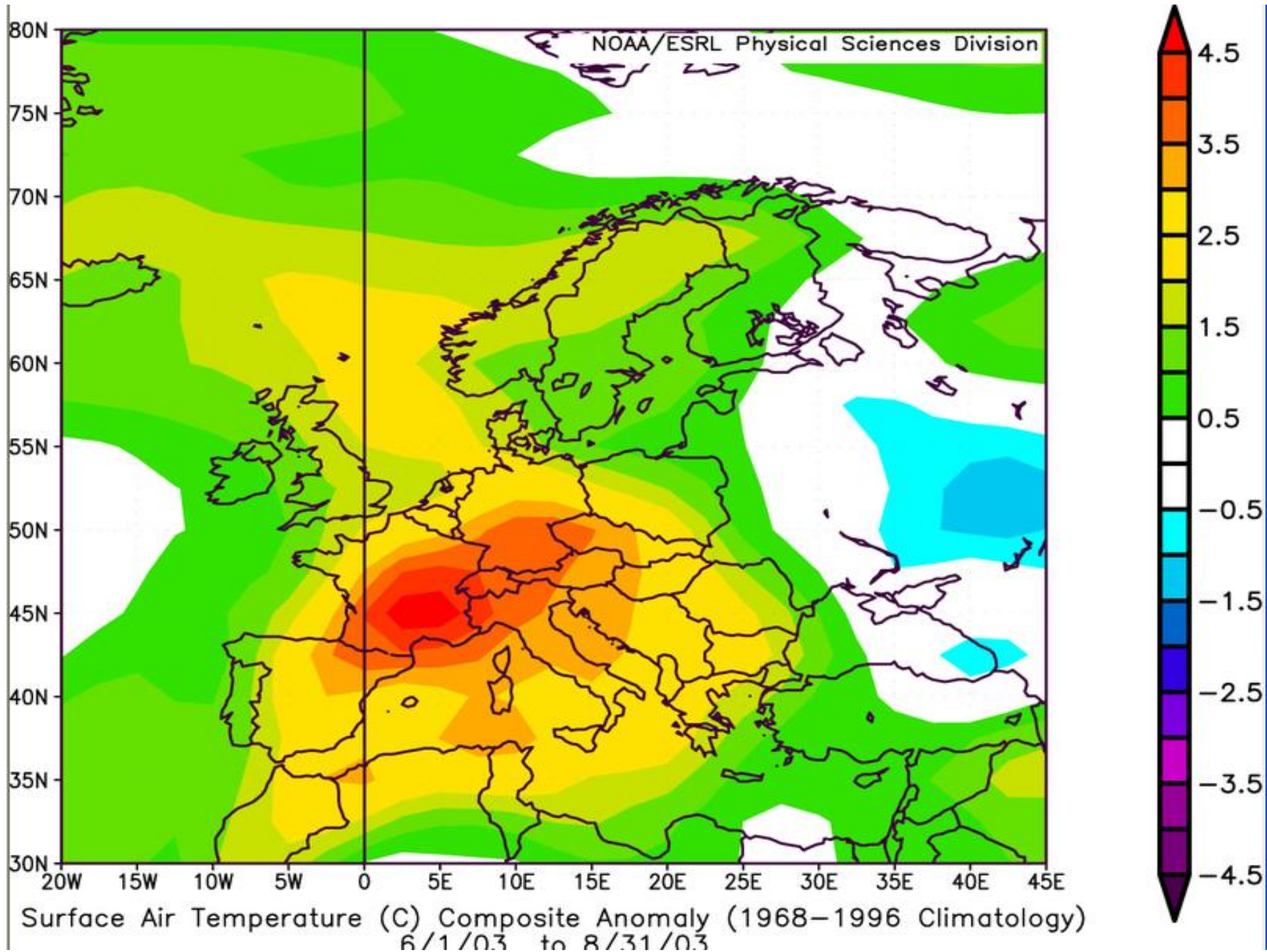


Figure 3a: Typical Daily Summer Rural Energy Balance

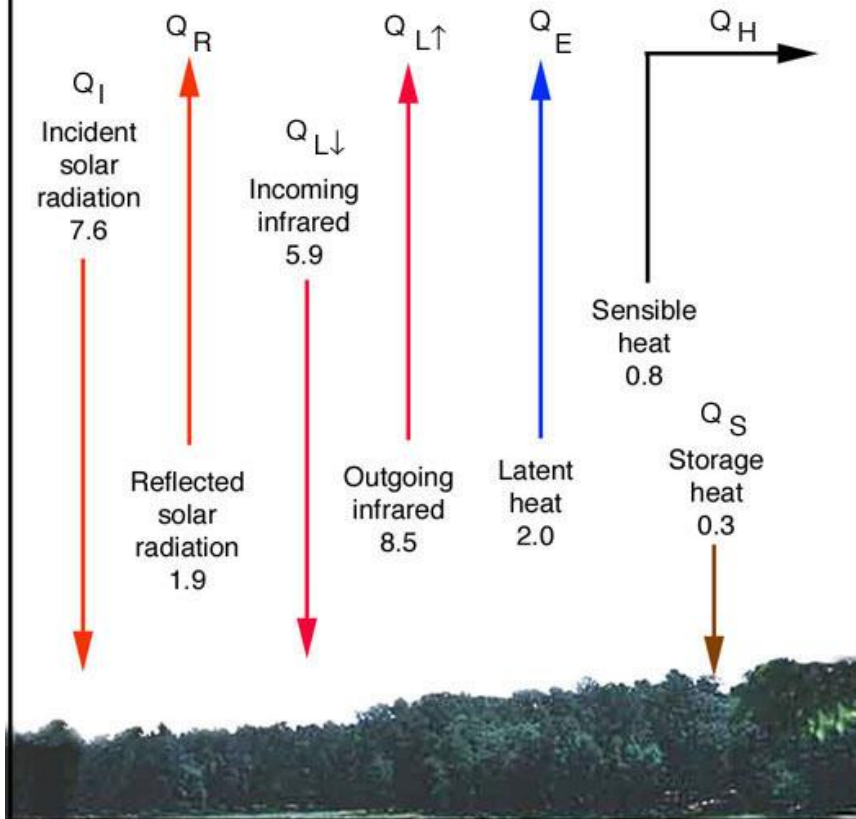
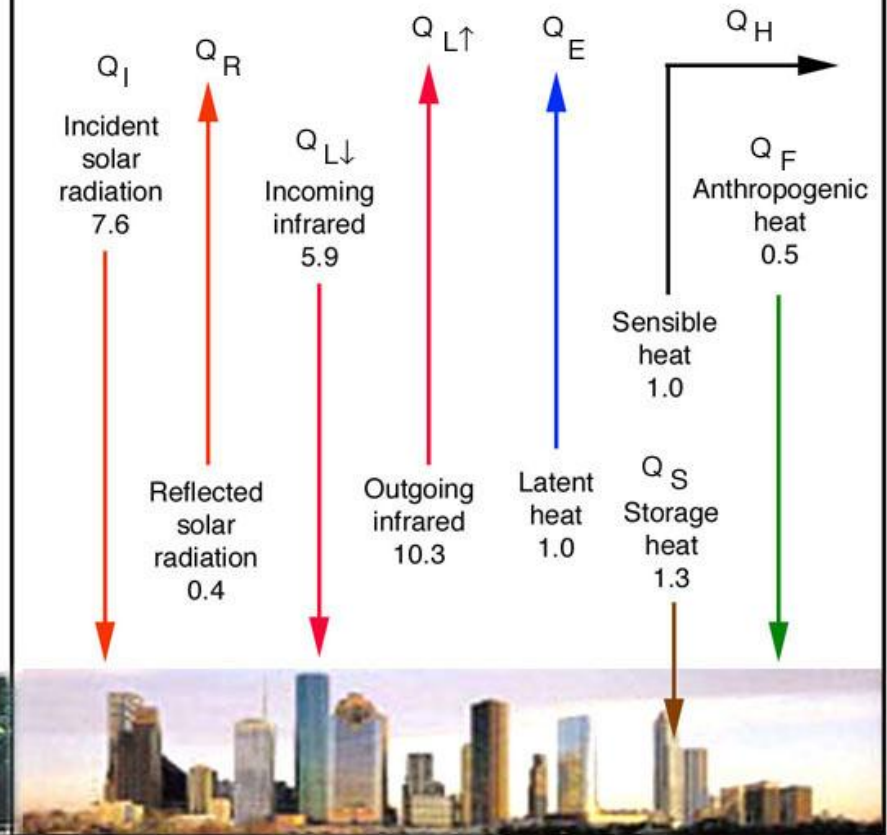


Figure 3b: Typical Daily Summer Urban Energy Balance



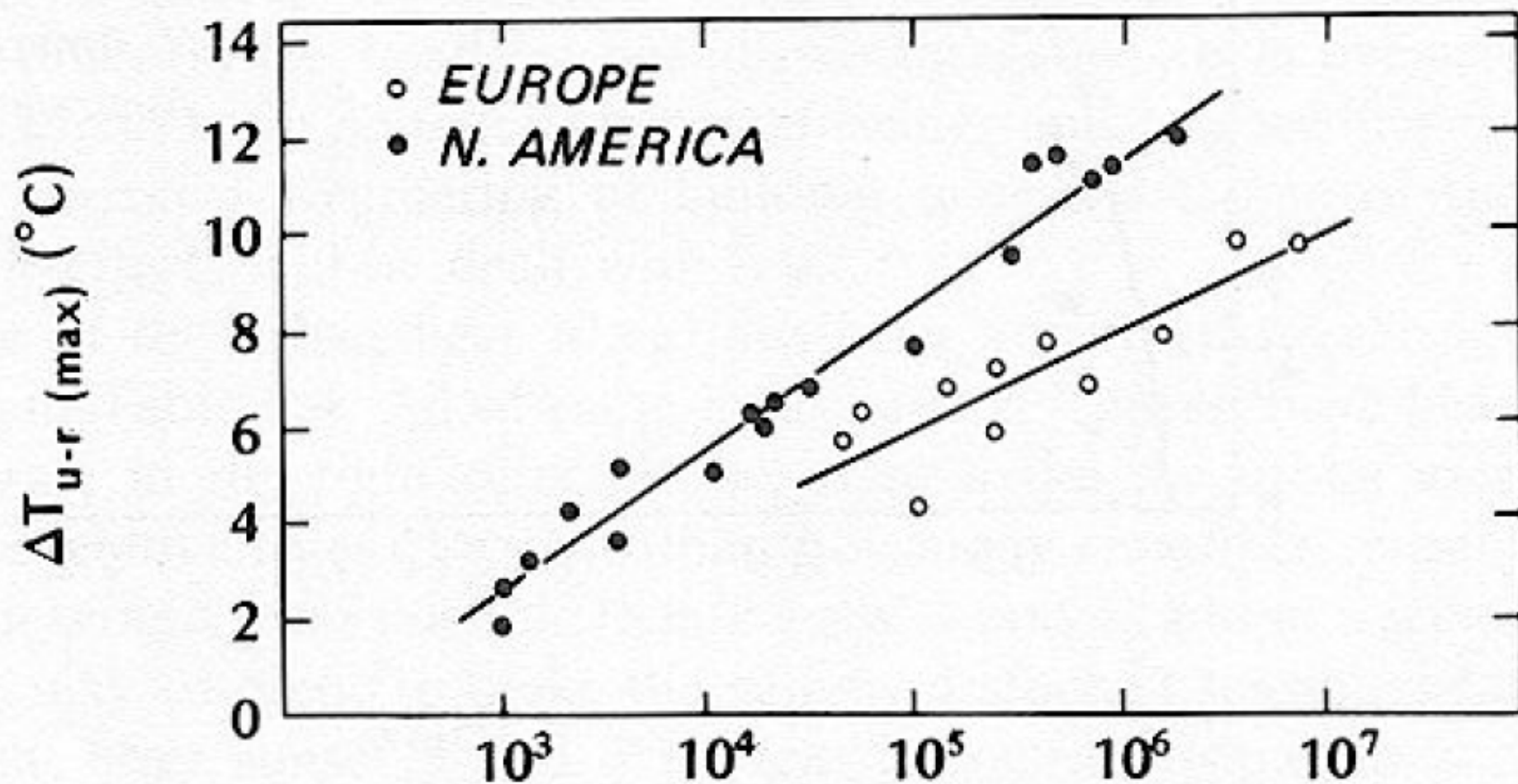
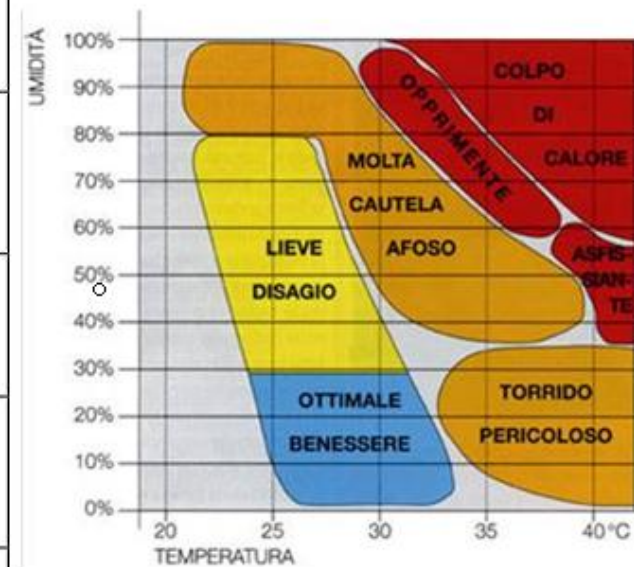
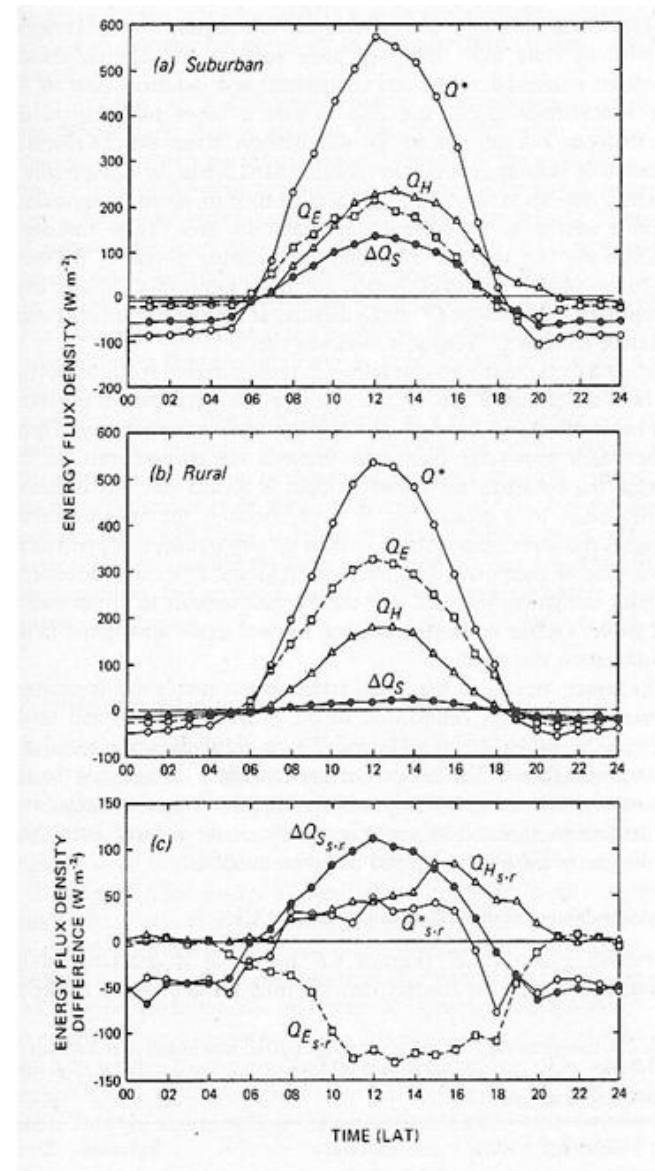
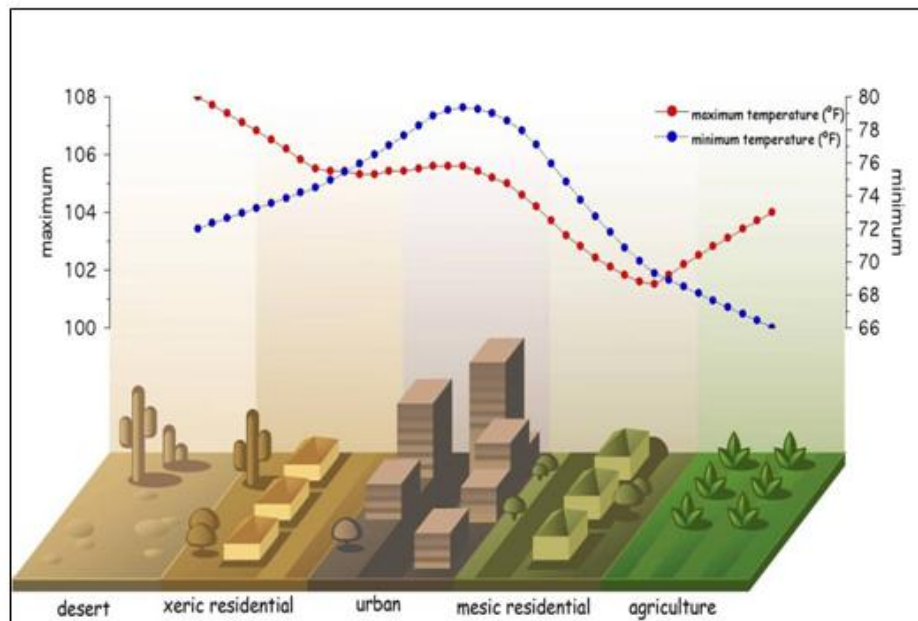
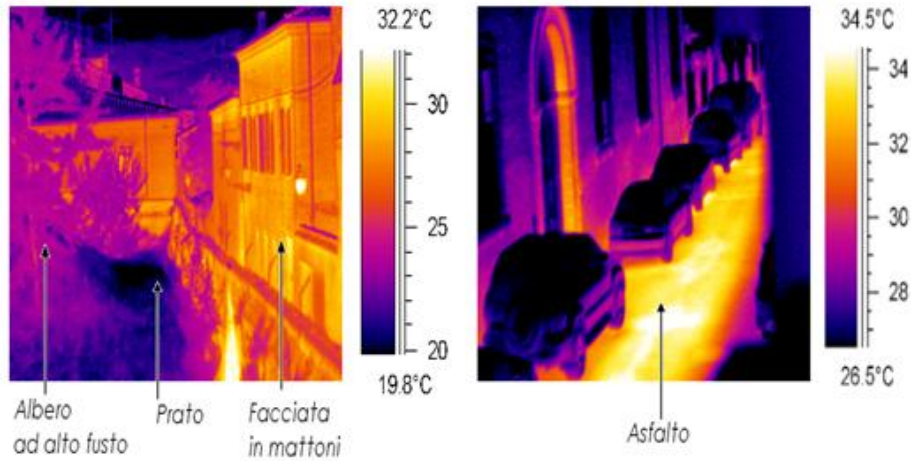


Figure 8.15 Relation between maximum observed heat island intensity ($\Delta T_{u-r(\text{max})}$) and population (P) for North American and European settlements (modified after Oke, 1973).

Urban Climate Zone, UCZ ¹	Image	Roughness class ²	Aspect ratio ³	% Built (impervious) ⁴
1. Intensely developed urban with detached close-set high-rise buildings with cladding, e.g. downtown towers		8	> 2	> 90
2. Intensely developed high density urban with 2-5 storey, attached or very close-set buildings often of brick or stone, e.g. old city core		7	1.0-2.5	> 85
3. Highly developed, medium density urban with row or detached but close-set houses, stores & apartments e.g. urban housing		7	0.5-1.5	70-85
4. Highly developed, low or medium density urban with large low buildings & paved parking, e.g. shopping mall, warehouses		5	0.05-0.2	70-95
5. Medium development, low density suburban with 1 or 2 storey houses, e.g. suburban housing		6	0.2-0.6, up to >1 with trees	35-65
6. Mixed use with large buildings in open landscape, e.g. institutions such as hospital, university, airport		5	0.1-0.5, depends on trees	< 40
7. Semi-rural development, scattered houses in natural or agricultural area, e.g. farms, estates		4	> 0.05, depends on trees	< 10

Key to image symbols: buildings; vegetation; impervious ground; pervious ground





RayMan Pro

File Input Output Table Language ?

Date and time

Date (day.month.year) 21.3.2012
 Day of year 81
 Local time (h:mm) 22:29
 Now and today

Geographic data

Location:
 Ägypten (Kairo)
 Add location Remove location

Geogr. longitude (°E) 31°15'
 Geogr. latitude (°N) 30°3'
 Altitude (m) 95
 Timezone (UTC + h) 2.0

Current data

Air temperature Ta (°C) 20.0
 Vapour pressure VP (hPa) 12.5
 Rel. humidity RH (%) 53.5
 Wind velocity v (m/s) 1.0
 Cloud cover N (octas) 0.0
 Surface temperature Ts (°C)
 Global radiation G (W/m²)
 Mean radiant temp. Tmrt (°C)

Personal data

Height (m) 1.75
 Weight (kg) 75.0
 Age (a) 35

Clothing

Clothing
 Activity (V)
 Position



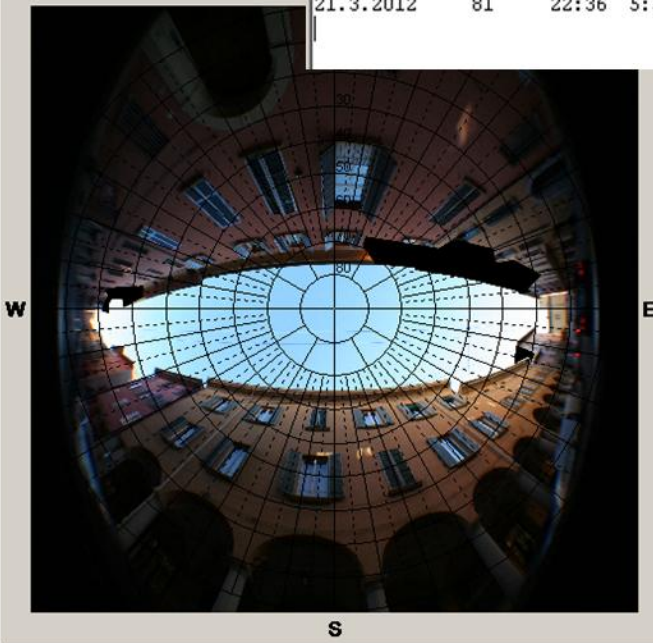
RayMan Pro - Output - Ausgabe

File View

Time: 22:36 Increment (min): 30

RayMan Pro © 1999 - 2009
 Meteorological Institute, University of Freiburg, Germany
 place: Ägypten (Kairo)
 geogr. longitude: 31°15' latitude: 30°3' timezone: UTC +2.0 h
 horizon limitation: 100.0% sky view factor: 0.000

date	day of time	sunr.	sunset	SDmax	SDact	SVF	Gmax	Gact	Sact	Dact
d.m.YYYY	year h:mm	h:mm	h:mm	min	min		W/m²	W/m²	W/m²	W/m²
21.3.2012	81 22:36	5:57	18:08	731	0	0.000	0.0	0.0	0.0	0.0



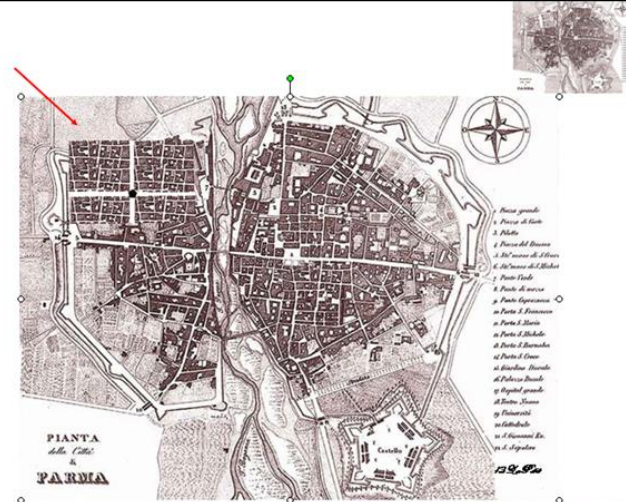
Albedo 0.3
 Emiss. coeff. 0.95

Cut off
 R G B
 [Sliders for R, G, B]
 Cut off

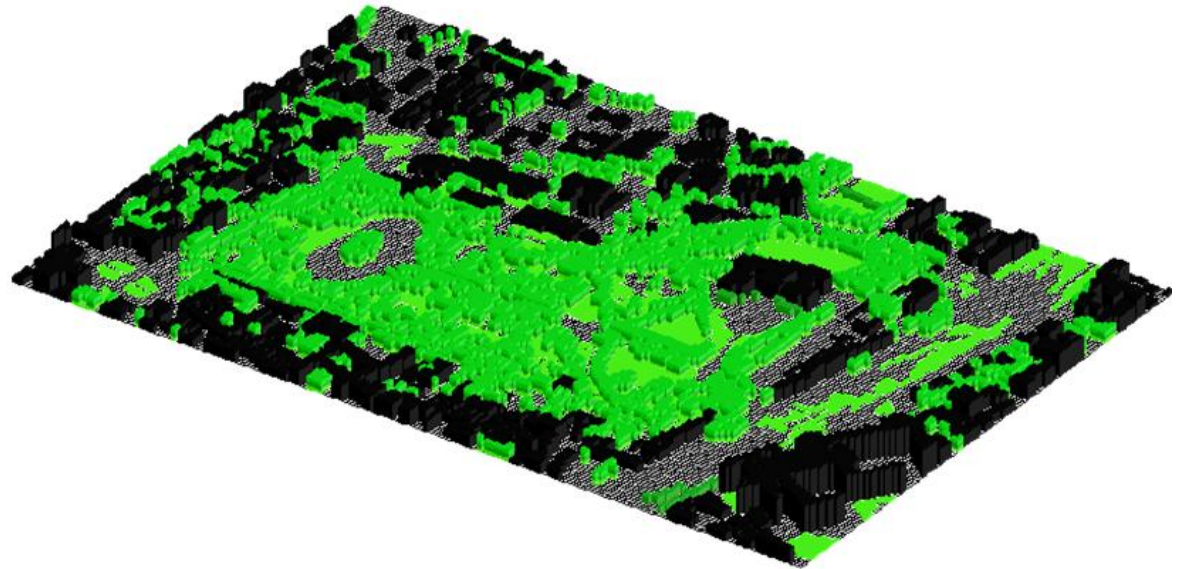
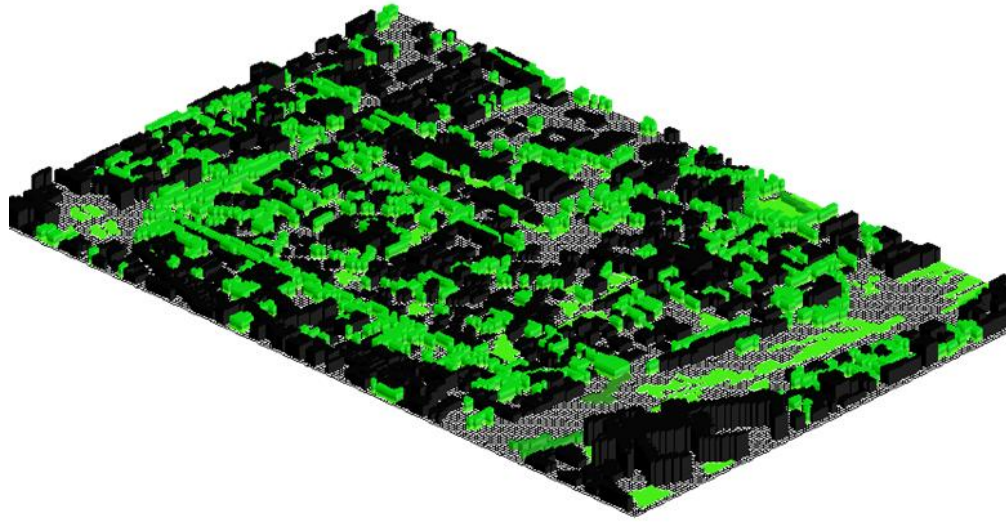
Undo
 Close

SKY-VIEW FACTORS ESTIMATION

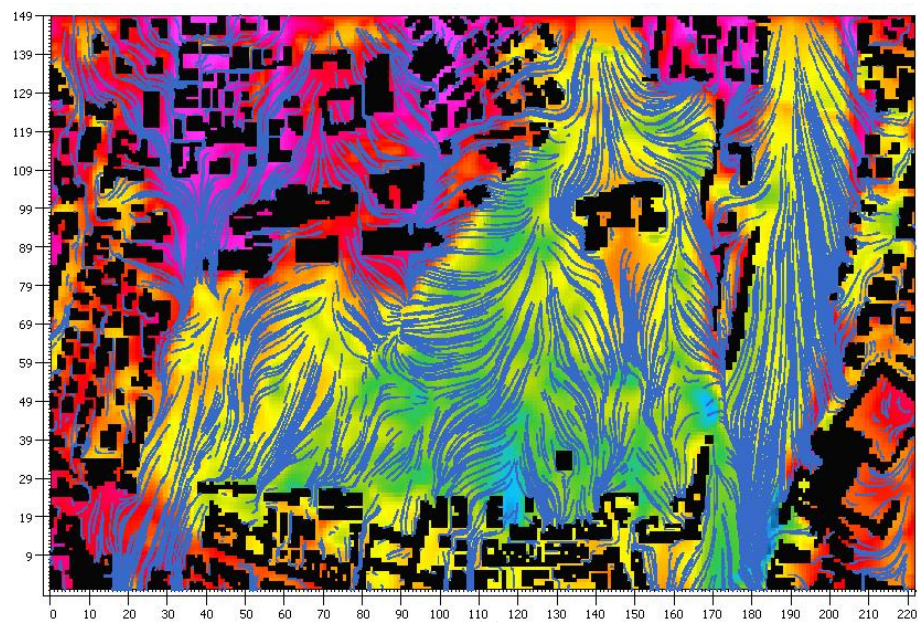
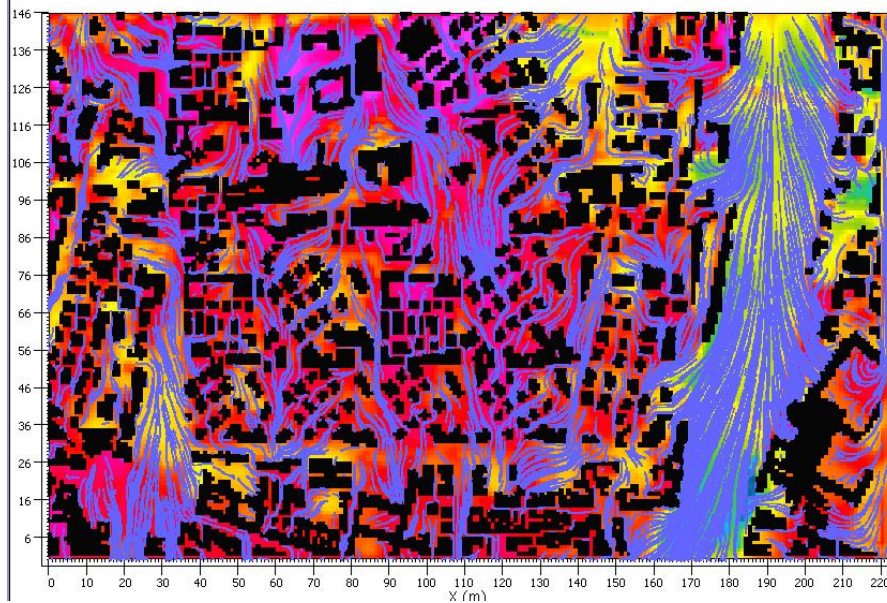
Casi di studio

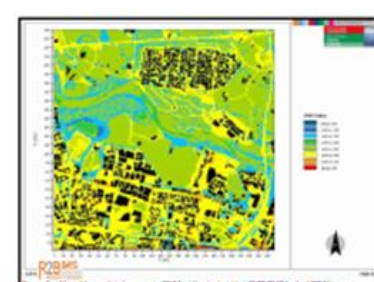
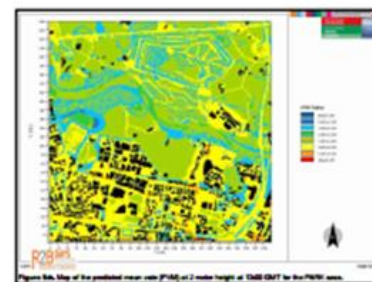
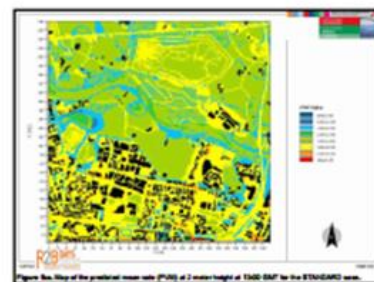
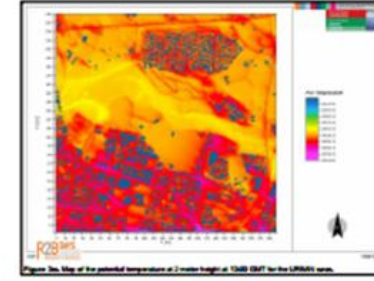
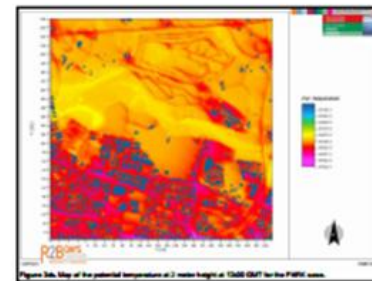
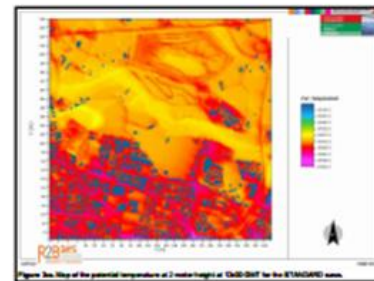


Parco ducale di Parma



TRAIETTORIE



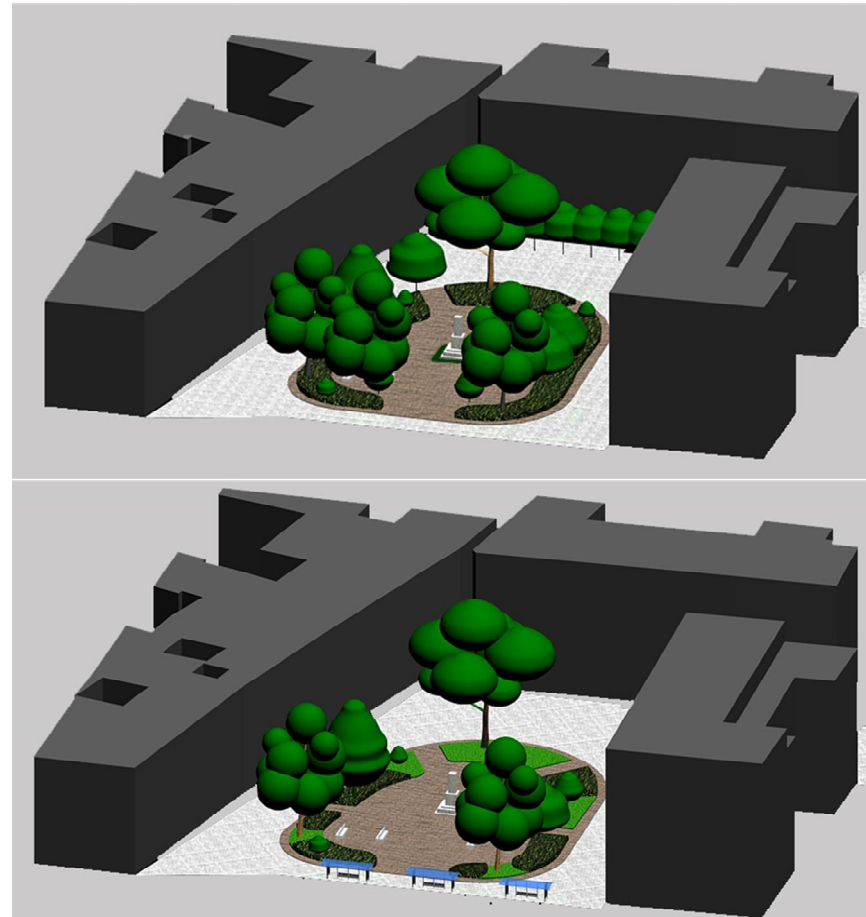
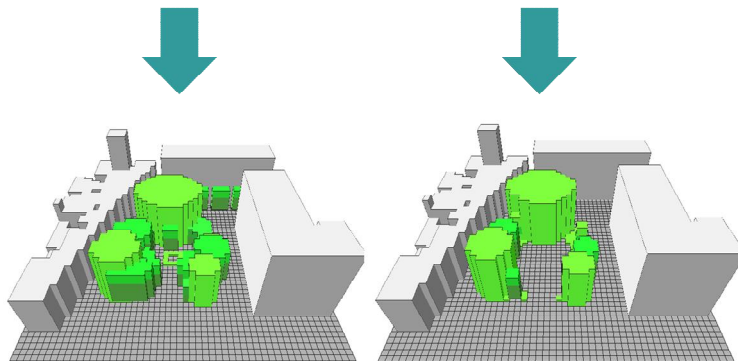
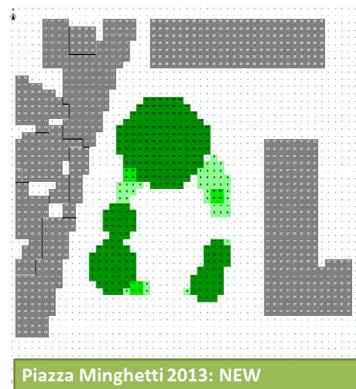
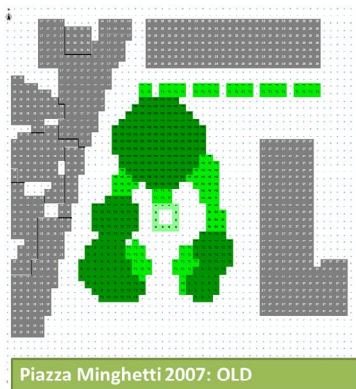


Basse di stura Torino

Talvolta la fisica potrebbe aiutare



PIAZZA MINGHETTI ENVI-Met SIMULATION



Piazza Minghetti 2007

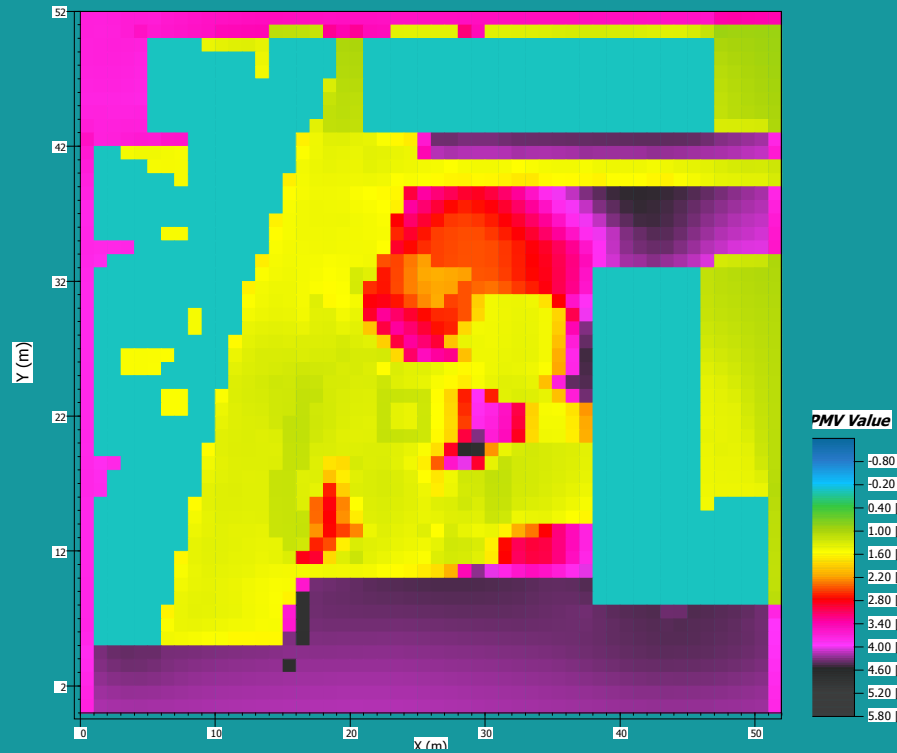
Piazza Minghetti 2013

Regional placement - CNR - IBIMET Bologna *Teodoro Georgiadis, Marianna Nardino*

Impacts of vegetation on the microclimate - modeling the changes in ENVI-met programme

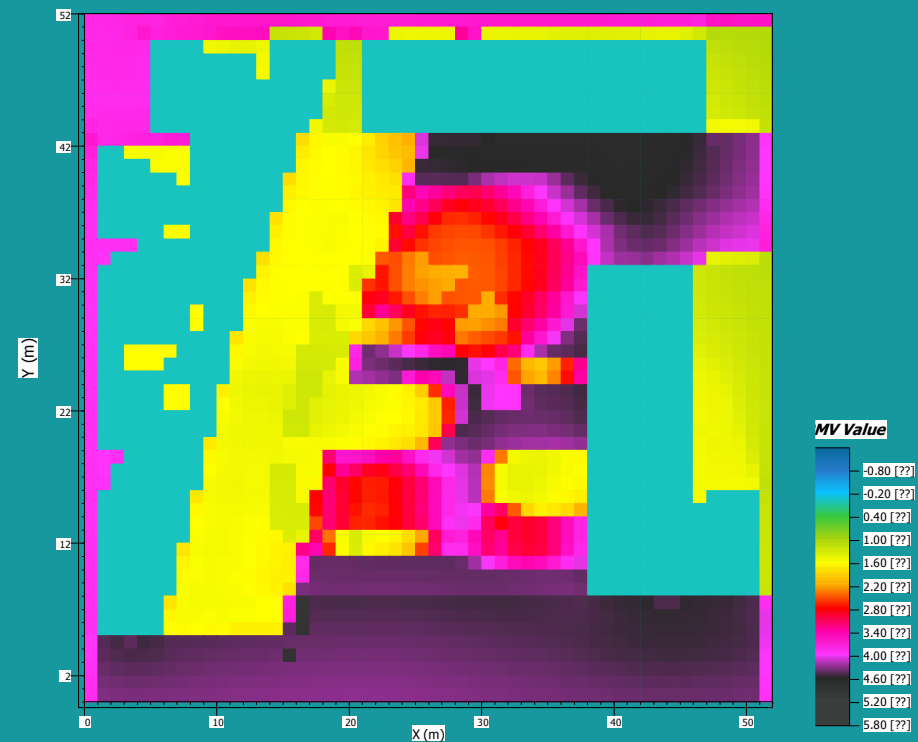
Piazza Minghetti in 2007

16:00

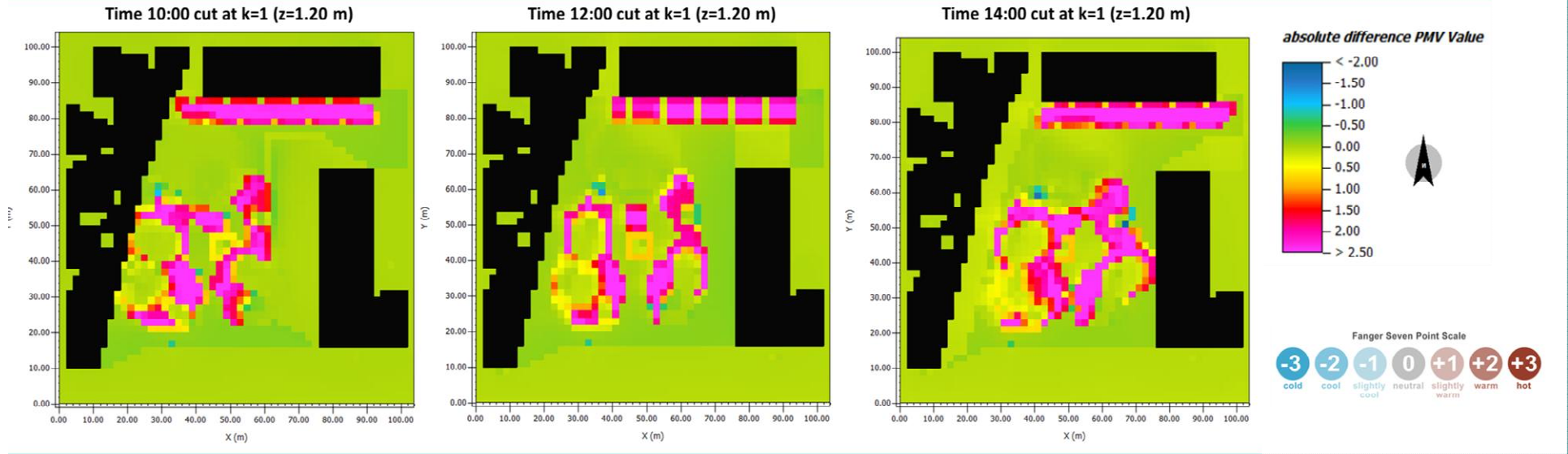
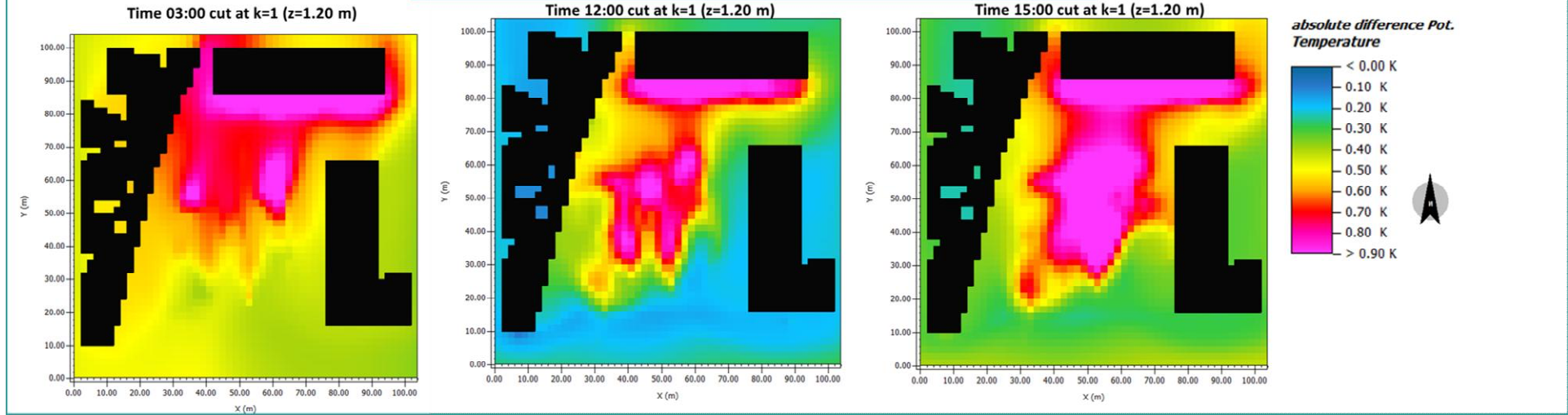


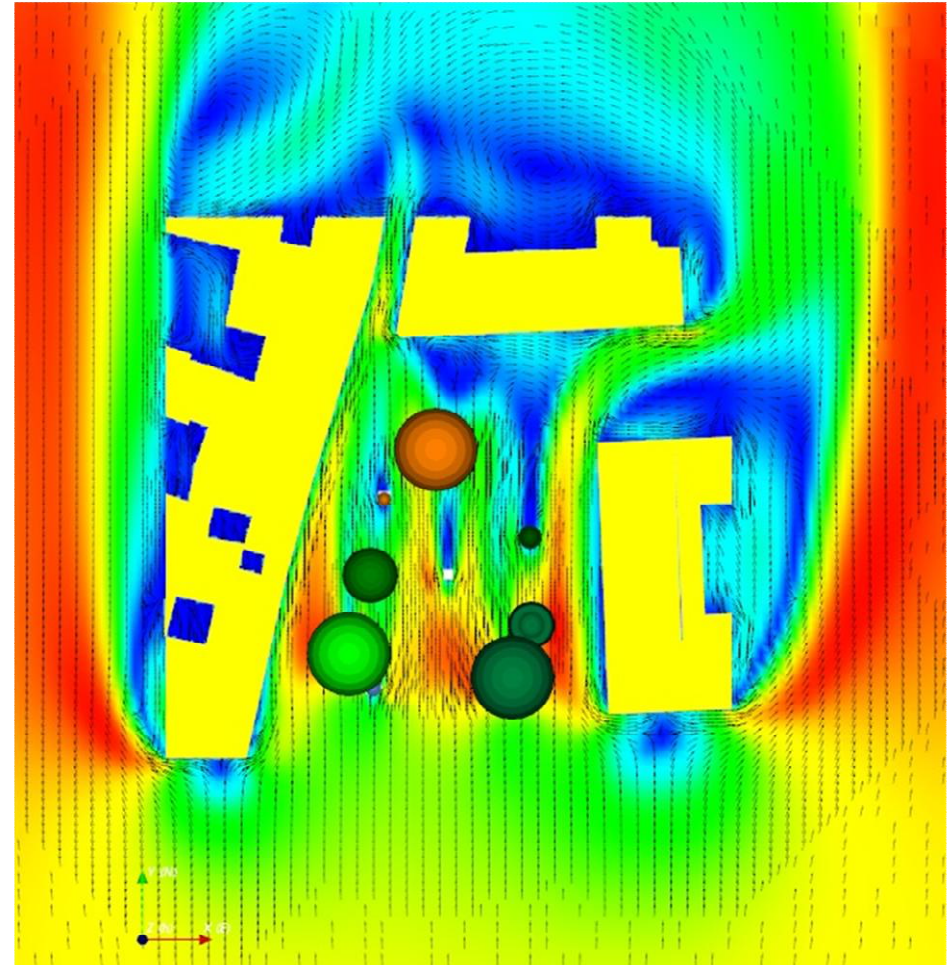
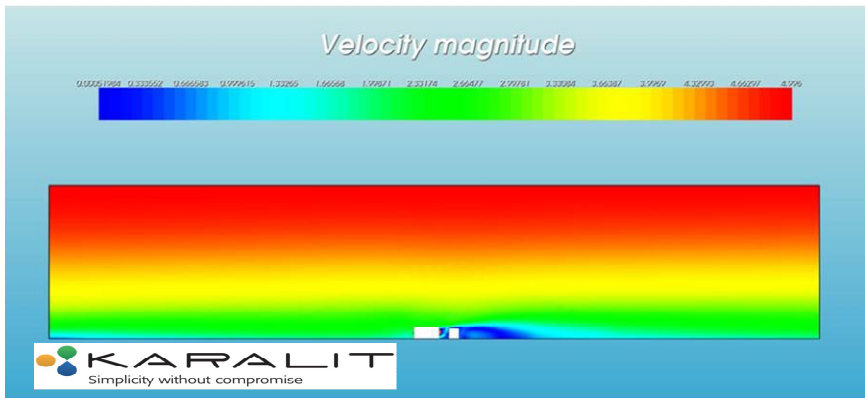
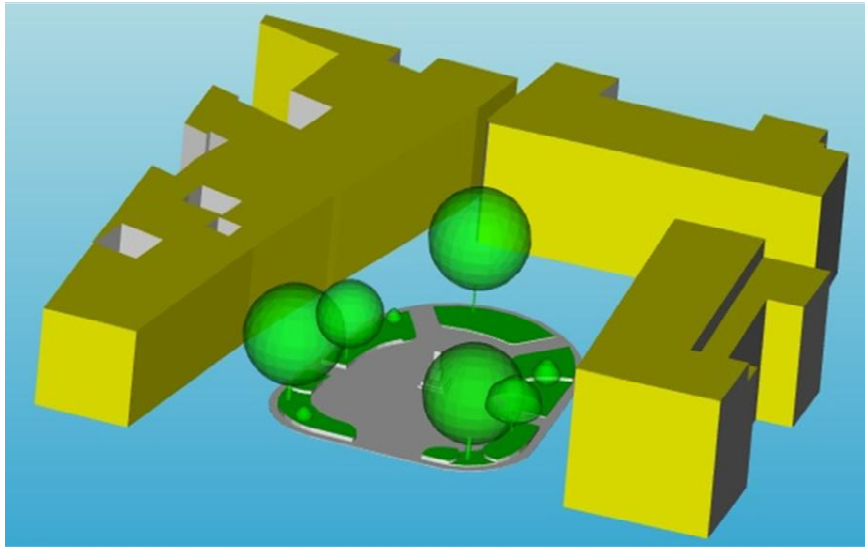
Piazza Minghetti in 2013

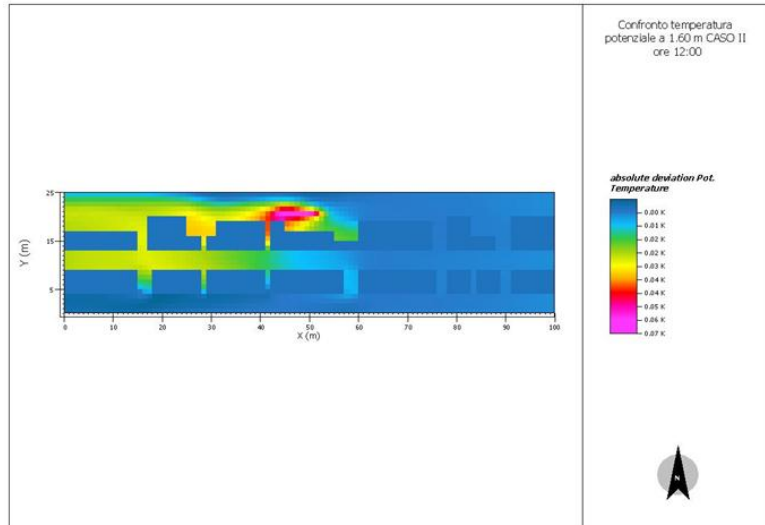
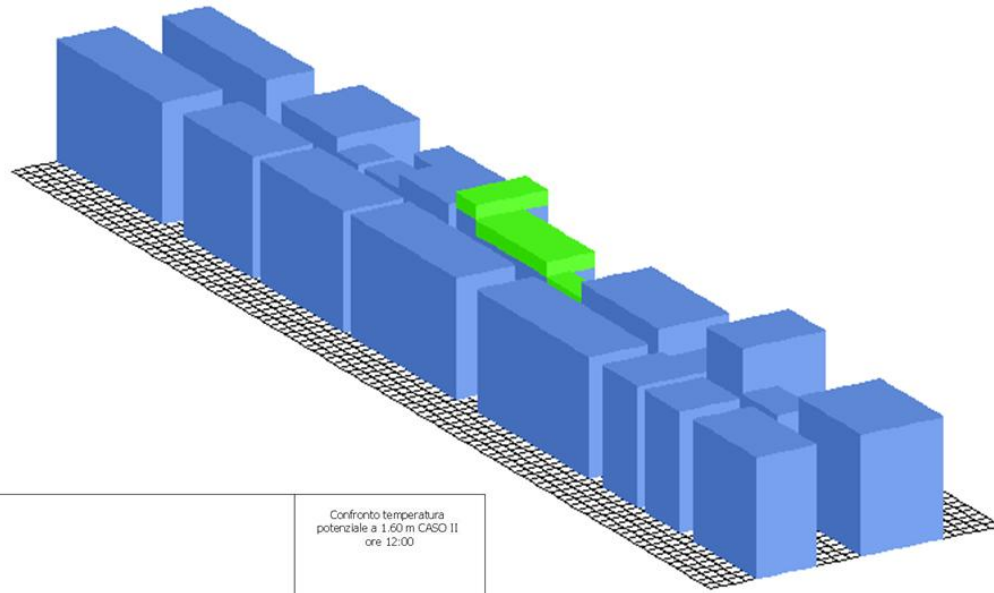
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COMPARISON: NEW (2013)-OLD(2007)







Canyon urbana

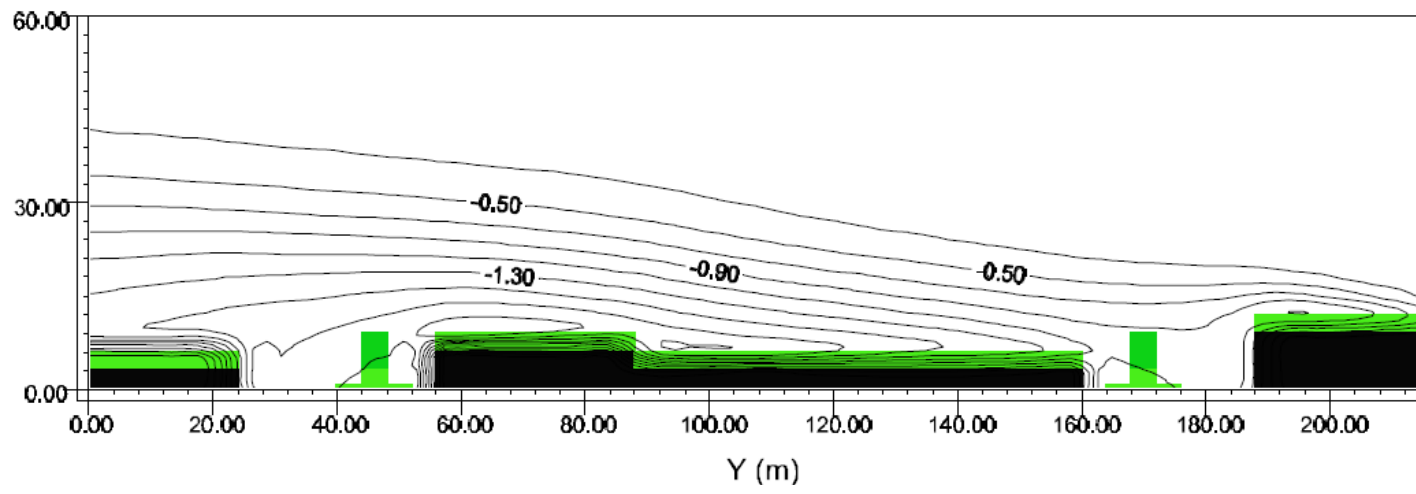
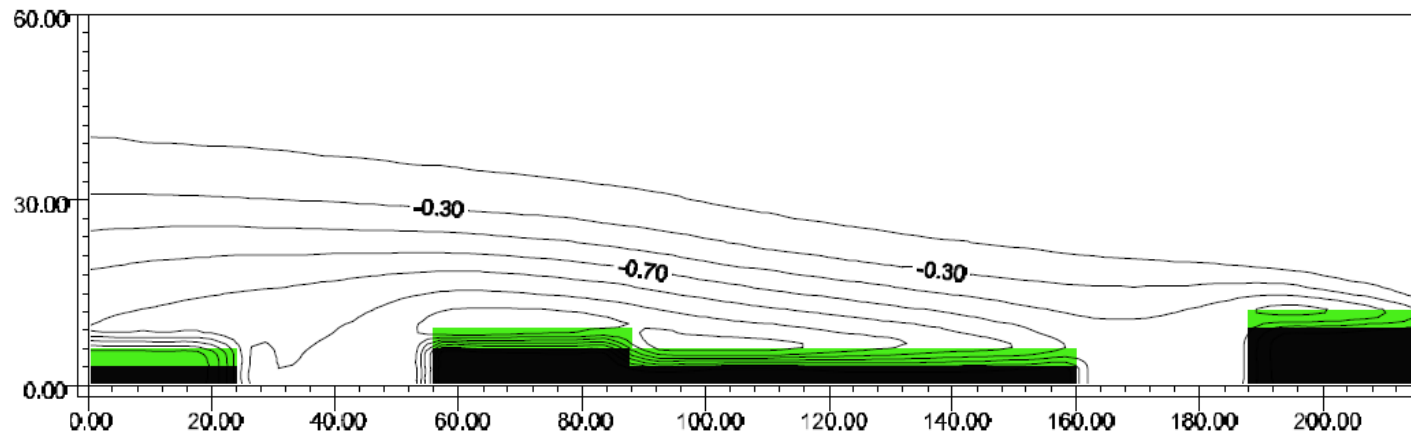




Fig.1 – Le tracce colorate corrispondono ai percorsi del mezzo mobile attrezzato con misuratore di polveri e sistema GPS. I valori numerici della legenda sono relativi al dato istantaneo (una misurazione al secondo espressa in $\mu\text{gr m}^{-3}$).

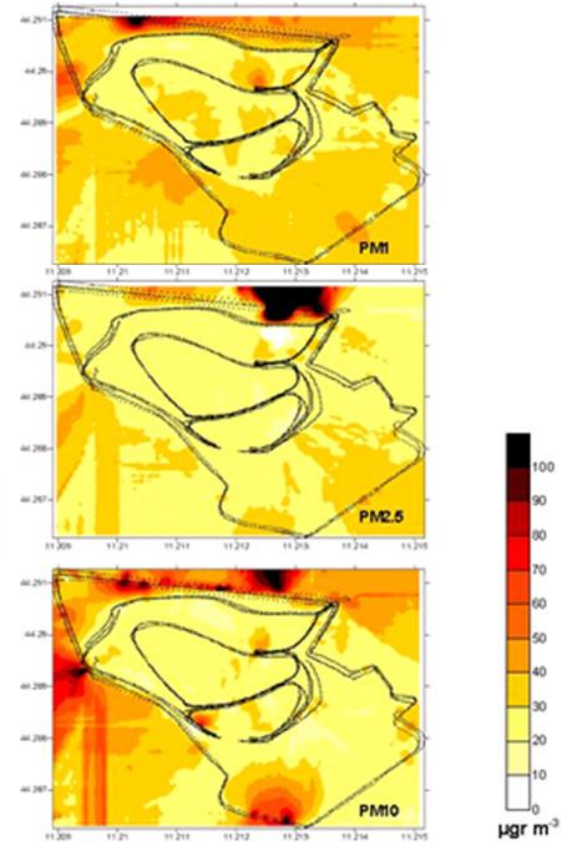


Fig. 2 – Mappe di concentrazione di PM1, 2.5, e 10

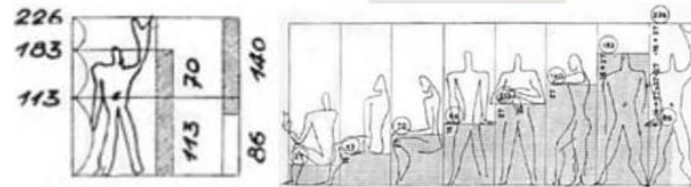
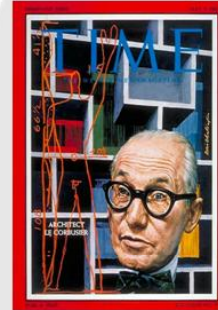


Jardines del Turia (Valencia)



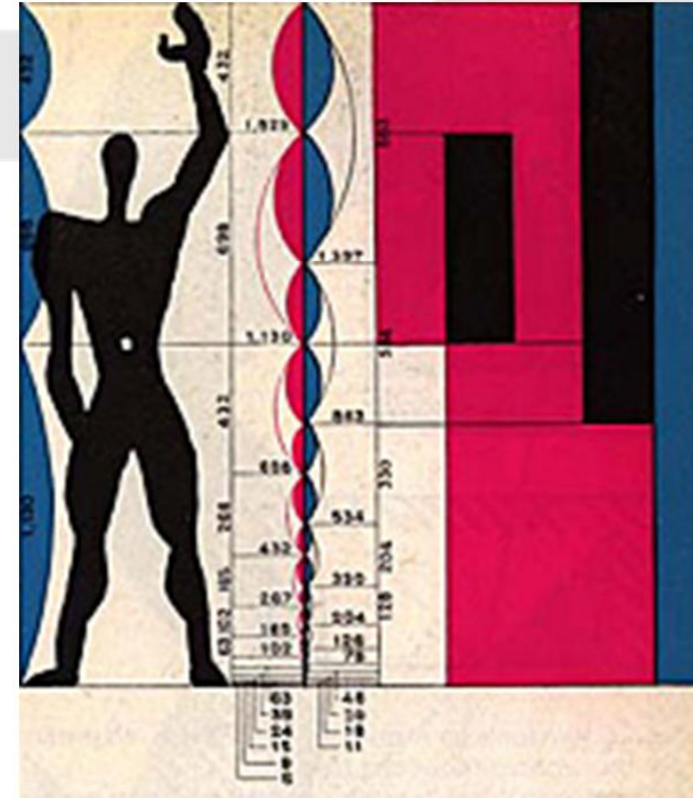
"Les matériaux de l'urbanisme sont le soleil, le ciel, les arbres, l'acier, le ciment dans cet ordre et dans cette hiérarchie."

Le Concrétisme



Le Modulor

Une nouvelle mesure humaine



conclusioni



TIME FOR QUESTIONS