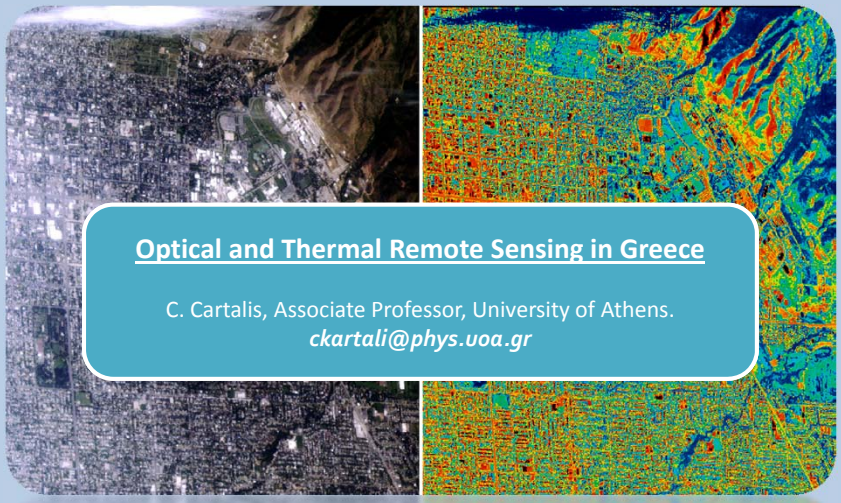
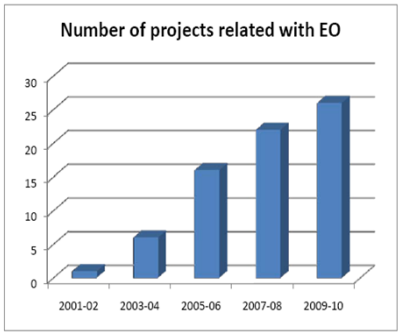


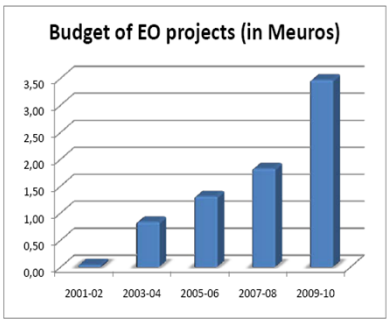
Optical and Thermal Remote Sensing in Greece

C. Cartalis, Associate Professor, University of Athens.
ckartali@phys.uoa.gr

Greek participation to EU and ESA projects (related to EO)



Number of running projects (EU and ESA) related with Earth Observation

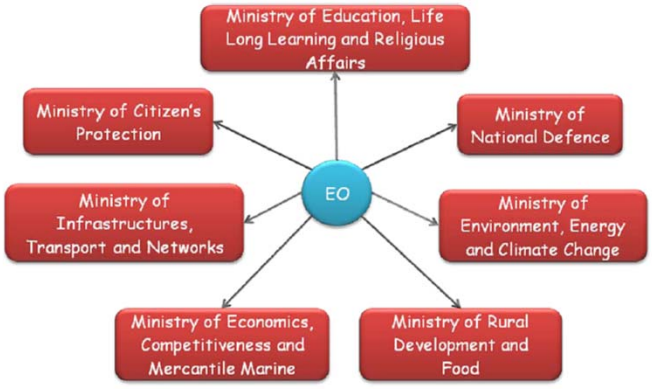


Budget of EO projects during 2001 up to now

Number of projects has evolved from 2007 onwards due to the participation to ESA and the launch of new EO related projects In the context of ESA-Greece Task Force and EOEP-3.

Main actors from the public sector (Ministries)

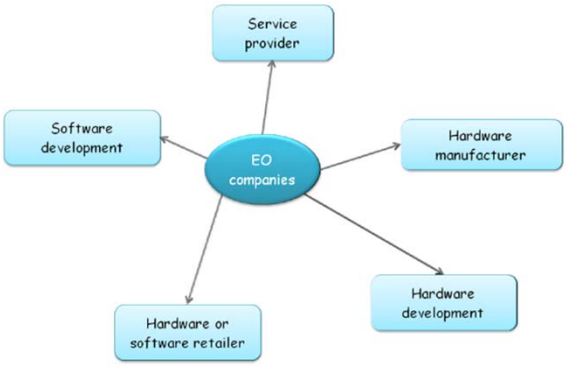
demonstrated interest, limited operational use, emphasis given to traditional methodologies



Ministries involved in the field of EO

EO community in Greece – companies

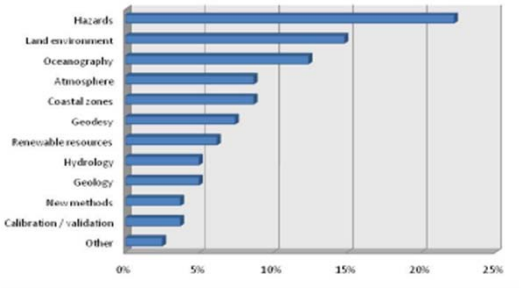
small but stable, with growing potential



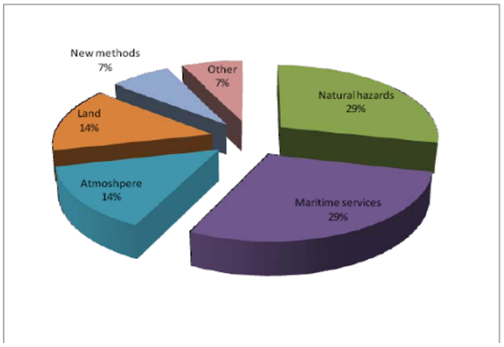
Categories of companies involved in the field of EO

Network of Universities with EO related activities (teaching, research)

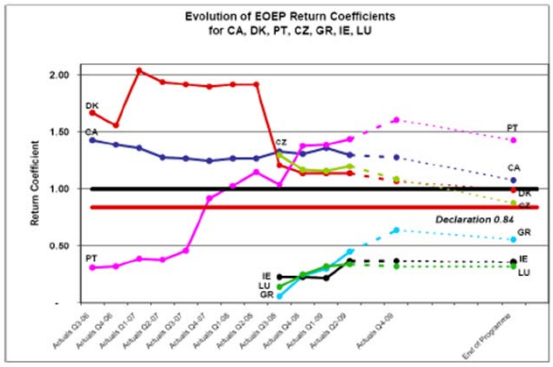
Main thematic categories



Categorisation of EO
(ESA-Greece Task Force)



Participation of Greece to ESA
(in terms of return coefficient)

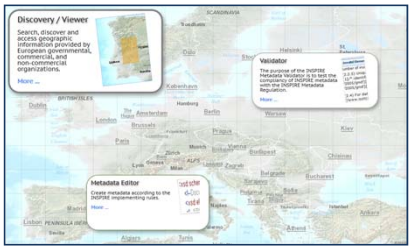


he evolution of EOEP return coefficient for Greece (ESA report), shown in light-blue colored line

Horizontal Actions

INfrastructure for **SP**atial **I**nfo**R**mation in **E**urope

The INSPIRE Directive requires the Commission to establish a community geo-portal and the Member States shall provide access to their infrastructures through the geo-portal as well as through any access points they themselves decide to operate.



ΕΥΓΕΟ Εθνική Υποδομή Γεωχωρικών Πληροφοριών

The INSPIRE database and application runs under the Ministry of Environment, Energy and Climate Change. **Currently: population phase.**

Horizontal Actions

Geoclima – NATIONAL METEOROLOGICAL CENTER

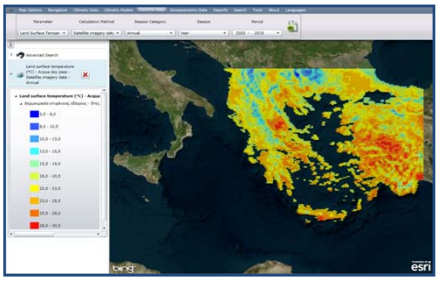
The main scope of the project "Geoclima" is the development of a user friendly integrated Geographic Information System (GIS) that will provide interactive access to the climate related information for Greece.

Variable	Unit	Spatial resolution	Source
Precipitation	mm	0.25°x0.25°	Tropical Rainfall Multisatellite Mission (TRMM)
Normalized Differential Vegetation Index (NDVI)	-	0.05°x0.05°	Modis (Aqua satellite)
Land Surface Temperature (LST)	°C	0.05°x0.05°	Modis (Aqua and Terra satellites)
Cloud fraction	octaves	1°x1°	Modis (Terra satellite)
Instability Index TTI	K	1°x1°	Modis (Terra satellite)
Instability Index LI	K	1°x1°	Modis (Terra satellite)
Land cover type No1	-	100mx100m and 250mx250m	SPOT and Landsat satellites
Land cover type No2	-	300mx300m	ENVISAT satellite (MERIS)

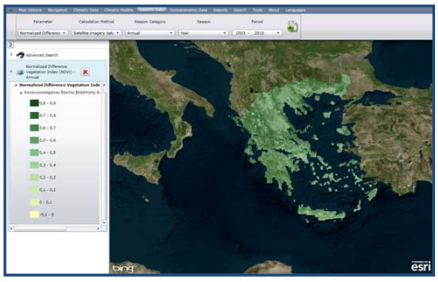
Horizontal Actions

Geoclima

Land surface temperature – Aqua/MODIS day pass – Annual (2003 – 2010)

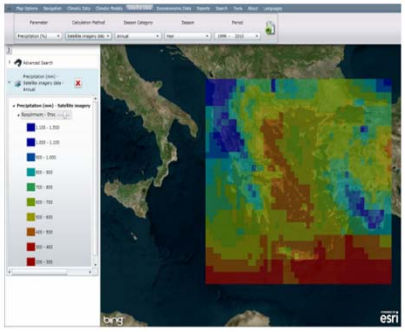


Normalized Difference Vegetation Index – Aqua/MODIS day pass – Annual (2003 – 2010)

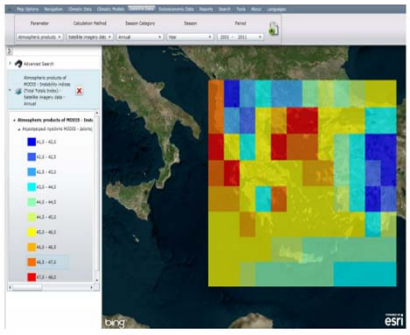


Horizontal Actions

Precipitation – TRMM Database - Annual

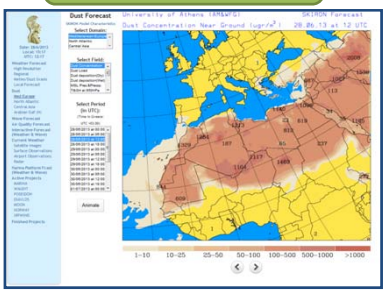


Instability indices – TERRA annual

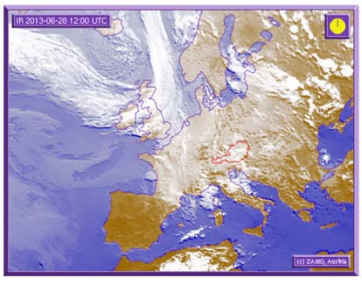


Meteorological and Atmospheric Applications

Forecast



Weather



Ozone

WMO Ozone Mapping Centre

EUMETSAT Ozone SAF

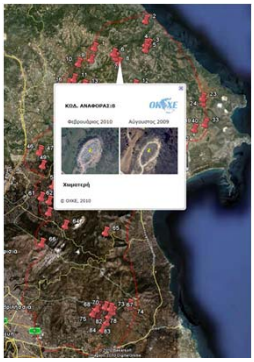
Natural Disasters / Hazards

NOA Fire near Real Time Detection and Archive

Horizontal Actions

Attica region, Geo-Eye -1

MINISTRY OF ENVIRONMENT ENERGY & CLIMATE CHANGE



- ✓ Spatial resolution 0.5m
- ✓ Revisit time: 3 days
- ✓ Cost: 5.000 euros for an area of 270 Km²

Tracing illegal constructions in islands (Worldview, IKONOS)

Case study: Mykonos island (2011)

Before

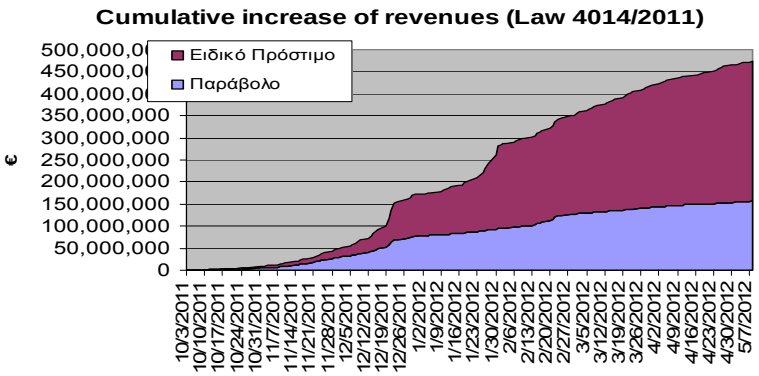
After

Case study: Mykonos island (2011)

Before

After

from a financial perspective



Optical Remote Sensing

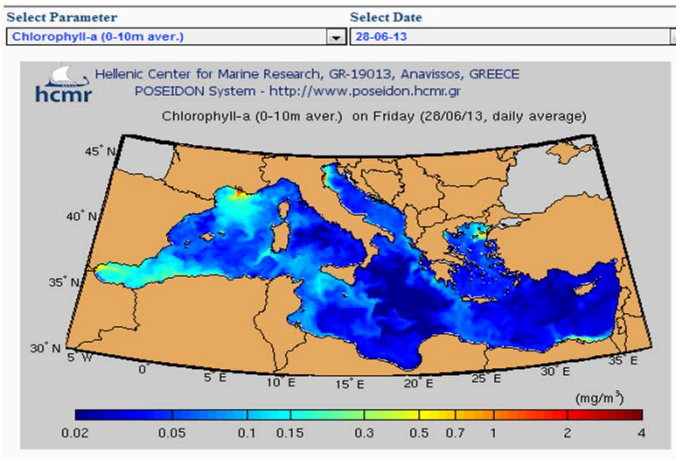
Operational

Weather forecasting (including extreme weather events)
Land use – land cover
NDVI
Marine applications

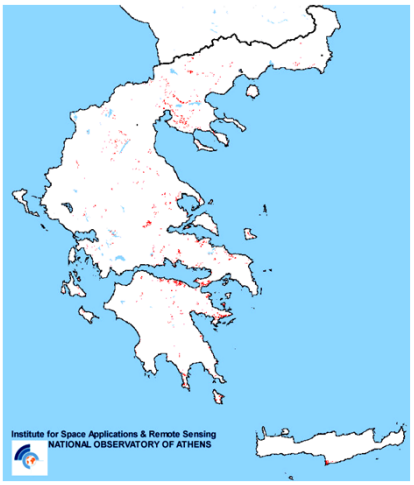
semi - Operational

Hazards (including forest fires)
Cadastre (VHSR)
Agricultural (statistics + control of farmer subsidies)

Optical Remote Sensing



Optical Remote Sensing

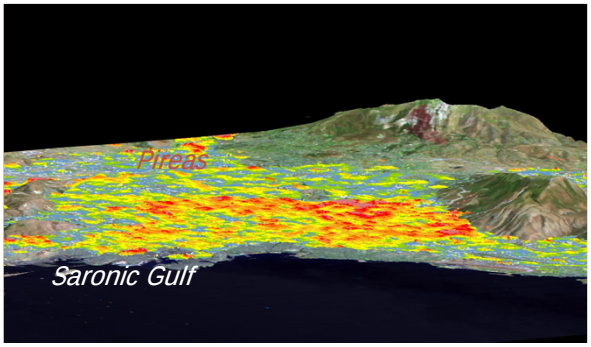


Optical Remote Sensing

Research

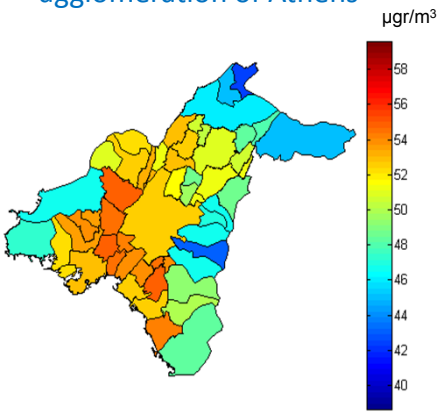
Urban environment:

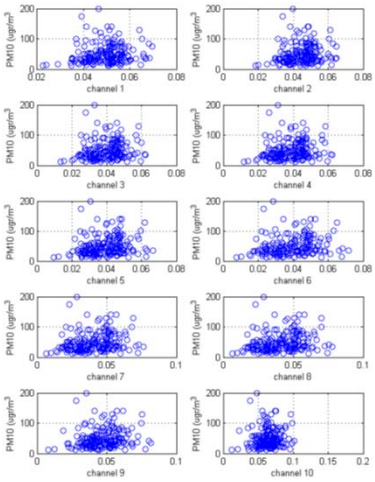
aerosol particles, land use/land cover, urban sprawl, urban modeling



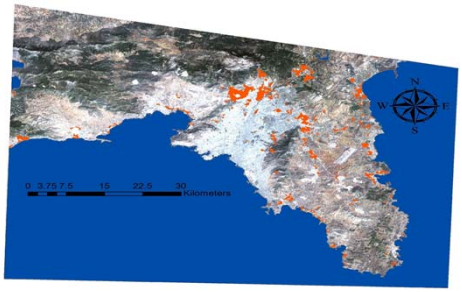
Optical Remote Sensing

MERIS, urban agglomeration of Athens





Optical Remote Sensing



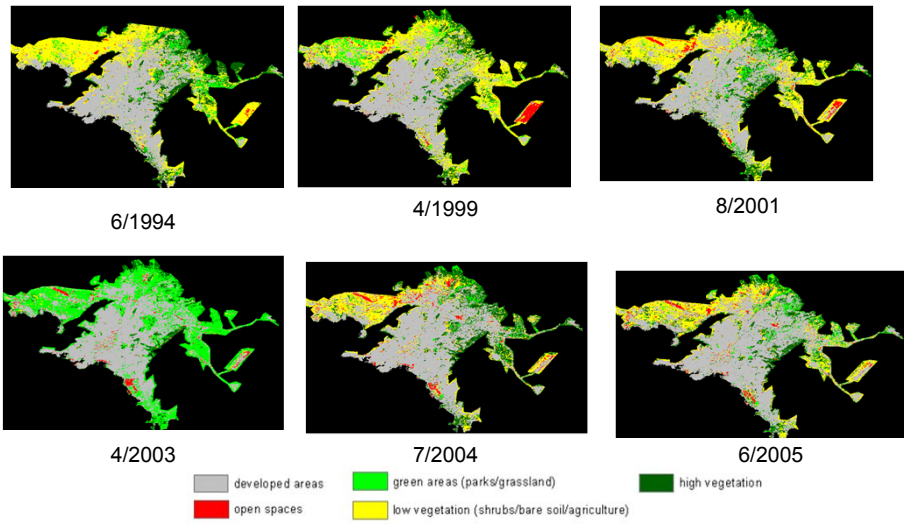
LULC change 1987-2012
(new urban areas in orange)

Natural environment – LULC (mostly related to the assessment of the impact of forest fires).

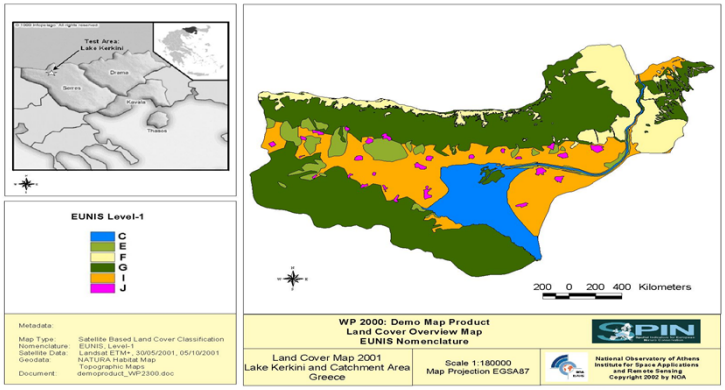
Geological applications.

Use of EO in support of climate adaptation and mitigation plans.

Optical Remote Sensing
change detection



Optical Remote Sensing



Biotope/wetland monitoring (NATURA 2000) – several projects.

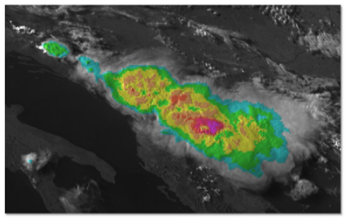
Thermal Remote Sensing

Operational

mostly with respect to the use of satellite images in the thermal infrared for weather forecasting, oceanography and forest fire applications

Cloud top structure and microphysics of storms

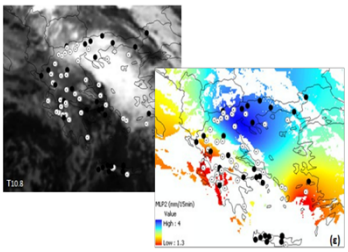
Spectral and textural features of the Meteosat Second Generation (MSG) are used to extract information on the cloud top structure and microphysics of storms.

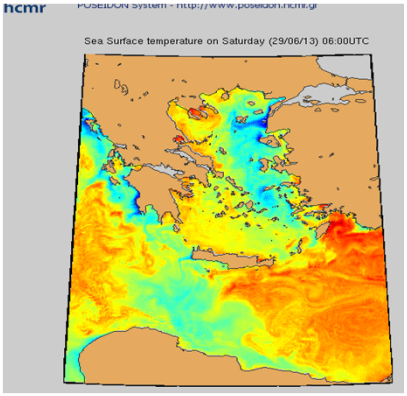


Thermal Remote Sensing

Rainfall estimation

Development of rainfall estimation algorithms using spectral and textural features in the infrared channels of the Meteosat Second Generation - Spinning Enhanced Visible and Infrared Imager (MSG-SEVIRI) data





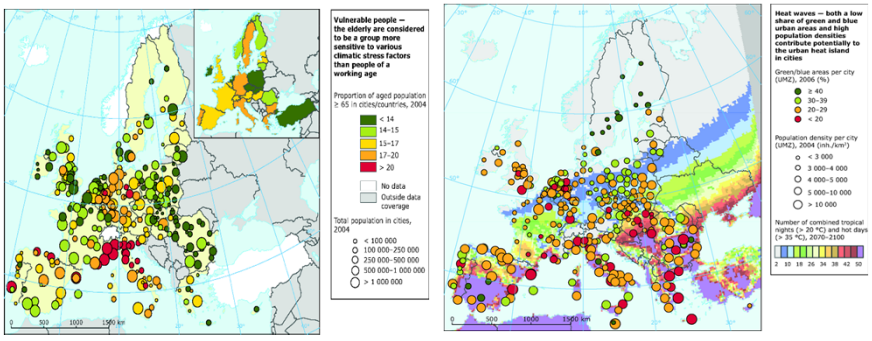
Thermal Remote Sensing

Research

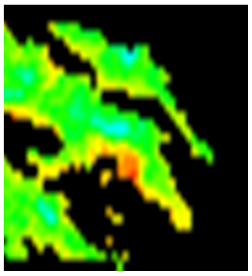
Strong emphasis in urban climatology and the thermal environment in cities:

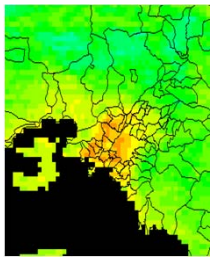
- state of thermal environment
- presence, extent and intensity of UHIs
- heat waves
- thermal comfort indices
- urban metabolism (radiation balance and energy fluxes)
- urban planning indicators

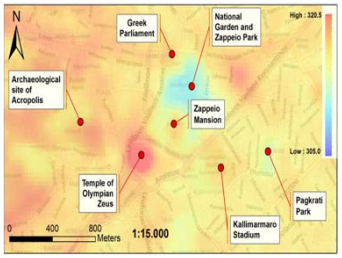
Why?



Thermal Remote Sensing in cities across scales

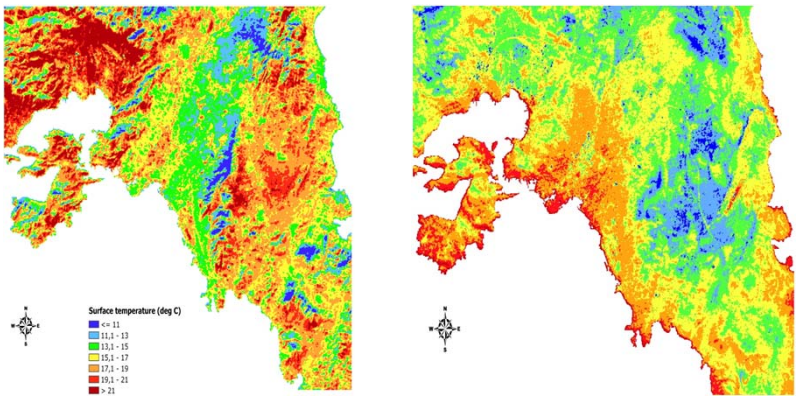






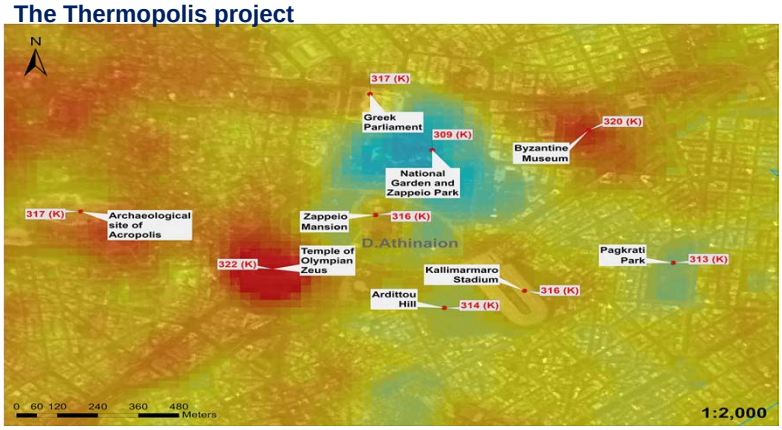
Thermal Remote Sensing

Morning (left image) and evening (right)



Thermal Remote Sensing

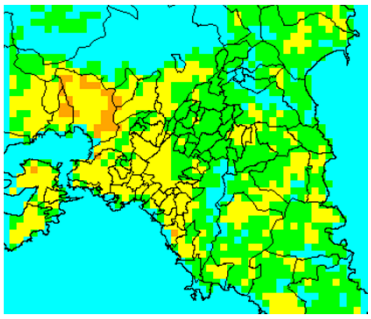
The Thermopolis project



Athens has been included in the Supersites project.

Thermal Remote Sensing

Thermal Comfort Index

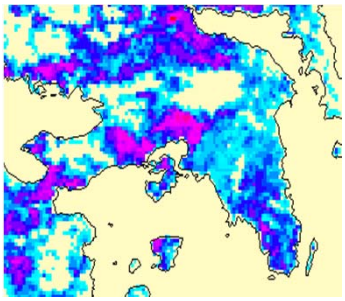


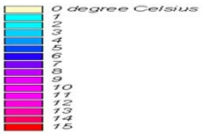
DI classification

Class_Names

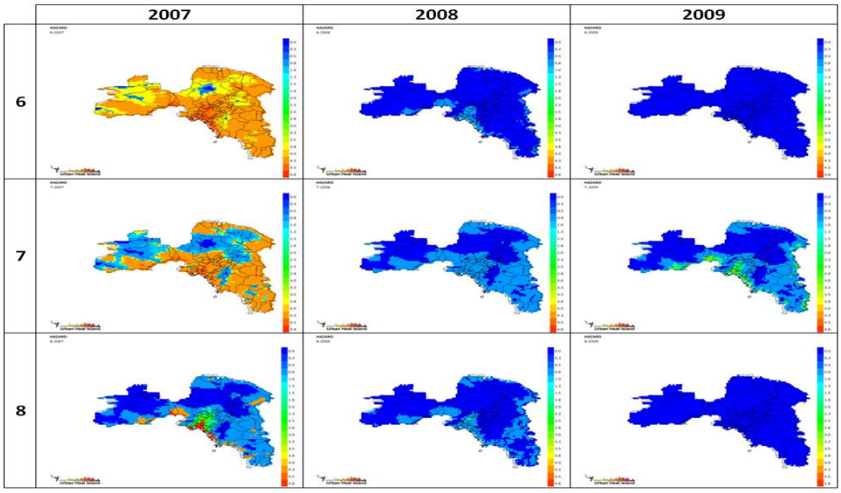
- No discomfort
- Under 50% population feels discomfort
- Over 50% population feels discomfort
- Most of population suffers discomfort
- Everyone feels severe discomfort
- State of medical emergency

Cooling Degree Days

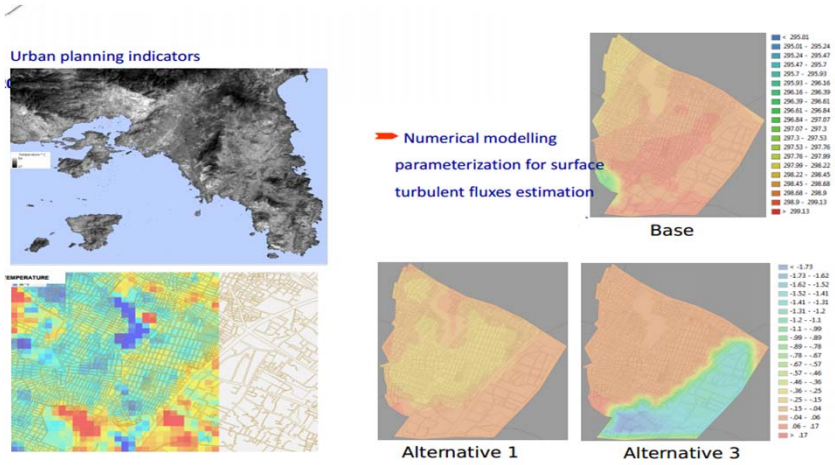




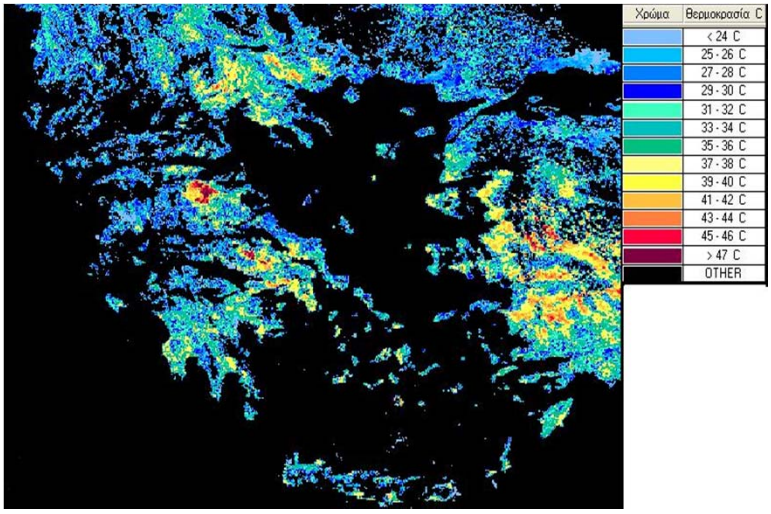
Thermal Remote Sensing



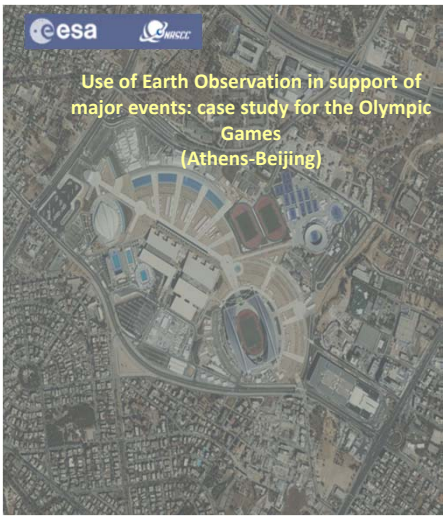
Thermal Remote Sensing

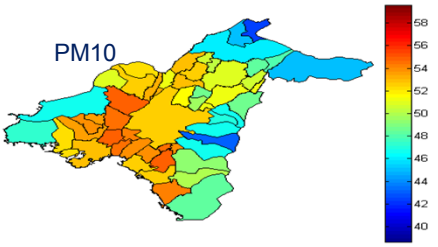


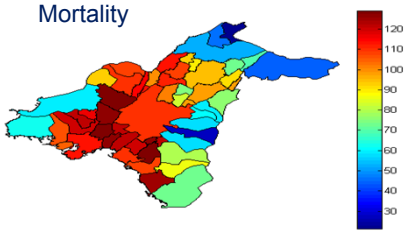
Thermal Remote Sensing
(satellite climatology applications)



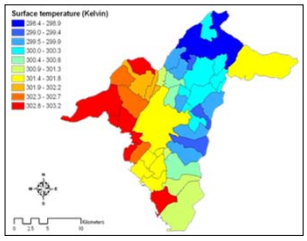
Optical +TIR Remote Sensing

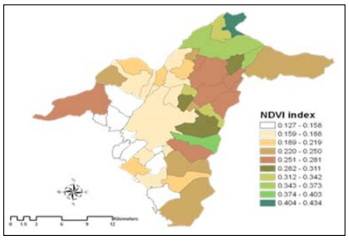


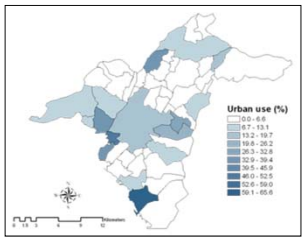


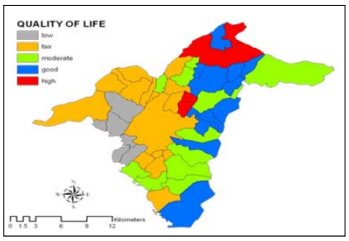


Optical +TIR Remote Sensing: aggregate urban indicators









Concluding points

- Mature – multidisciplinary - research community (mostly at the level of Universities and Research Centers); needs do exist, hard to be fully compensated due to austerity measures.
- As in any case, in every country: there is always space for further coordination between actors, end users and stakeholders.
- Need for greater involvement of the end users (state authorities) so as EO applications to a) acquire operational character and b) be integrated in policy making and implementation.
- Continuity in policy, is a major factor for enhancing the links in between the research community and the operational users.
- Private sector: small but dynamic and quite coherent; needs support to sustain its activities. **Strong need for custom services.**

Concluding points

- Thematic guidelines for the next programmatic period 2014-2020 for Greece, provide solid opportunities for EO in such sectors as:

  natural environment (mostly with respect to NATURA 2000 sites management), climate change, hazards, urban areas, environment and health, sustainable agriculture (new CAP).
- Significant EO activity reported prior to 2006; however the entry to ESA acted as catalyst for further development.
- ESA's next satellite missions (SENTINEL) are expected to boost EO applications in the country.

Optical and Thermal Remote Sensing in Greece

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ckartali@phys.uoa.gr

Credits:

General Secretariat for Research and Technology-Ministry of Education, Ministry of Environment, Ministry of Defense.
National Meteorological Service, Hellenic Centre for Marine Research, National Cadastre Organization, National Mapping Organization.
University of Athens, Technical University of Athens, University of Thessaloniki, University of Aegean, University of Thessaly.
National Observatory of Athens, Foundation for Research and Technology, Mediterranean Agronomic Institute.