REMOTE SENSING LAB

RSLab

Χαρακτηριστικά δορυφορικών καταγραφών, τυπικές εφαρμογές και μελλοντικές τάσεις

FORTH
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS

Νεκτάριος Χρυσουλάκης
Εργαστήριο Τηλεπισκόπησης | ΙΥΜ | http://rslab.gr

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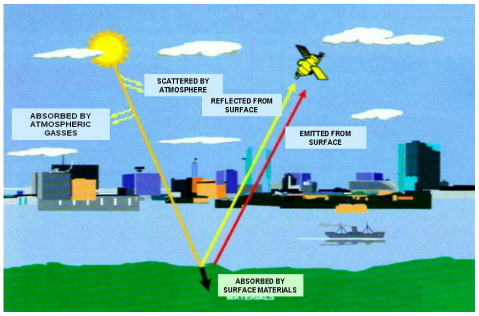
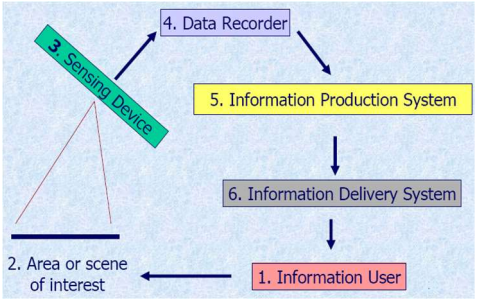
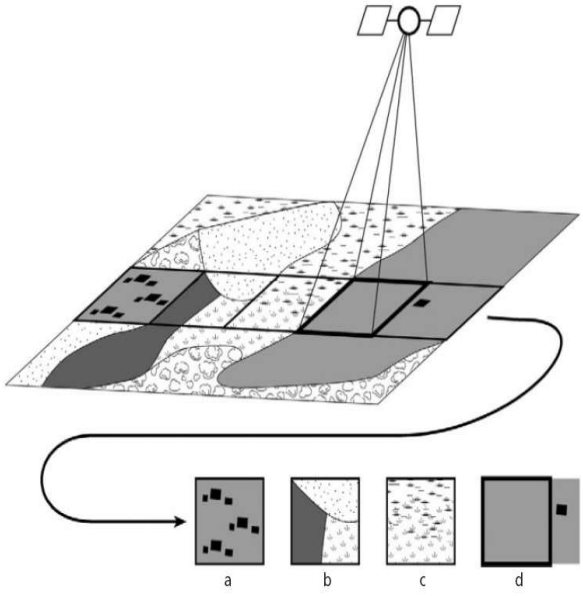
Χαρακτηριστικά των δορυφορικών καταγραφών







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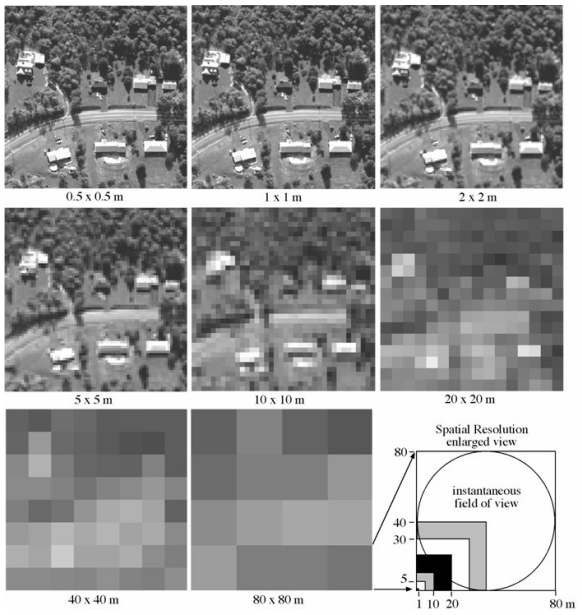

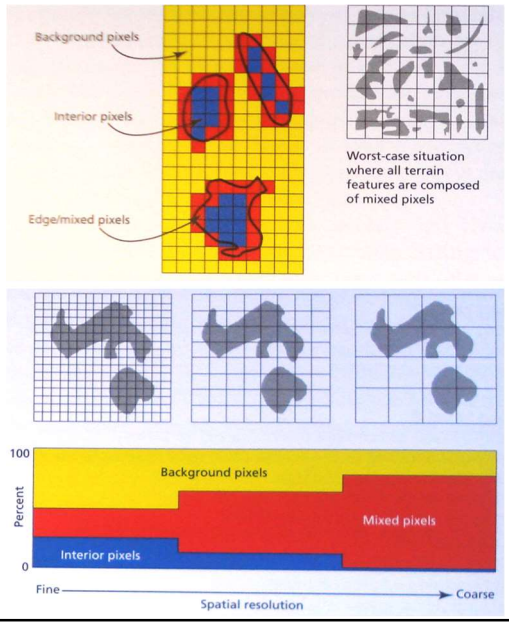

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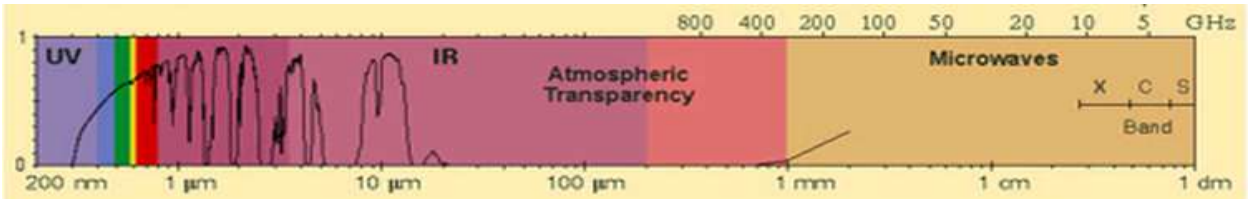

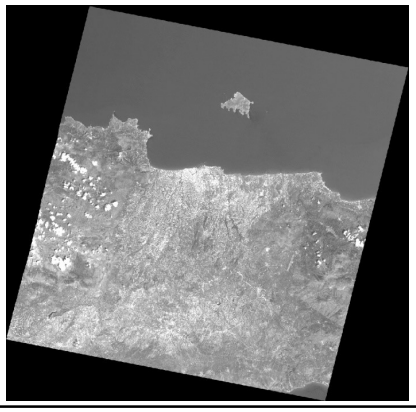

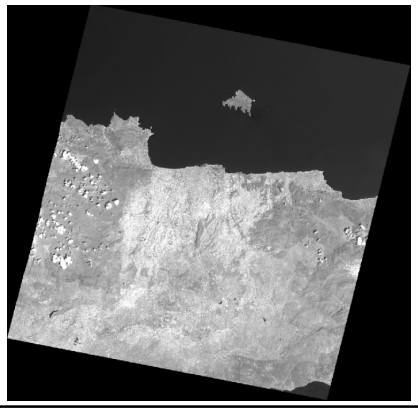

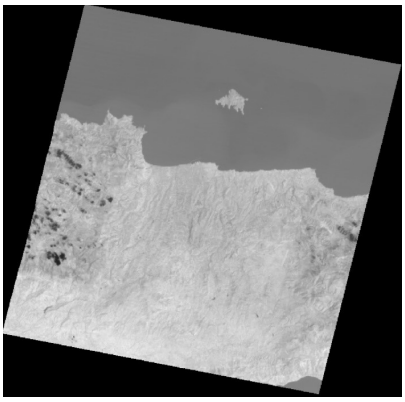

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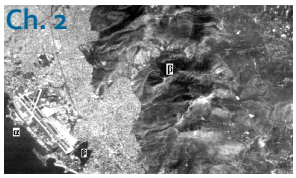
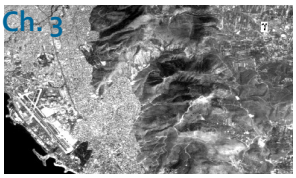
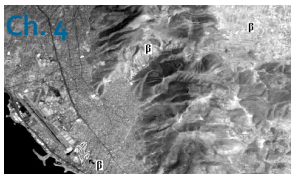
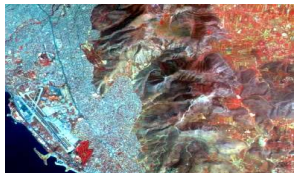


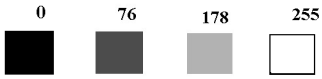


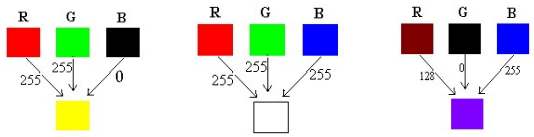


Ψευδόχρωμη σύνθεση

R-G-B: 4-3-2







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Χαρακτηριστικά των δορυφορικών καταγραφών

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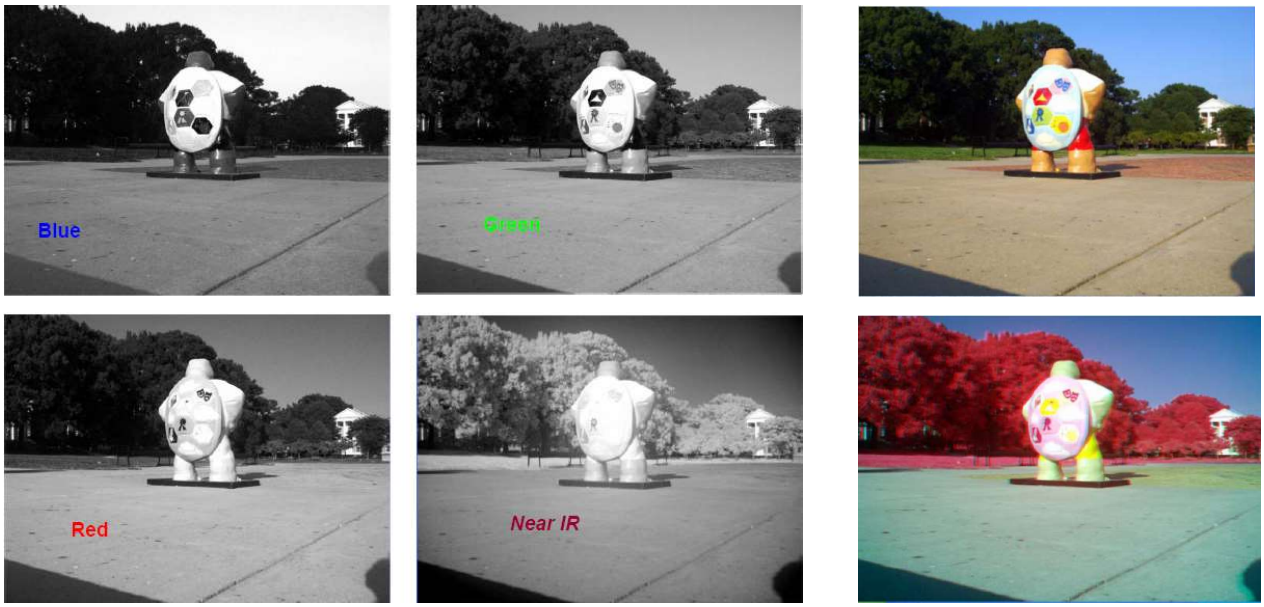

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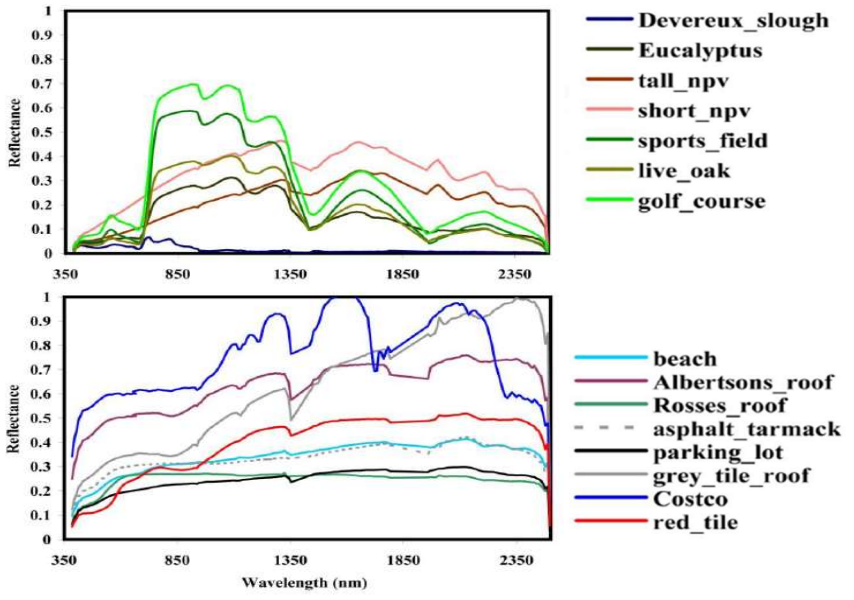

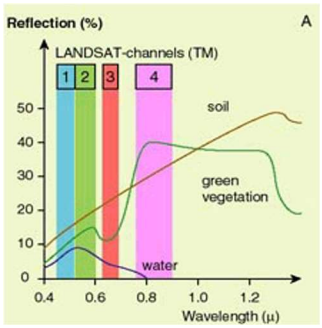

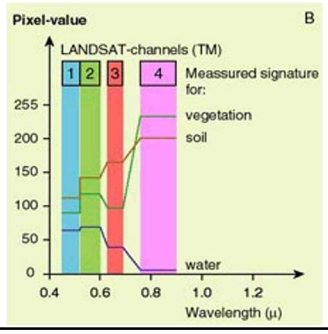

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Χαρακτηριστικά των δορυφορικών καταγραφών

CH 1

BLUE

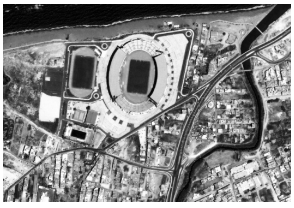
CH 2

GREEN

RGB: 4-3-2

CH 3

RED



CH 4

NIR

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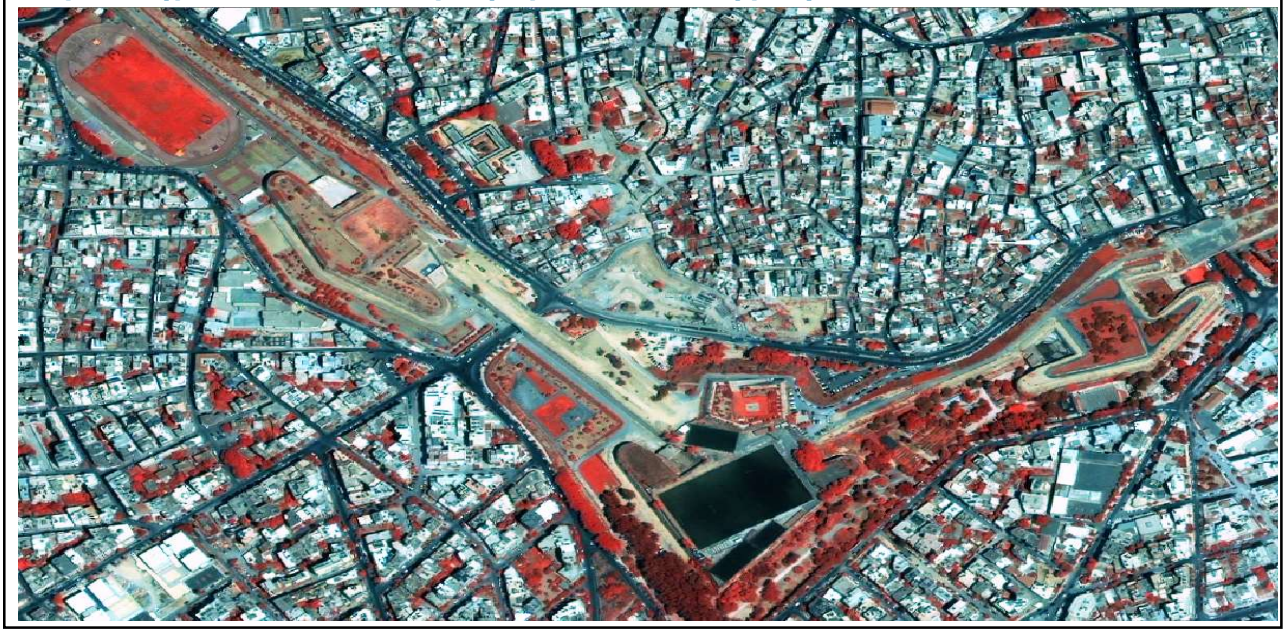
Χαρακτηριστικά των δορυφορικών καταγραφών



Landsat

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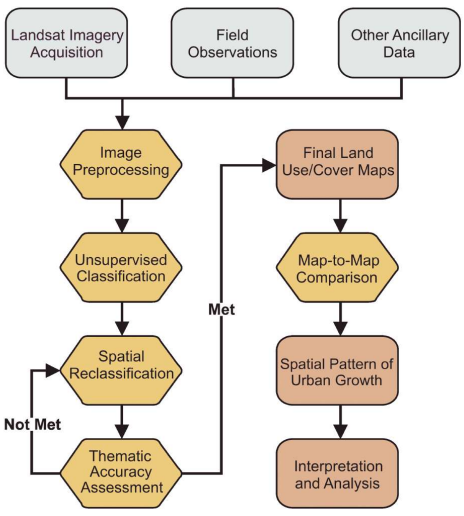
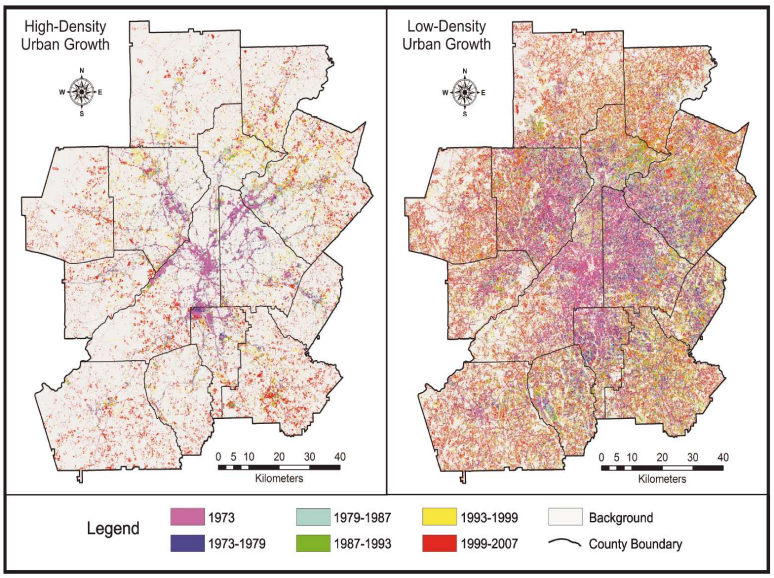
Landsat





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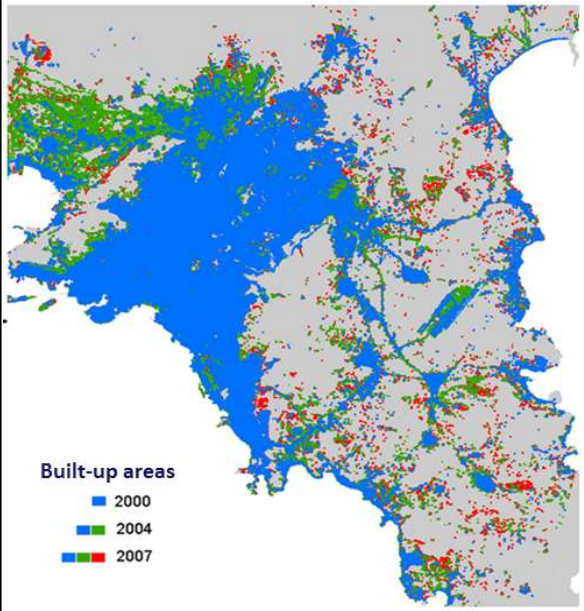
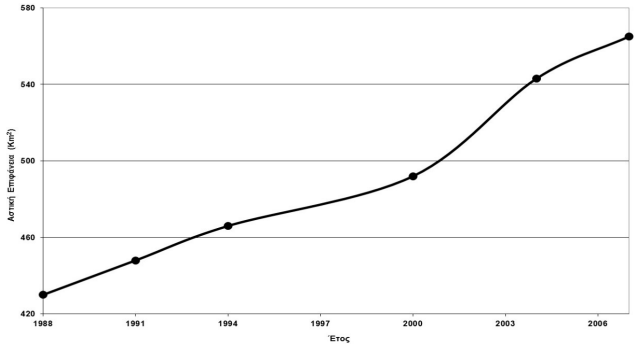
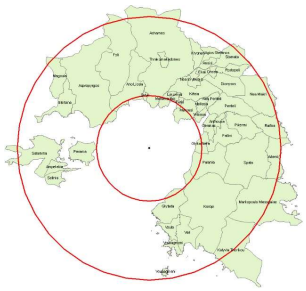
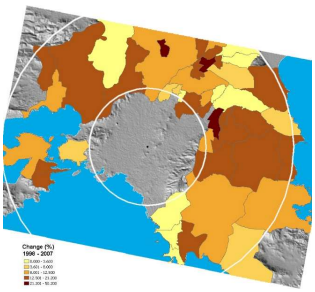
Landsat









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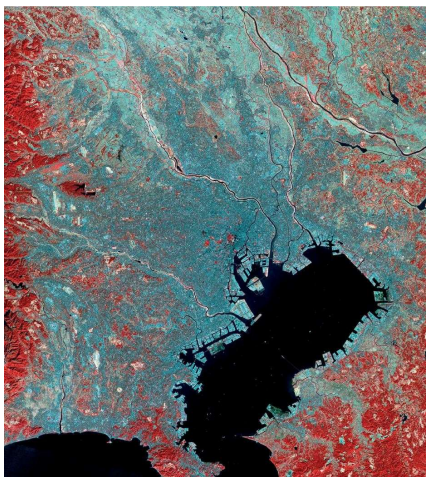
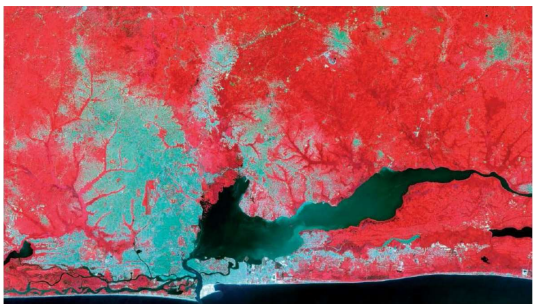
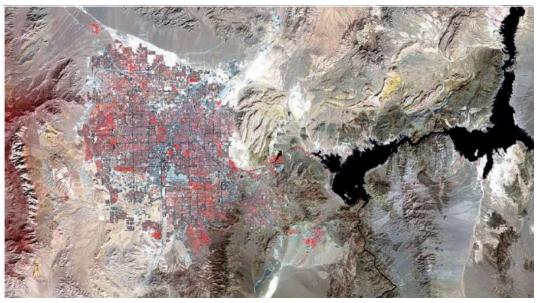
Landsat



Tokyo:
- 1979: 28.169.000
- 2017: 38.241.000



Lagos:
- 1984: 3.291.000
- 2015: 13.123.000



Las Vegas:
- 1976: 345.000
- 2015: 2.270.000

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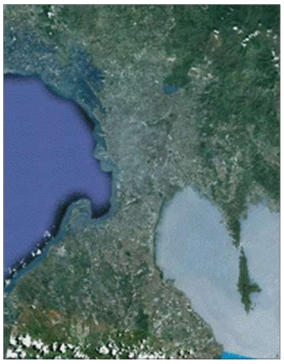
Landsat

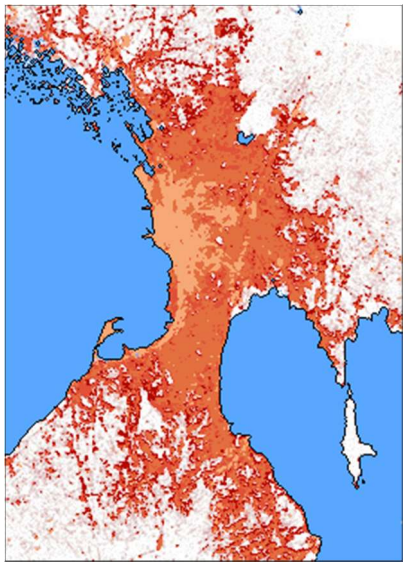


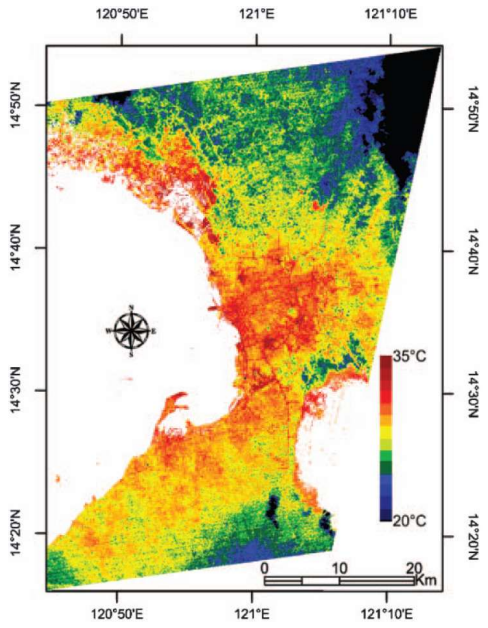
2010

2000

1990

1975





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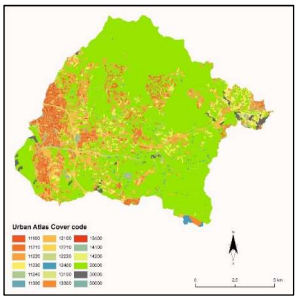

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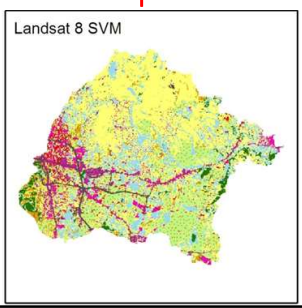

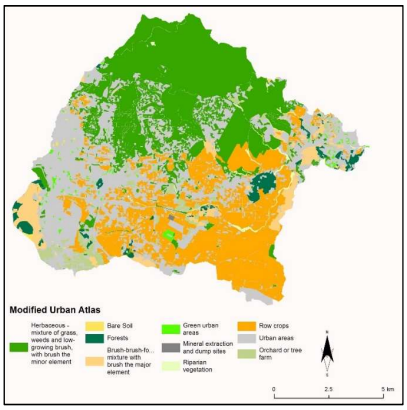

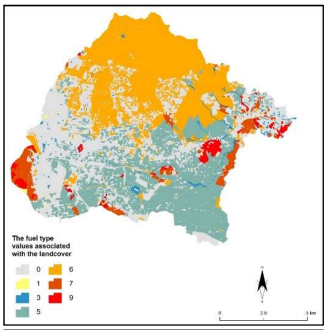

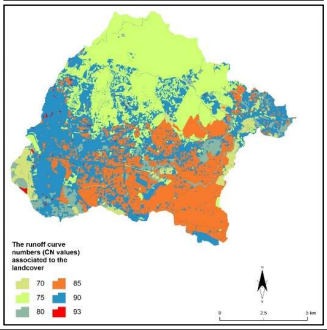

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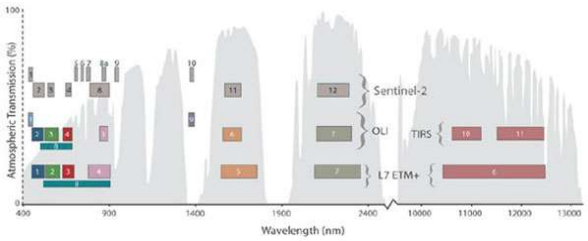
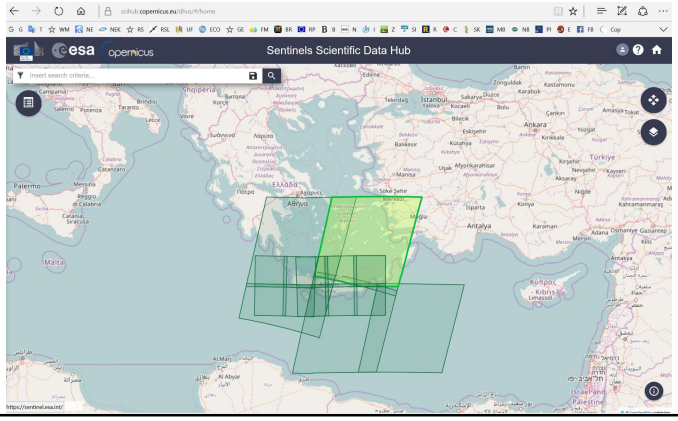
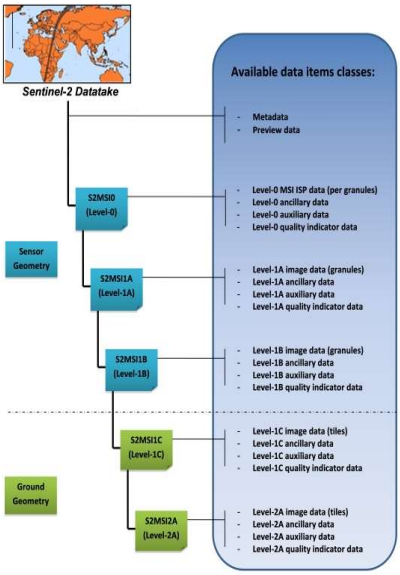
Sentinel 2







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Sentinel 2

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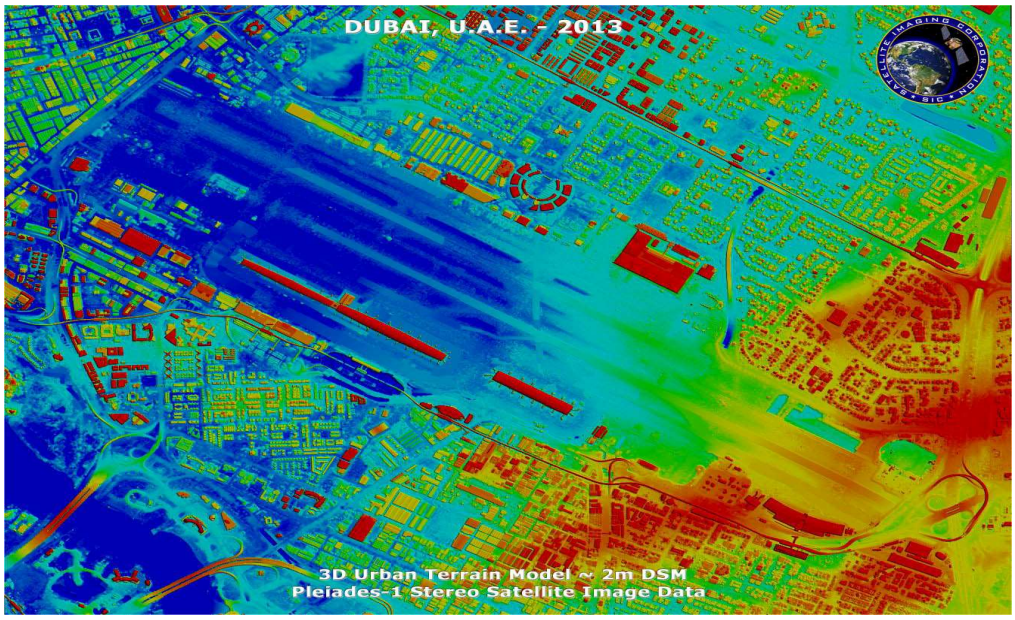
VHR Optical Sensors

- WorldView-4 (0.31m)
- WorldView-3 (0.31m)
- WorldView-2 (0.46m)
- WorldView-1 (0.46m)
- GeoEye-1 (0.46m)
- Pleiades-1A (0.5m)
- Pleiades-1B (0.5m)
- SuperView-1 (0.5m)
- KOMPSAT-3A (0.55m)
- KOMPSAT-3 (0.7m)
- QuickBird (0.65m)
- Gaofen-2 (0.8m)
- TripleSat (0.8m)
- IKONOS (0.82m)
- SkySat-1 (0.8m)
- SkySat-2 (0.8m)



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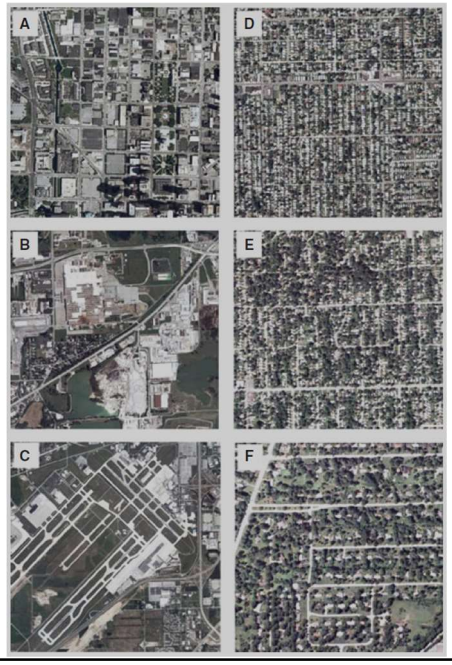
VHR Optical Sensors

Commercial

Industrial

Transportation



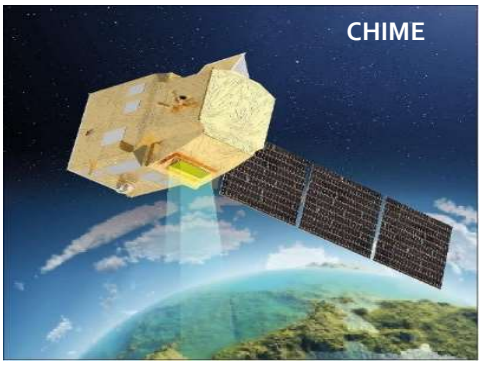
High-density residential

Med-density residential

Low-density residential

Hyperspectral Sensors

Level 1	Level 2: Land cover types	Level 3: Material types	Level 4: Surface materials
Man-made/artificial surfaces	Buildings/roofs	Mineral materials	Asbestos
			Bitumen roof sheeting
			Clay tiles
			Concrete slabs
			Concrete tiles
			Fiber cement
			Glass
			Gravel
			Slate
		Metallic materials	*Aluminum*
			Copper
			Zinc
			Steel with protective coating
			Corrugated metal sheet
			Lead
			Gold leaf
			Tin
		Hydrocarbon materials	*Coated corrugated metal sheet (PVC, Polyethylene, coating color)*
			Polyvinylchloride (PVC)
			Polyethylene (PE)
			Polyisobutylene (PIB)
			Plexiglas
			Tar Paper
		Biomass materials	*Green roof*
			Thatched roof
			Wood shingles
	Artificial open spaces	Partially impervious surfaces	*Cinder*
			Clay-baked paving stones
			Cobblestone pavement
			Concrete paving stones
			Gravel
			Grass pavers
			Loose chippings
			Railway tracks
		Fully impervious surfaces	*Asphalt*
			Concrete
			Flagstone (Granite)
			Synthetic turf
			Tartan
		Water bodies with artificial bottom	*Pool*
			Garden pond



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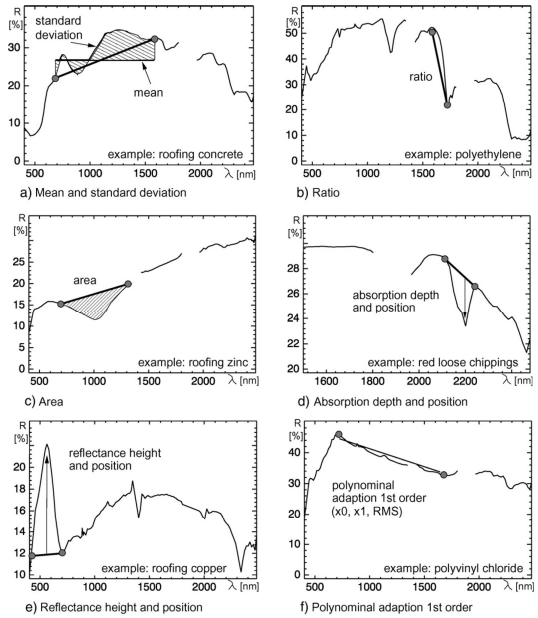
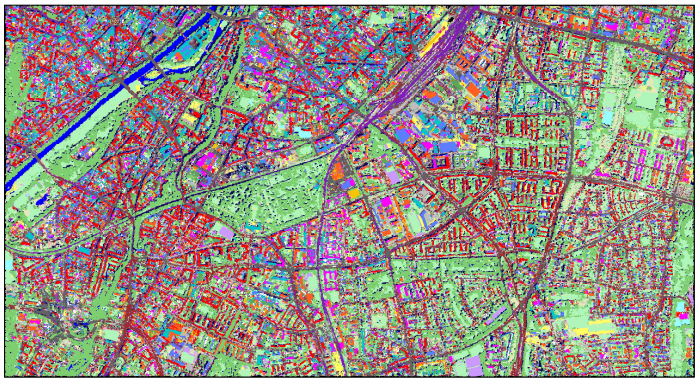
Hyperspectral Sensors

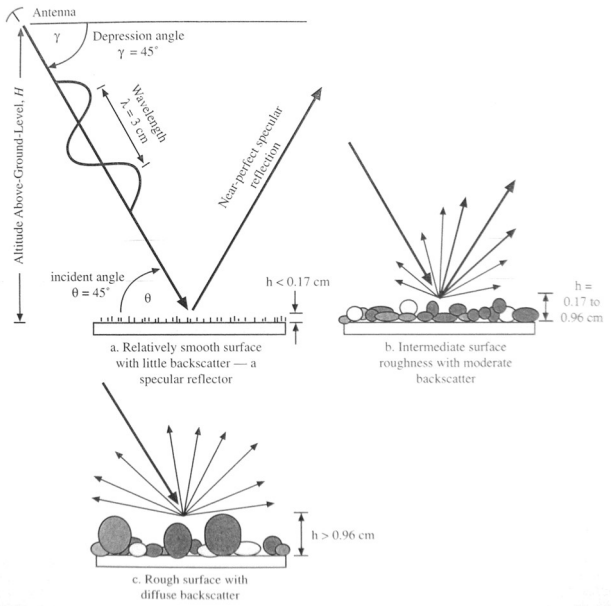


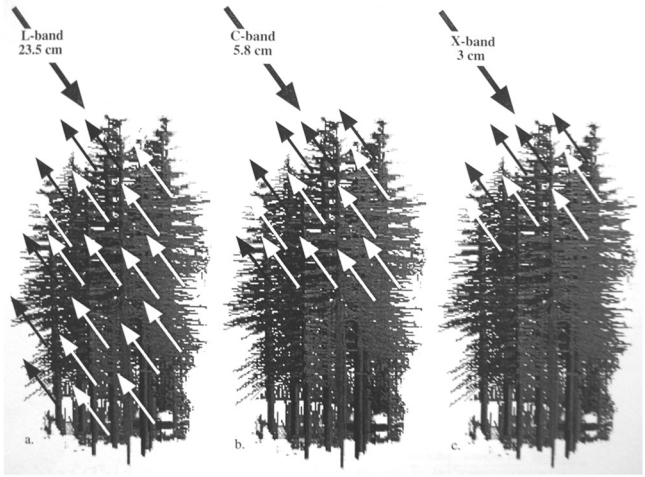


Roofing tiles
Roofing concrete
Roofing metal
Roofing bitumen / tar
Roofing synthetic / glass
Vegetated roof
Roofing gravel
Unknown
Concrete
Asphalt
Tartan/ synthetic turf/polyethylene surfaces
Loose chippings
Railway tracks
Sand/soil
Trees
Lawn
Water
Shadow

RSLab

SAR





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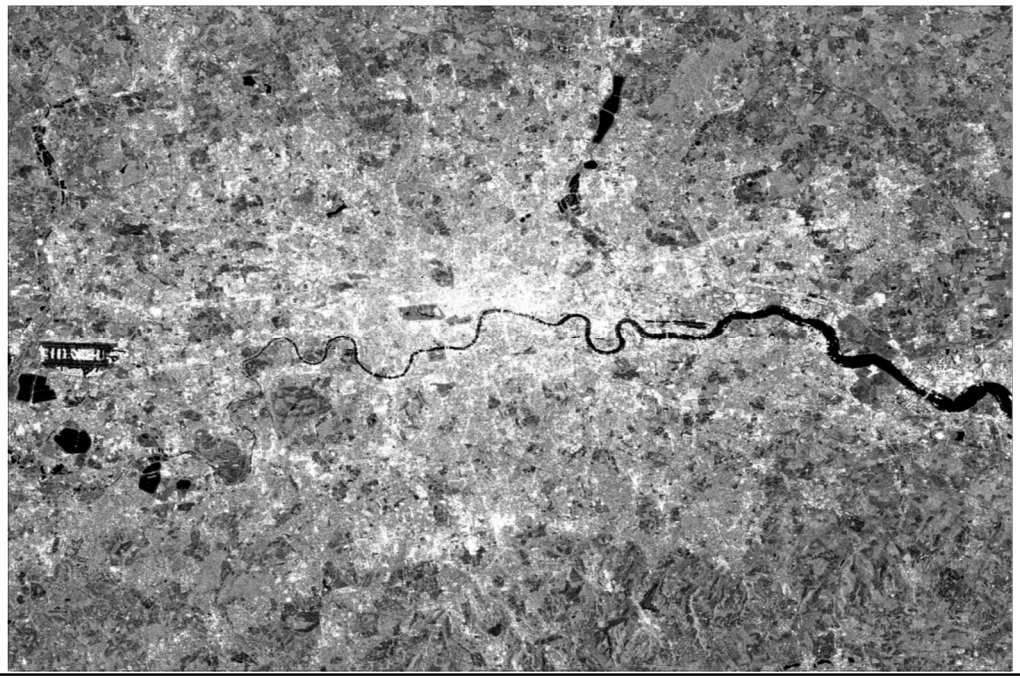
SAR



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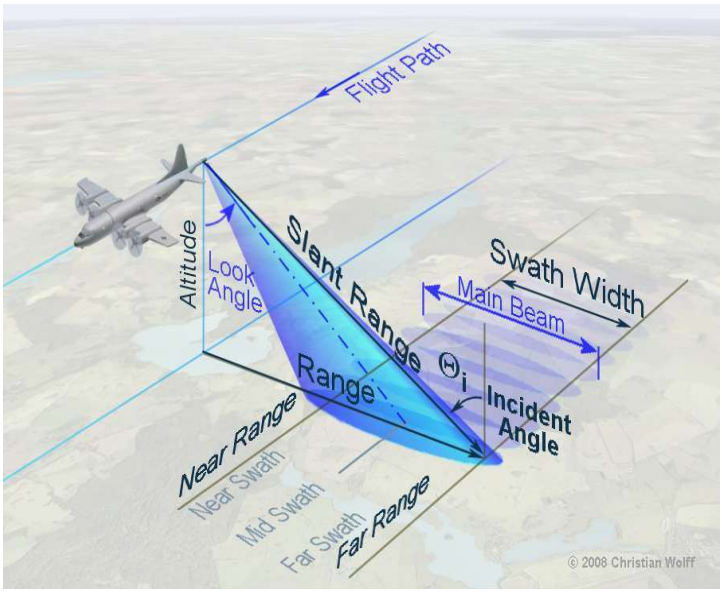
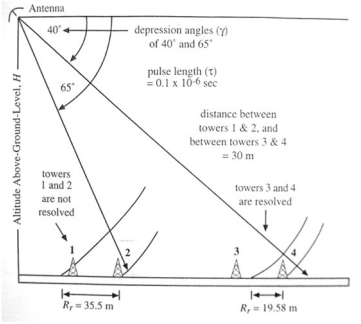
SAR

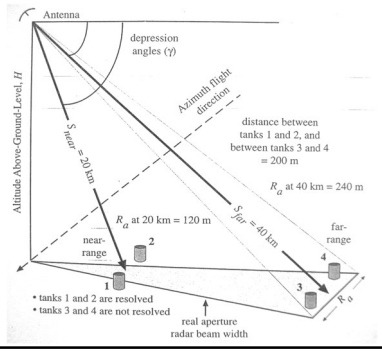
RSLab

SAR





$$R_r = \frac{\tau c}{2\cos\gamma}$$



$$R_a = \frac{H}{\sin\gamma}\frac{\lambda}{L}$$

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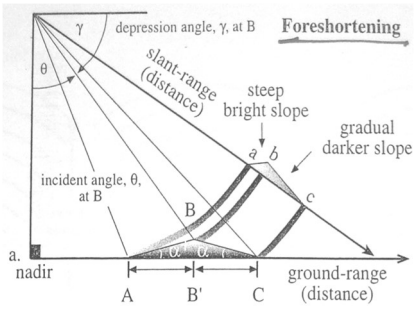
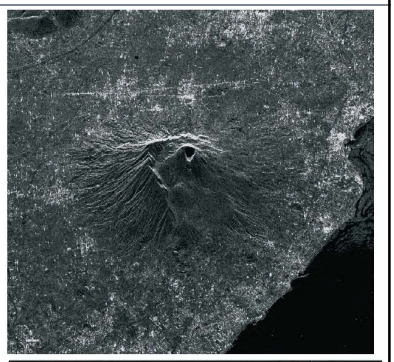
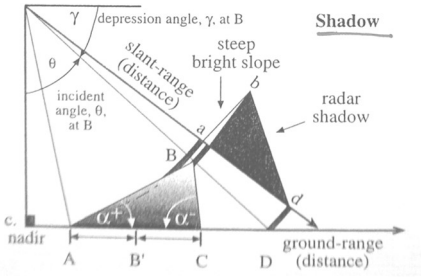
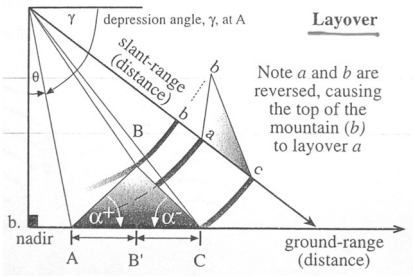
SAR



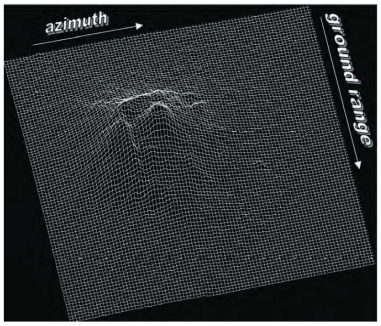




$a^- > \gamma$



$\theta < \alpha^+$



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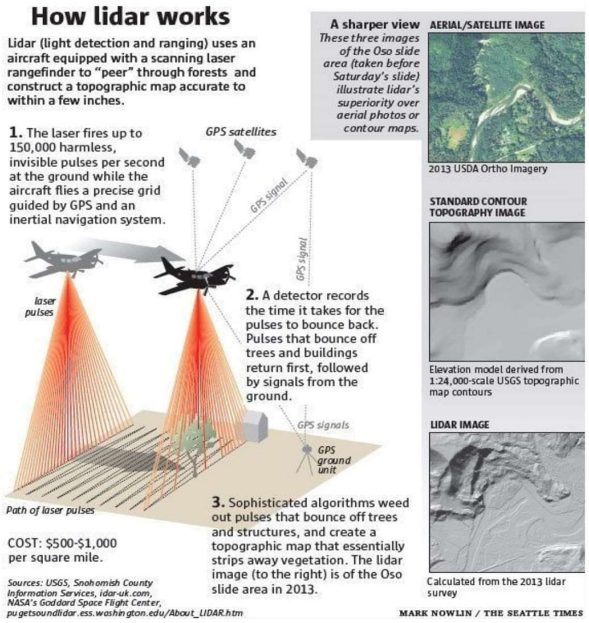
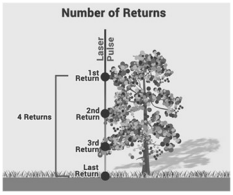
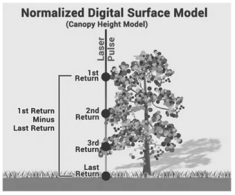
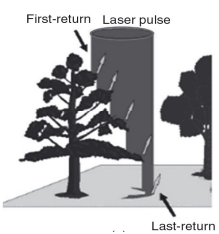
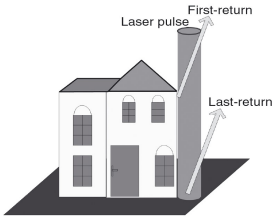
LiDAR

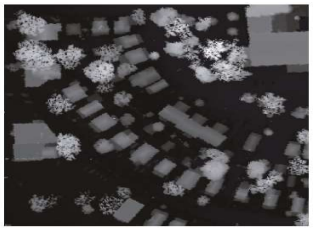


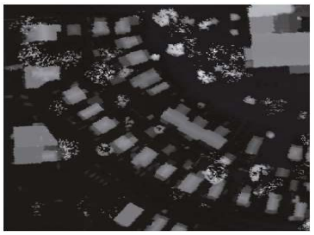












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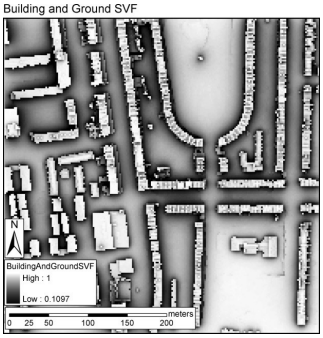
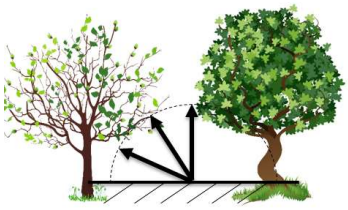
Building and ground DEM

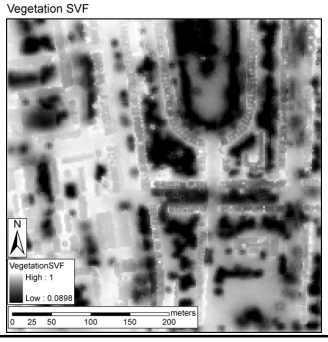
Building and Ground SVF



Vegetation DEM



Vegetation SVF



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Future trends

Spatial Resolution Trend over the past 15 years

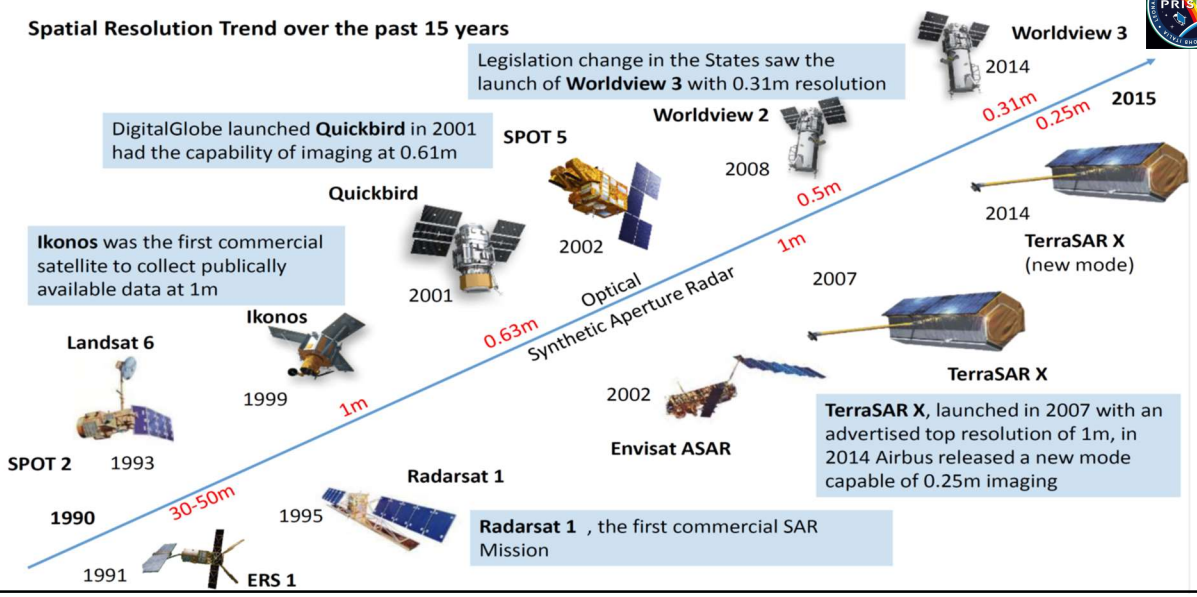
Legislation change in the States saw the launch of **Worldview 3** with 0.31m resolution

DigitalGlobe launched **Quickbird** in 2001 had the capability of imaging at 0.61m

Ikonos was the first commercial satellite to collect publically available data at 1m

TerraSAR X, launched in 2007 with an advertised top resolution of 1m, in 2014 Airbus released a new mode capable of 0.25m imaging

Radarsat 1 , the first commercial SAR Mission



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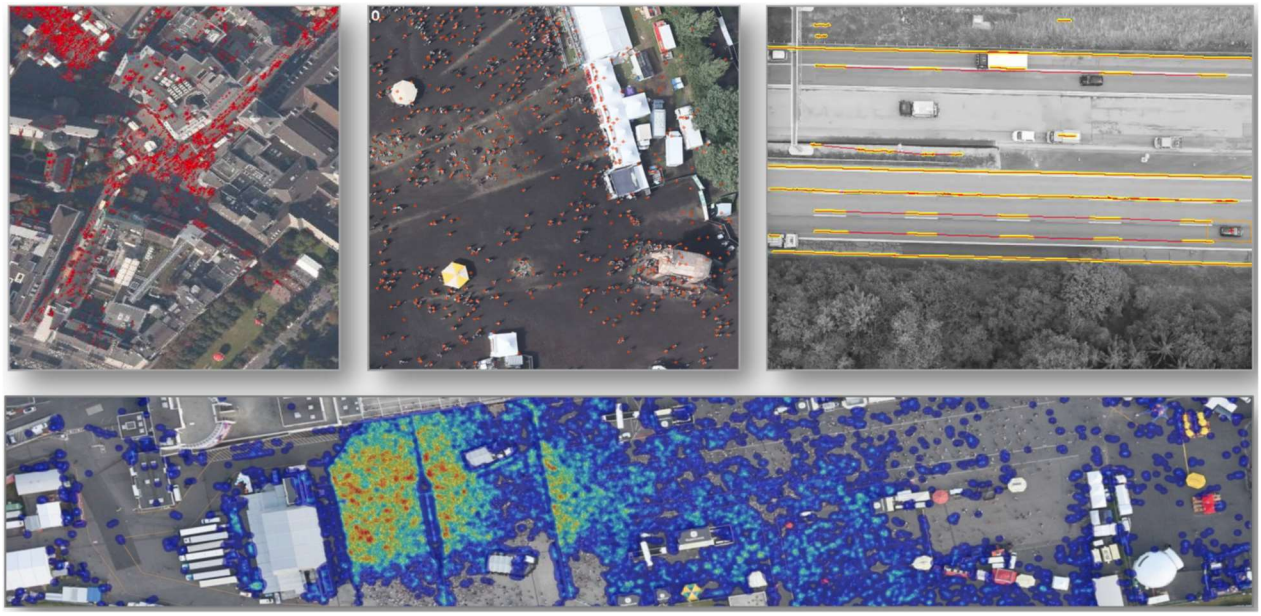

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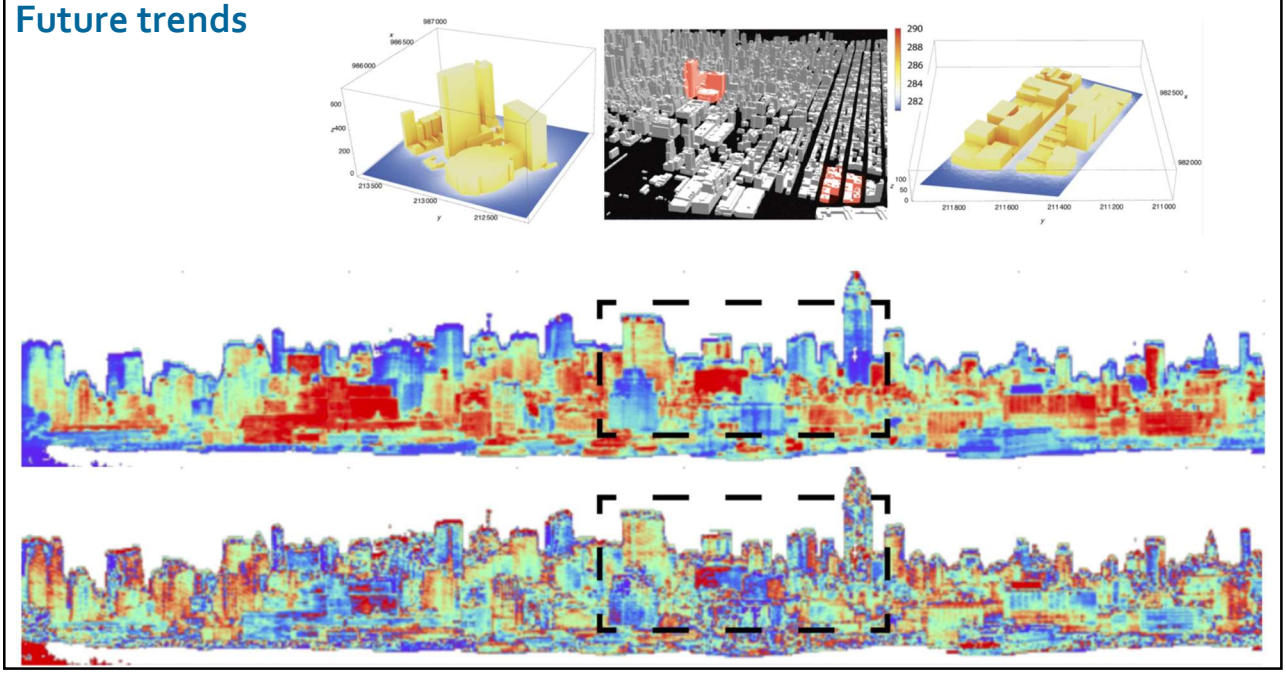

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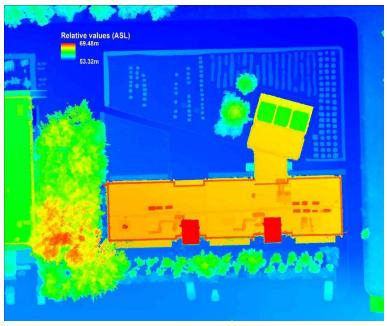

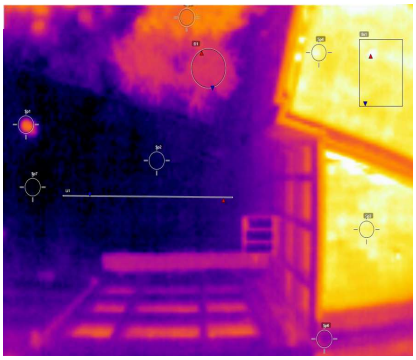

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Future trends

EO Expert

Training data

AI expert

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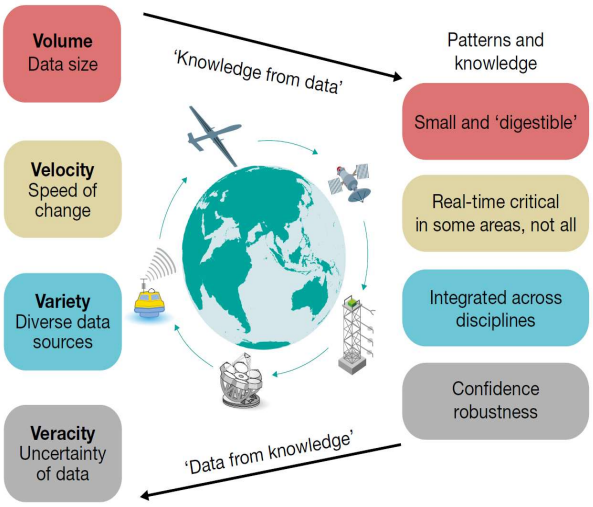
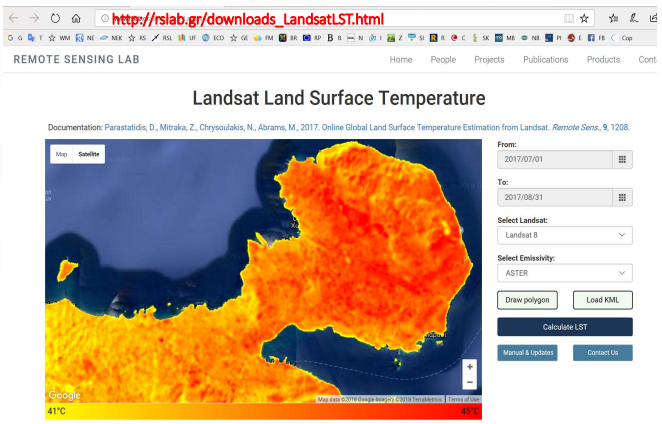
Future trends



Google Earth Engine



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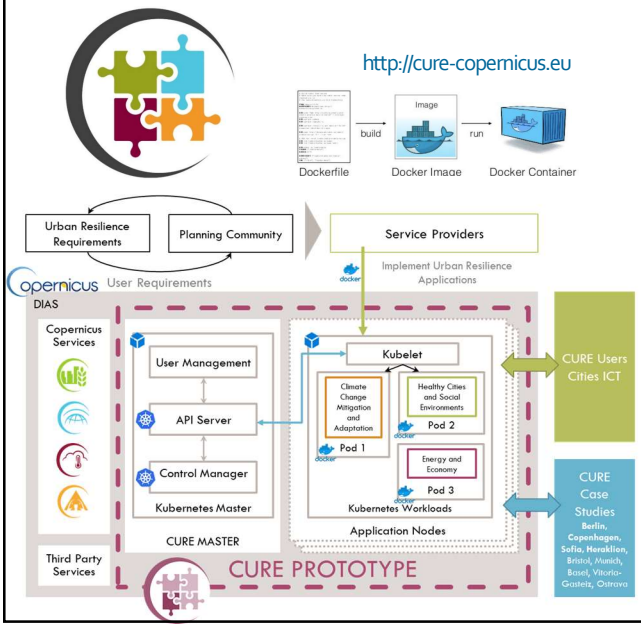

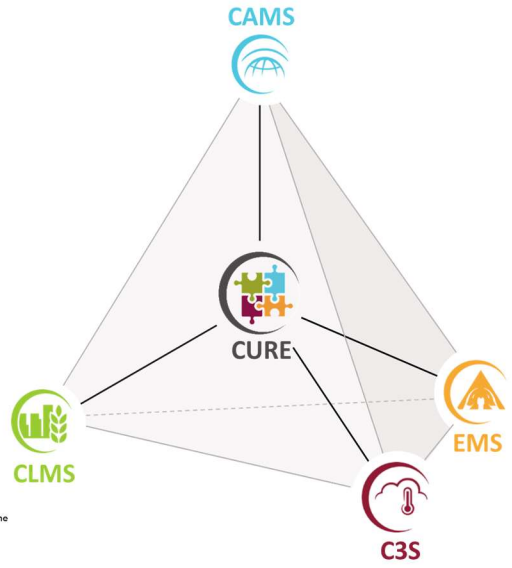

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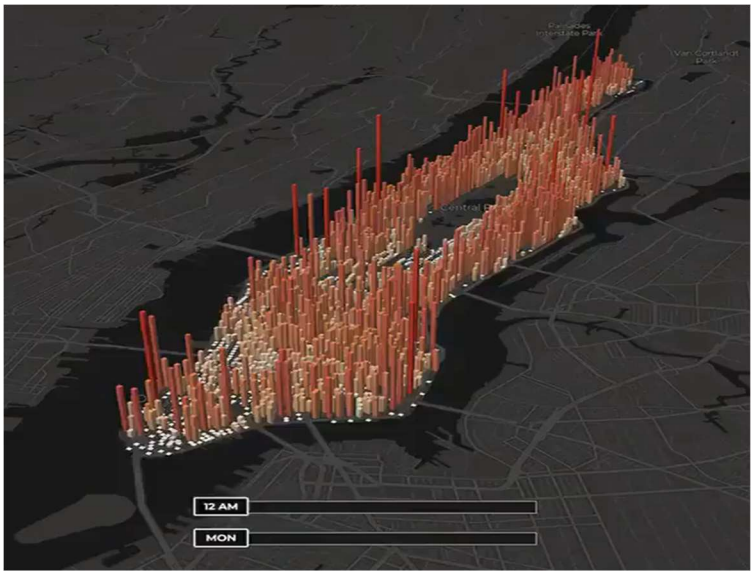

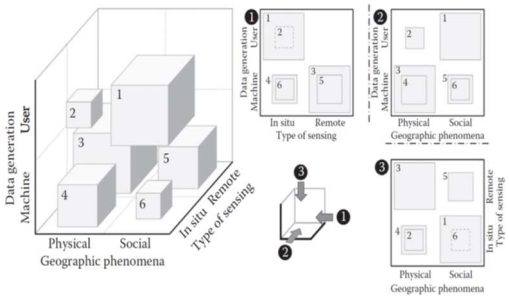

1. VGI and mobile network traffic
2. VGI in the context of environmental status updates
3. Satellite imagery
4. Measurements from sensors and sensor networks
5. Human settlements extracted from satellite imagery
6. Counter data at entrances and exits of shopping malls, public transport.

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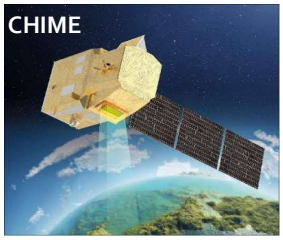
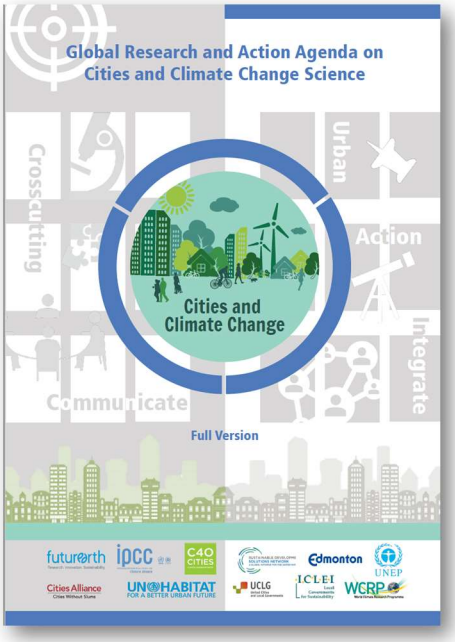
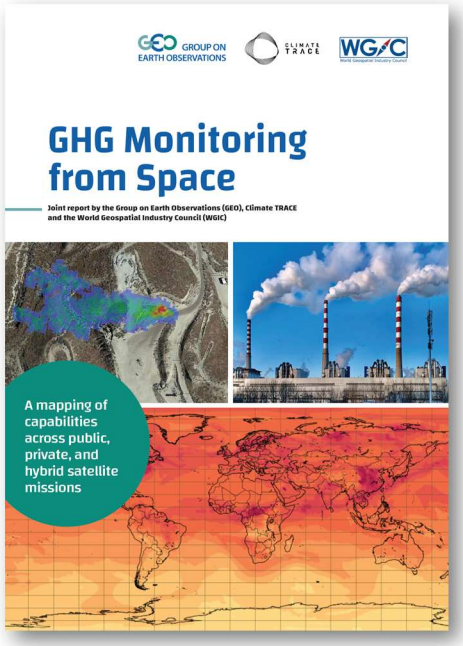
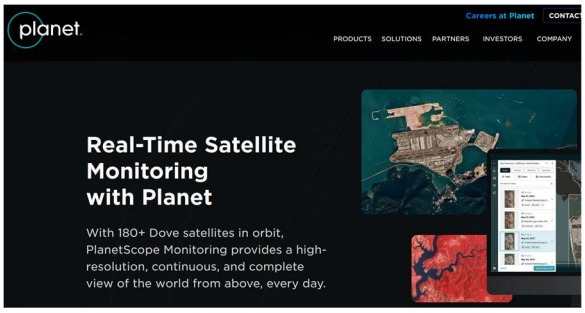






Future trends



Albedo wins license to sell 10-centimeter imagery

by Debra Werner — December 14, 2021