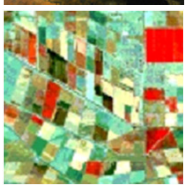
Potential and limitations of remote sensing for cadastre and land management

Potentiel et limites de la télédétection pour les applications foncières



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Conservatoire National des Arts et Métiers
France

FIG 2011
Marrakech, May 2011

Traditional use of remote sensing
for land management
Usages traditionnels de la télédétection pour les applications foncières

Technological improvements
and benefits for land management
Améliorations technologiques et retombées pour la gestion foncière

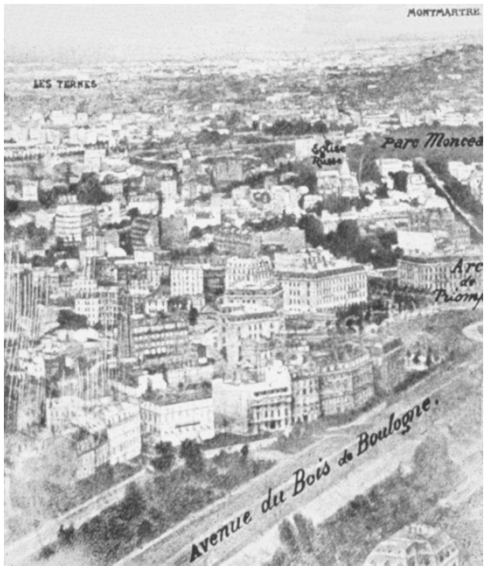
New possibilities
Nouvelles applications possibles de la télédétection dans le domaine foncier

Conclusion

1 Traditional use of remote sensing for land management

Usages traditionnels de la télédétection pour les applications foncières

Aerial photography for land management : a long history



First aerial photograph by Nadar (Paris, 1860)

Applications
of remote sensing

Agriculture
Urban planning
Resource monitoring
Natural hazard assessment
Epidemiology
Archeology

Information
provided by remote sensing

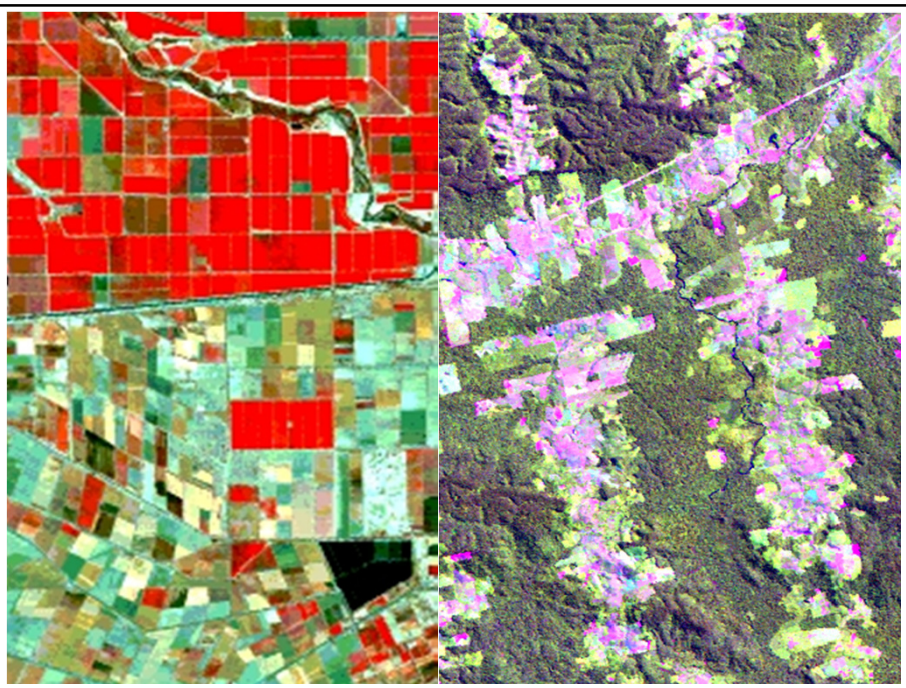
2D / 3D geometry
Description of land cover
Evidence of land use

Advantages
of using remote sensing

Survey is often faster and cheaper
Traditional cadastral mapping is limited to boundaries
Remote sensing provides a visual support

Human settlements generate patterns under two influences

A. **Spatial expression of a land policy**
B. **Presence of natural constraints**



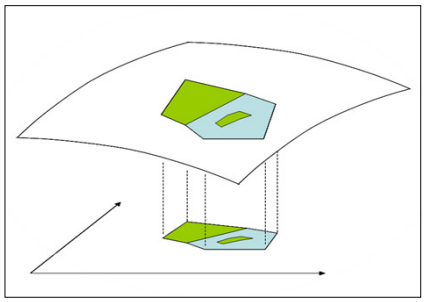
US / Mexico border *deforestation in the Brasilian Amazonia*

Requirement 1

Definition of a 2D « geometry » on the Earth surface

- Measurement possibilities

- Topological rules

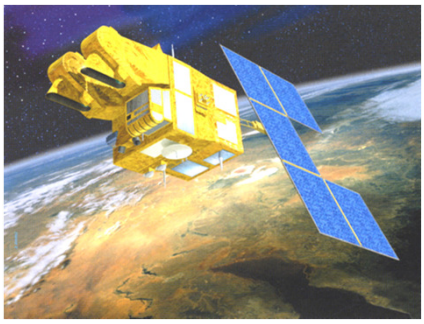


Requirement 2

Existence of suitable sensors to describe the Earth surface :

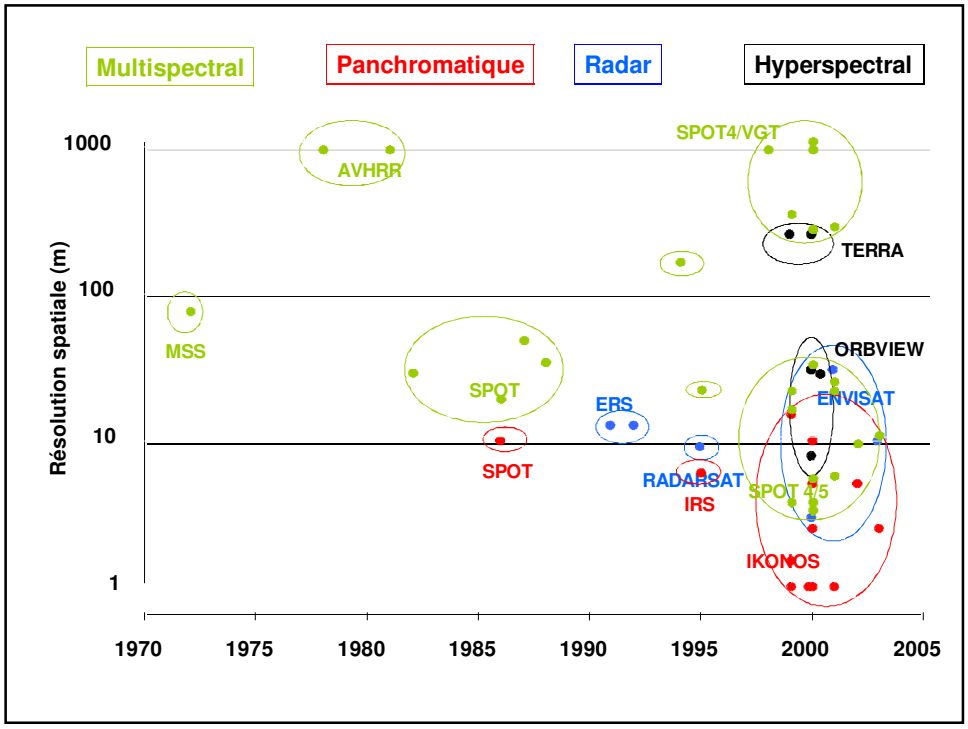
- Suitable scale

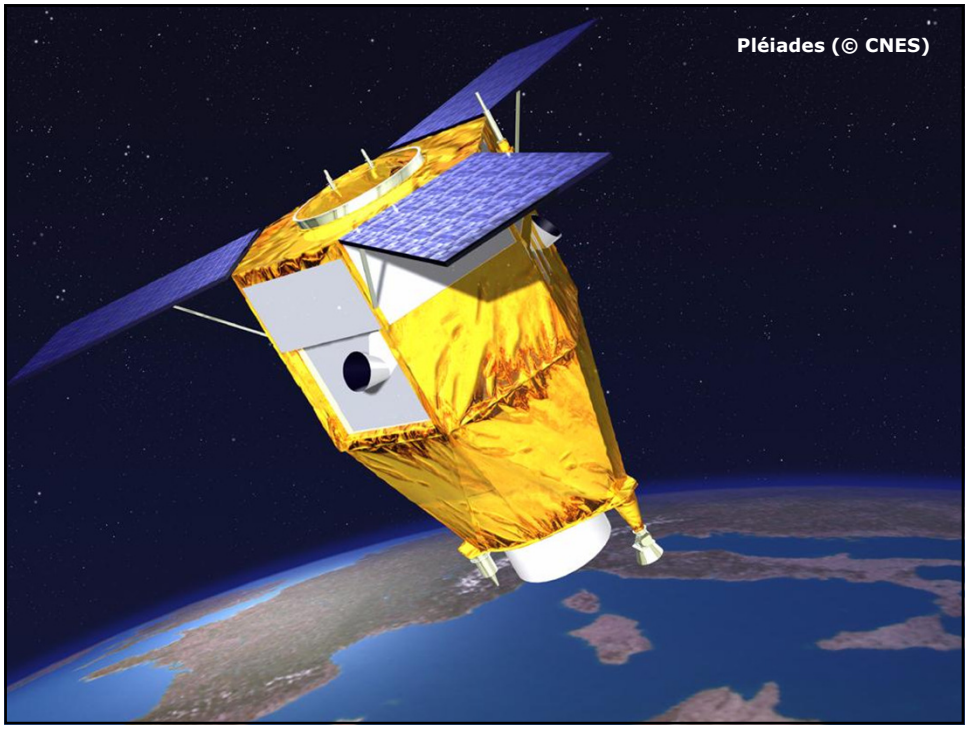
- Suitable spectral domain



2 Technological improvements and benefits for land management

Améliorations technologiques et retombées pour la gestion foncière


Multispectral
Panchromatique
Radar
Hyperspectral
Résolution spatiale (m)
1000
100
10
1
1970
1975
1980
1985
1990
1995
2000
2005
AVHRR
SPOT4/VGT
TERRA
MSS
SPOT
ERS
ORBVIEW
ENVISAT
SPOT
RADARSAT
IRS
SPOT 4/5
IKONOS


Pléiades (© CNES)

Ground resolution
Opens new possibilities for urban planning
Drawback : heterogeneous data bases

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Location accuracy
Reduces need for ground control points

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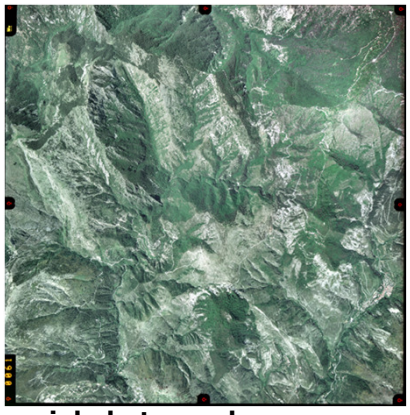
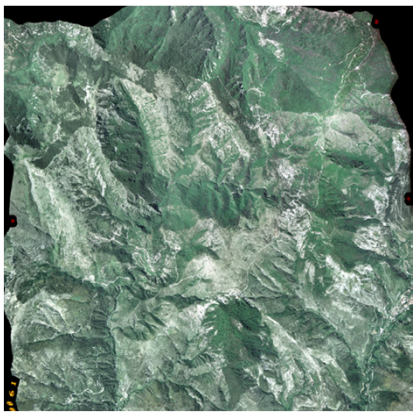
Stereo capabilities
DTM available for image rectification
3D location



aerial photograph

acquisition parameters

digital elevation model



Orthophoto

A standard product
- for permanent data bases
- for one shot projects

Ground resolution
Opens new possibilities for urban planning
Drawback : heterogeneous data bases

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Stereo capabilities
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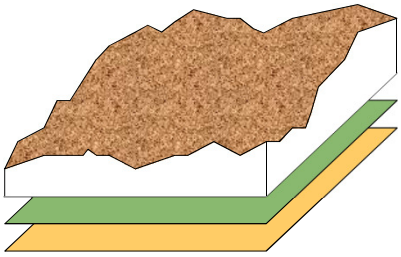
3D location

Digital information
Automated aerotriangulation
Automated image rectification
GIS has become a standard environment

GIS = standard environment



A geodata base
A query language
A toolbox (computation, display etc.)

Ground resolution
Opens new possibilities for urban planning
Drawback : heterogeneous data bases

Location accuracy
Reduces need for ground control points

Stereo capabilities
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Digital information
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Automated image rectification
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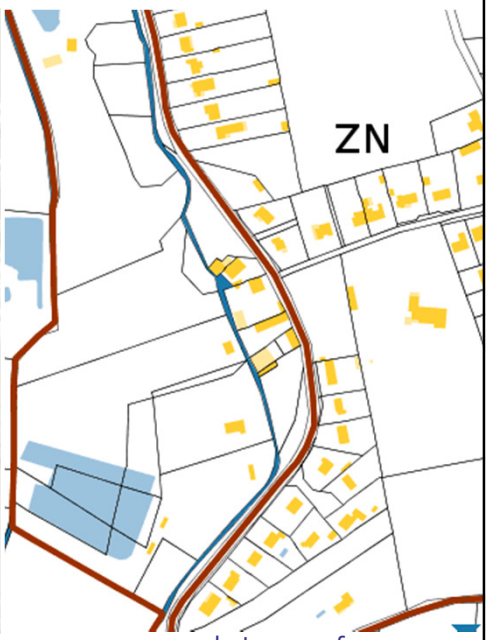
Internet
Public data bases

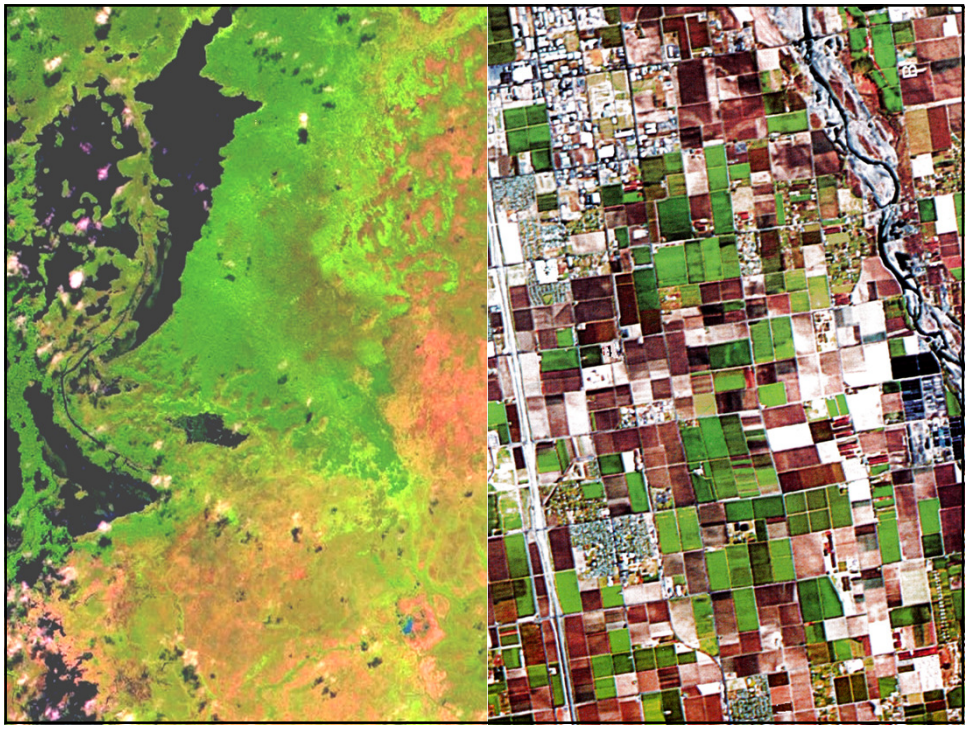
Institut Géographique National

www.geoportail.fr

Direction Générale des Finances Publiques



www.cadastre.gouv.fr

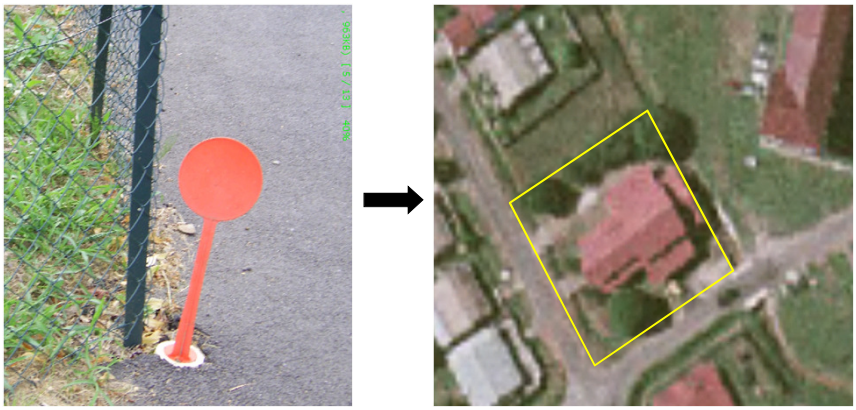



3
New possibilities
Nouvelles applications possibles
de la télédétection dans le domaine foncier

1.Virtual boundary delineation

Délimitation virtuelle

The boundary in defined in an rectified image



Technical constraints

Location accuracy

Image quality

Virtual delineation will never replace a surveyor

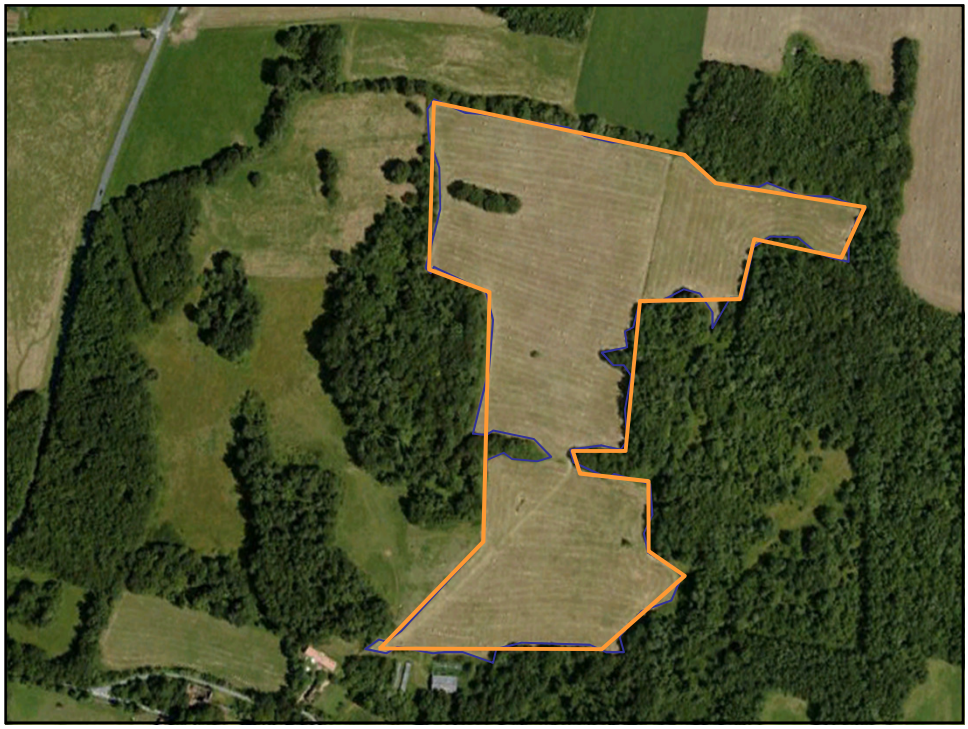
Limitation of the legal value of an image

Legal boundaries do not always fit the visible boundaries

It can provide a valuable help

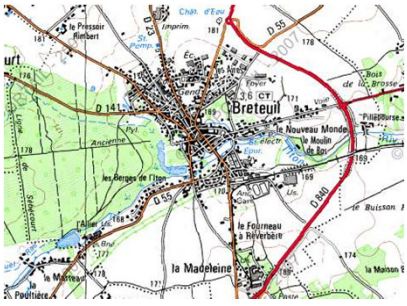
To save and share the information more securely

To replace traditional delineation in specific situations :
- when the boundary position is not accessible
- when the boundary is curvilinear or « fractal »



2. Public communication

Communication grand public



An ortho-image is much more friendly than a map
The information is not « filtered »
The cost per km2 is lower

Beijing declaration (2008) :

We, members of the International Society for Photogrammetry and Remote Sensing (ISPRS) and participants of the XXIst ISPRS Congress in Beijing, recognise the importance of imagery to measure and monitor the natural and man-made features on planet Earth and to explore othr planets of the solar system, especially after witnessing the important role of photogrammetry, remote sensing and spatial information systems in the rescue operation and damage assessment of the recent devastating natural disasters.

Sydney declaration (2010) :

We, members of FIG and participants of the FIG XXIV International Congress in Sydney, 11-16 April 2010, recognise the importance of good land information and good land governance in support of the global agenda such as the Millenium Development Goals, and as a basis for meeting the key challenges of the 21st centurysuch as climate change, natural disasters, environmental degradations, rapid urban growth, and poverty eradication.