UHI Quarterly Newsletter
Issue 1, May 2009

News and advancements in the Urban Heat Islands
and Thermography management

Content:

UHI newsletter

The project "Urban Heat Islands and Urban Thermography" started in November 2008 and will last 2.5 years. The project - called "**UHI**" as acronym – is funded by the ***European Space Agency (ESA)*** within the framework of the Data User Element (DUE) program.

In brief, the main objectives and related goals of the UHI project, are: the integration/ assimilation of satellite remote sensing observations - mainly thermal infrared observations - and of ground weather stations data into urban meteorological and climate models, to help the mitigation of Urban Heat Islands impact (through an appropriate alert system) and to reduce the risk during heat waves (through dedicated urban land planning); the study of the mission requirements for a high resolution TIR (Thermal InfraRed) satellite sensor; as well as the study of how Thermal InfraRed observations from space can support the implementation of urban energy efficiency policies.

The partners (7) are **Planetek Italia,** Coordinator**,** Italy; **VITO -** Flemish Institute for Technological Research, Belgium; E**UROSENSE,** Belgium; **NOA-ISARS** - National Observatory of Athens - Institute for Space Applications and Remote Sensing in collaboration with the Laboratory of Atmospheric Physics - Aristotle University of Thessaloniki (**LAP-AUTH**), Greece; **Edisoft,** Portugal; **INDRA ESPACIO,** Spain.
10 European cities - Athens, Bari, Brussels, Budapest, Lisbon, London, Madrid, Paris, Sevilla and Thessaloniki – and 17 Public Authorities are involved into the project as users.

The scope of the quarterly UHI newsletter is to provide "Urban Heat Islands" stakeholders and involved users as well as scientific communities working on urban climate issues with regular information on the project implementation and progress in terms of products delivered and technological issues tackled.

The **first fourth months** of the project allowed to consolidate the user requirements in 6 cities (**Athens, Bari, Lisbon, Madrid, Sevilla and Thessaloniki)** and to visit the users of Paris and Brussels. The TIR study started with a preliminary definition of use case scenarios and system scenarios. Most suitable extraction algorithms and models (urban climate and meteorological) to be used for UHI products generation have been selected. A meeting in Athens (3-4 March) with ESA and the UHI experts closed successfully this first period (SRR_ System Requirement Review).

This newsletter presents one of the ten cities involved in the project, namely, Athens (Greece). This includes the climatic, physiographic, and anthropogenic features related to the development of the UHI phenomenon, and a presentation of the entities acting as end-users for the purposes of the project.

Presentation of the users from the other cities involved in the project will be published in the forthcoming issues of the UHI newsletter.

For further information about the scope of the project, the consortium, the involved cities, the UHI products, the project structure, please refer to the UHI website ***http://www.urbanheatisland.info/***

ATHENS: Short presentation of Athens and Urban Heat Island issues

By I. Keramitsoglou, N. Sifakis and V. Amiridis (NOA)

Athens is the capital and largest city of Greece. The Athens Larger Urban Zone (LUZ) is the 7th most populated in the European Union with a population of 4,013,368 (Eurostat (2004)).
Athens is characterised by a strong heat island effect, mainly caused by the accelerated industrialisation and urbanisation during recent years[1]. Athens sprawls across the central plain of Attica, often referred to as the Attica Basin, and bound by Mount Egaleo. In Figure 1: (A) to the west, Mount Parnitha (B) in the north, Mount Penteli (C) in the northeast, Mount Hymettus (D) in the east, and the Saronic Gulf in the southwest. The basin is bisected by a series of small hills.

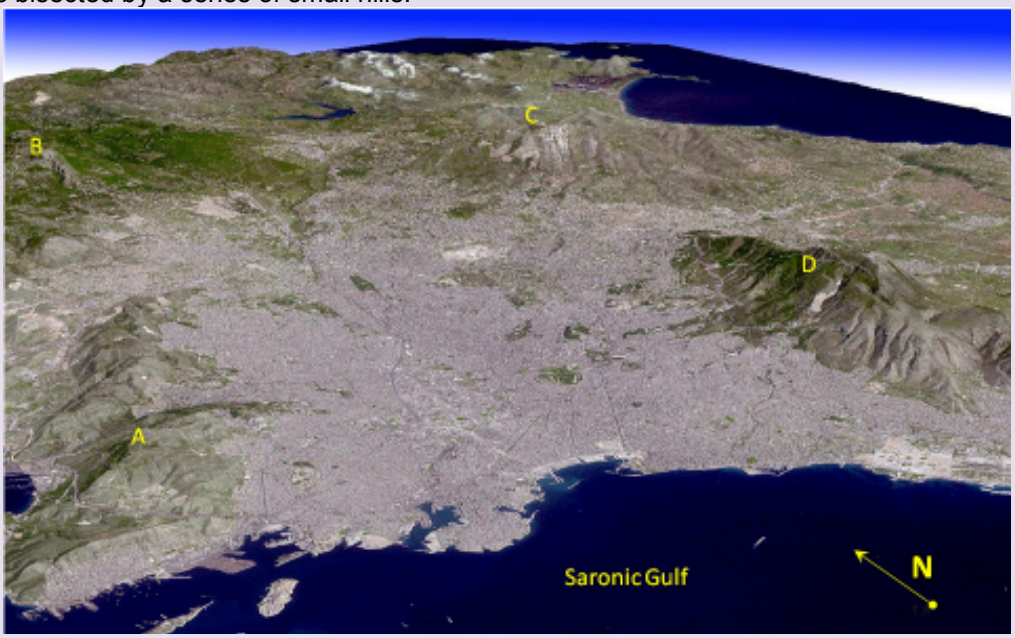

figure 1: 3D view of Athens [Image courtesy: NASA/GSFC/MITI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team]

Athens enjoys a typical Mediterranean climate, with the mountainous northern suburbs experiencing a somewhat differentiated climatic pattern, with generally lower temperatures. Summers can be particularly hot at times prone to smog and pollution related conditions (however, much less so than in the past). The average daytime maximum temperature for July is 33.5 °C and heat waves are relatively common, occurring generally during July and/or August, when hot air masses sweep across Greece from the south or the southwest. On such days temperatures soar over 37.8 °C. A 10-day heat-wave in Athens in 1987 resulted in 926 deaths classified as heat-related. During this extreme event the all-time highest temperature for the metropolitan area of Athens of 48.0 °C was recorded at the Municipality of Elefsina, a suburb industrial zone of Athens in 1987.

The Municipality of Athens is a densely built city with a narrow street network. The appearance of Urban Heat Islands in the city is strongly linked to the long-standing problem of high air pollution due to dense traffic and the nearby industries, as well as to intense air conditioning. Limited green and open space areas, lack of water evaporation as well as the conductivity of building and surface materials contribute to the magnitude and the duration of the heat wave events.

[1] M. Santamouris, K. Paraponiaris, G. Mihalakakou, Estimating the ecological footprint of the heat island effect over Athens, Greece. Climatic Change 80:265–276 (2007)

***Heat wave in Athens, June 2007**: only the sun about to disappear over the horizon reveals the truth - that it is nine o'clock at night [Source: Daily Mail, www.dailymail.co.uk].*

***Dozens of forest fires, fanned by strong winds in a six-day heat-wave of June 2007** raged across central and southern Greece, killing two people and burning scores of homes. Athens was covered in a cloud of thick black smoke as a forest fire that started 80 kilometres to the north spilled over Mount Parnitha and was closing in on the capital's north-western suburbs. [Source: Reuters, Yannis Behrakis]*

***Photograph from the Athenian Press Agency in the 1950's**.*
The caption reads: "Since Saturday, Athens is literary burning from an unexpected heat wave. Every method has been used in order to cope with the heat.
In the photograph we see two Athenian girls using a parasol to protect themselves from the sun."

Athens 'end users:

Four entities act as end-users for Athens:

- The City of Athens, currently launching various projects aiming at *planting* (on roofs and pavements) and at designing *bioclimatic municipal buildings*.
- The Municipality of Amaroussion, particularly interested in *energy efficiency*.
- The Hellenic National Meteorological Service (HNMS), which is the national authority mandated to issue *daily weather forecasts* and *severe weather warnings*. HNMS has a long archive of meteorological observations while maintaining a network of 116 ground meteorological stations at country level.
- The General Secretariat for Civil Protection (GSCP), which is a national entity in charge of the following: operation of a *Civil Protection Center* on a 24-hour basis; coordination of *emergency planning* actions at national level; cooperation with competent authorities towards *preparing legislation* for prevention; *assessment of information* on weather forecasting; public *information and awareness*; organization and promotion of *volunteer organizations*.

On November 7th 2008 the Greek UHI users from the city of Athens participated in the 1st meeting of Greek entities involved in the project in order to discuss the prospects of the UHI project and also to get introduced to the UHI questionnaire. The meeting was held at the Institute for Space Applications and Remote Sensing of the National Observatory of Athens in Pendeli. **Dr. I. Daglis** (project coordinator for NOA), **Dr. I. Keramitsoglou** (technical manager for NOA), **Dr. N. Chrysoulakis** (Foundation for Research and Technology – Hellas, FORTH) and by **Mr. Th. Giannaros** (Aristotle University of Thessaloniki) – besides the presentation of the objectives and specific research and services activities foreseen in the project – animated the debate and discussions regarding the role of end-users and the time table for the Greek contribution: **ground-truth data for Athens, user exploitation of the products, follow-up of services after the official end of the project, and the potential date for the first case study for Athens**.
A series of questionnaires and interviews was conducted by **Dr. N. Sifakis** (NOA) to collect the user requirements. The users emphasized the need to develop UHI forecasting services, while those that are already in charge of forecasting insisted that products should be disseminated to the public. As most of the users are not familiar with satellite remote sensing techniques they mostly require high level products for which no additional processing should be needed.

More specifically, the City of Athens requires *temperature maps* for energy efficiency and forecasting of extreme weather events; the Municipality of Amaroussion requires *temperature maps* at coarse and moderate resolution and *vegetation maps* at high resolution updated annually whilst moderate resolution temperature maps should be updated weekly to be used for statistics and for energy efficiency studies; HNMS requires *UHI maps* of high and low heat areas to cover the need for higher spatial resolution heat wave forecasting daily at 1 km resolution; GSCP requires *air temperatures* (at coarse resolution), *thermal stress indices* and *bio-climatic indicators*, *UHI maps* at a moderate spatial resolution, daily and forecasted for the next 2-3 days.

All interviews were accomplished in a cooperative atmosphere and all parties expressed their keenness on pursuing the cooperation in order to reach the best possible result in the framework of the UHI project. These interviews were considered very useful by the users.

The Authorities' officers who participated in the interviews were: **Dr. Michelaraki from HNMS, Dr. Varinou from GSCP, Ms. Ktistaki from the City of Athens, and Mr Dimopoulos, Ms Kapasa and Mr. Vlachopiotis from the Municipality of Amaroussion.**

Upcoming events

During the **next period (1 March ; 30 June 09),** the activities will be mainly focused on the consolidation of user requirements from Paris and Brussels and the involvement of London, the development of UHI products prototypes on 3 cities (**Athens, Madrid and Lisbon**) as well as the design of the information system. Further investigation on observations and mission scenarios – relying also on the DESIREX 2008[2] data campaign carried out over Madrid in July 2008 (airborne, satellite and in situ data) about the new Thermal Infra Red sensor will be performed.

Events (relevant to the project)

Name	*Date*	*Objectives*	*Location*
Preliminary Design Review	23-24 June	Milestone meeting closing phase 1.	Lisbon
Seventh International Conference on Urban Climate (ICUC-7)[3]	29 June - 3 July	An international forum to present showcase and discuss modern developments in research, and the application of climatic knowledge to the design of better cities	Yokohama

A poster about the UHI project, its objectives and first outcomes will be presented at the ICU-7 conference.

For further information and questions or remarks regarding the UHI project or the newsletter, please contact

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[2] http://www.esa.int/esaEO/SEMW3IWIPIF_index_0.html and http://www.uv.es/desirex/
[3] http://www.ide.titech.ac.jp/~icuc7/