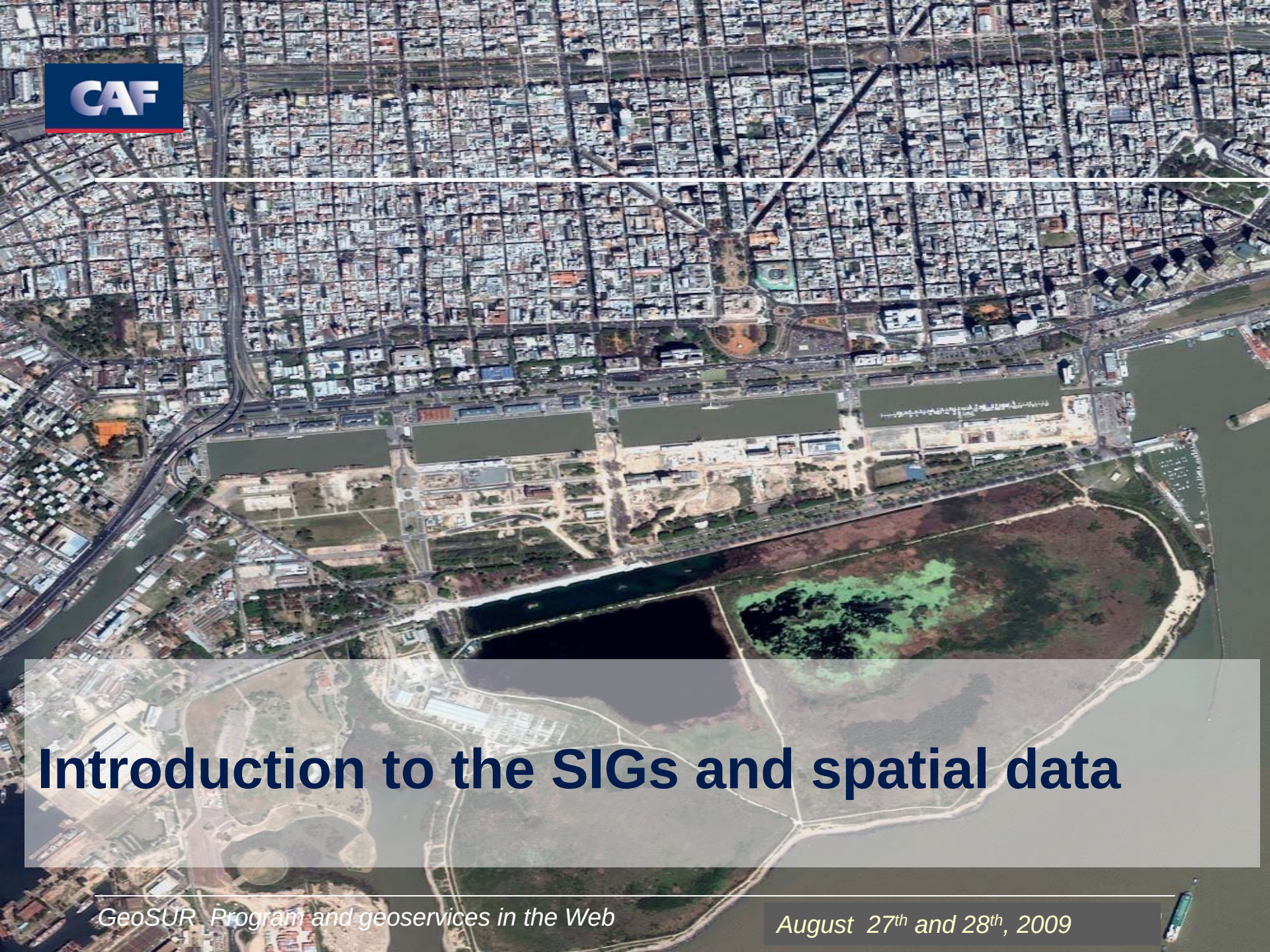
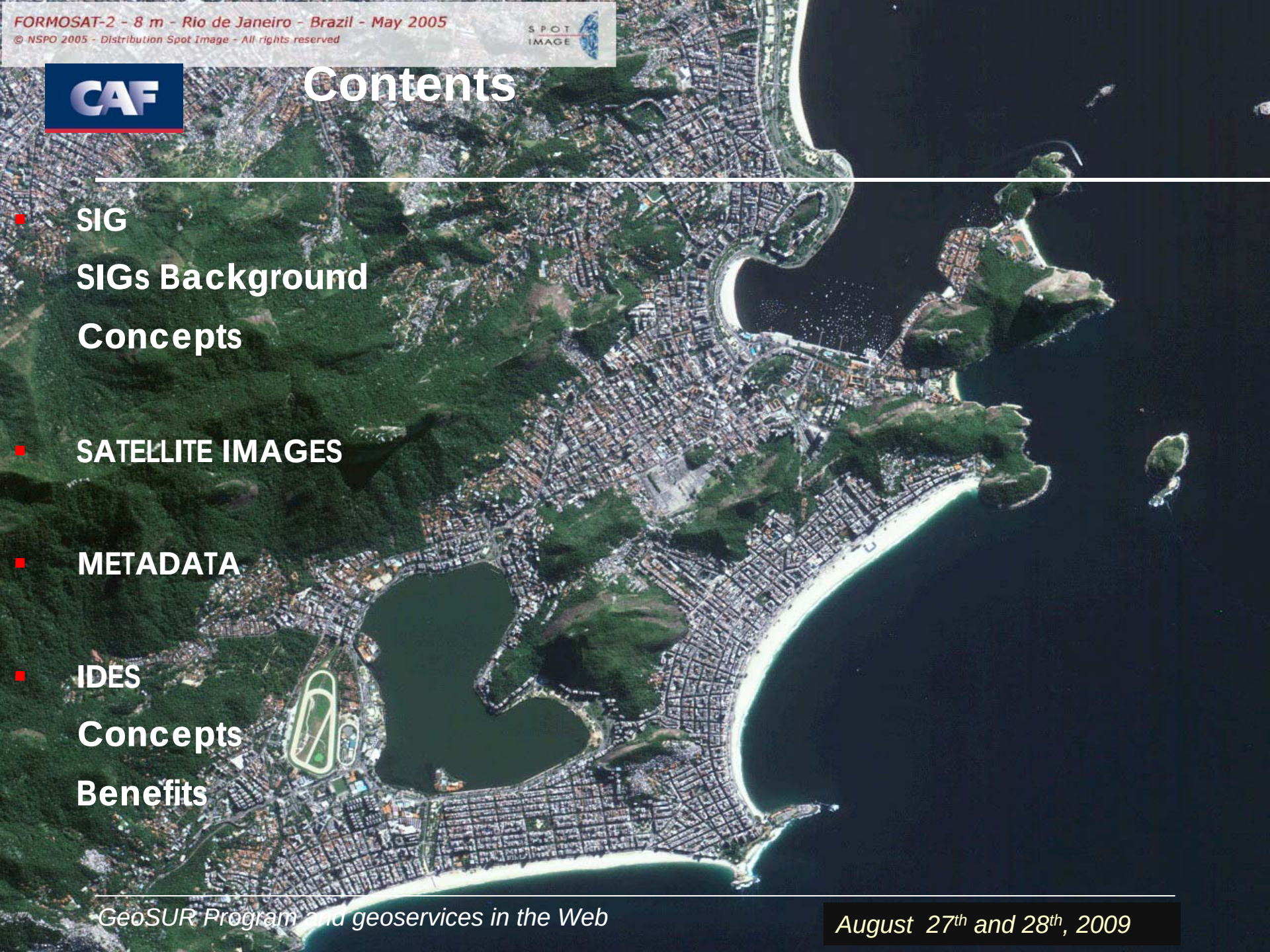


Introduction to the SIGs and spatial data

GeoSUR Program and geoservices in the Web

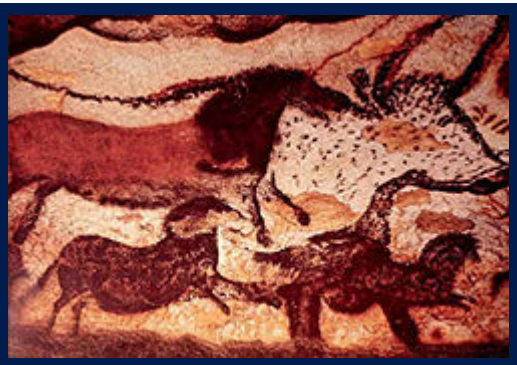
August 27th and 28th, 2009



Contents

- SIG
  - SIGs Background
  - Concepts
- SATELLITE IMAGES
- METADATA
- IDES
  - Concepts
  - Benefits

SIGs Background



Lascaux Caves (France), Cro-Magnon man, 15,000 years ago.

In 1854, Dr. John Snow mapped out the incidence of the cholera cases in a map of the district of SoHo, in London.

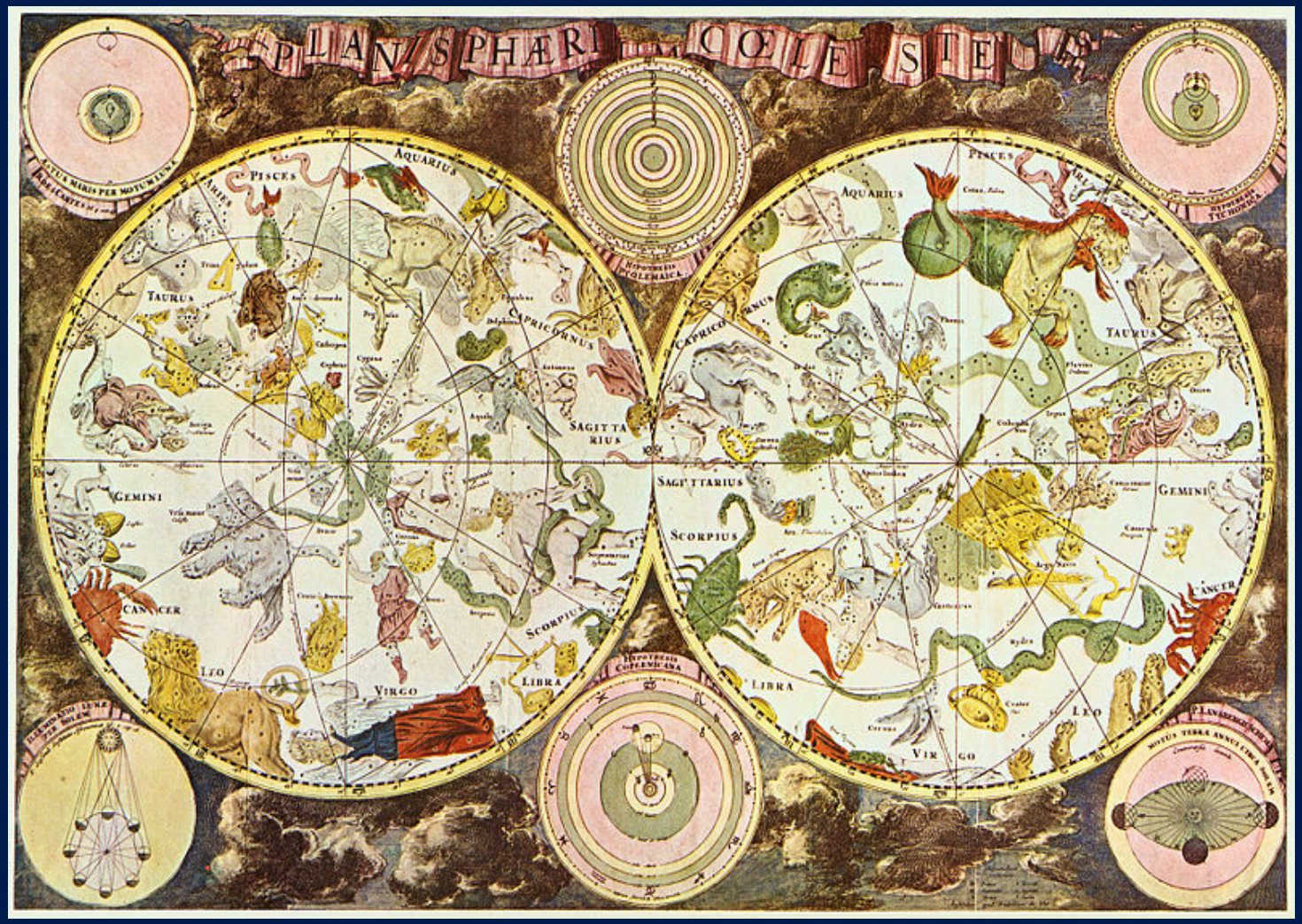
An example of georeferenced data collection is the one developed by the Incas.

SIGs Background

The Inca Empire

Vision of territory familiarization

SIGs Background

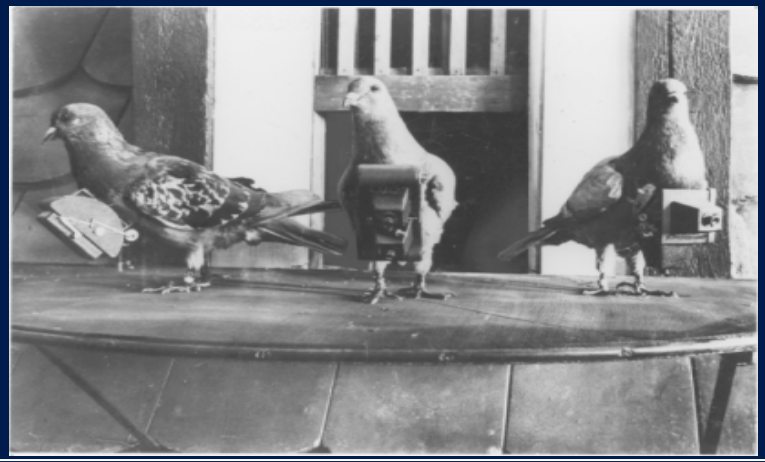


Celestial Chart.
XVII century.

SIGs Background

In 1905, the first aerial photographs (from a plane) were taken.

In 1962, Roger Tomlinson, the first SIG was used to store, analyze and manage data gathered for the Canada Land Inventory, or CLI. It was the first SIG in the world (just as we know it nowadays).



In 1903, photographs were taken every 30 seconds, with cameras attached to pigeons.

Geographic Information System – SIG, in Spanish

The Geographic Information Systems (SIGs) →

are a "powerful set of tools used to gather, store, recover at will, transform and deploy spatial data from the real world for certain purposes" (Borrough, 1986)

It involves:

Geographic Information System – SIG, in Spanish

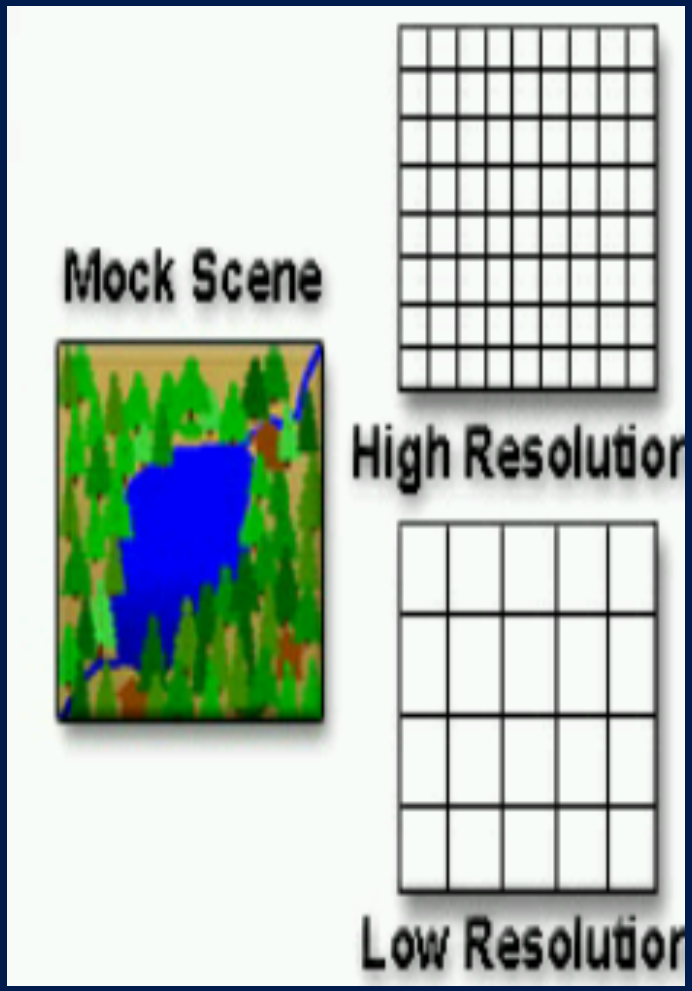
Raster

It is a very simple data structure. A raster data type is, essentially, any type of digital image represented in meshes.

The pixel is the least information unit in an image. A combination of these pixels will create an image.

Geographic Information System – SIG, in Spanish

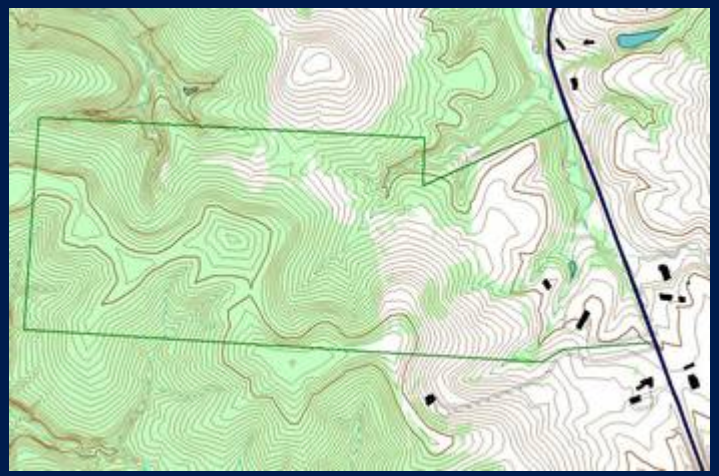
Raster



Photographed Images

Geographic Information System – SIG, in Spanish

Vector



It is based on the vectorial representation of the spatial component of the geographic data. It represents the objectives through the coordinates of the points or vertexes that delimitate them.

Types of topological dimensions

- Punctual (topological dimension: 0)
- Lineal (topological dimension: 1)
- The polygons (topological dimension: 2)

Geographic Information System – SIG, in Spanish

Software

Descriptive Data

Name	Address	City	Street	Zip
xxx	cll	01	45	17
xyy	cr	02	45	18
yyyyy	dg	03	75	19

Spatial Data

SI ⇒ Sig ⇐ g

Geographic Information System – SIG, in Spanish

Software

Descriptive Data

Name	Address	City	Street	Zip
xxx	cll	01	45	17
xyy	cr	02	45	18
yyyyy	dg	03	75	19

Spatial Data

SI → Sig ← g

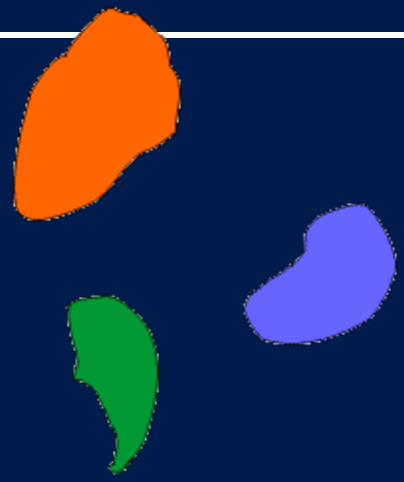
Geographic Information System – SIG, in Spanish

Software

Descriptive Data

Name	Address	City	Street	Zip
xxx	cll	01	45	17
xyy	cr	02	45	18
yyyyy	dg	03	75	19

Spatial Data



SI → **Sig** ← g

Geographic Information System – SIG, in Spanish

Software

Descriptive Data

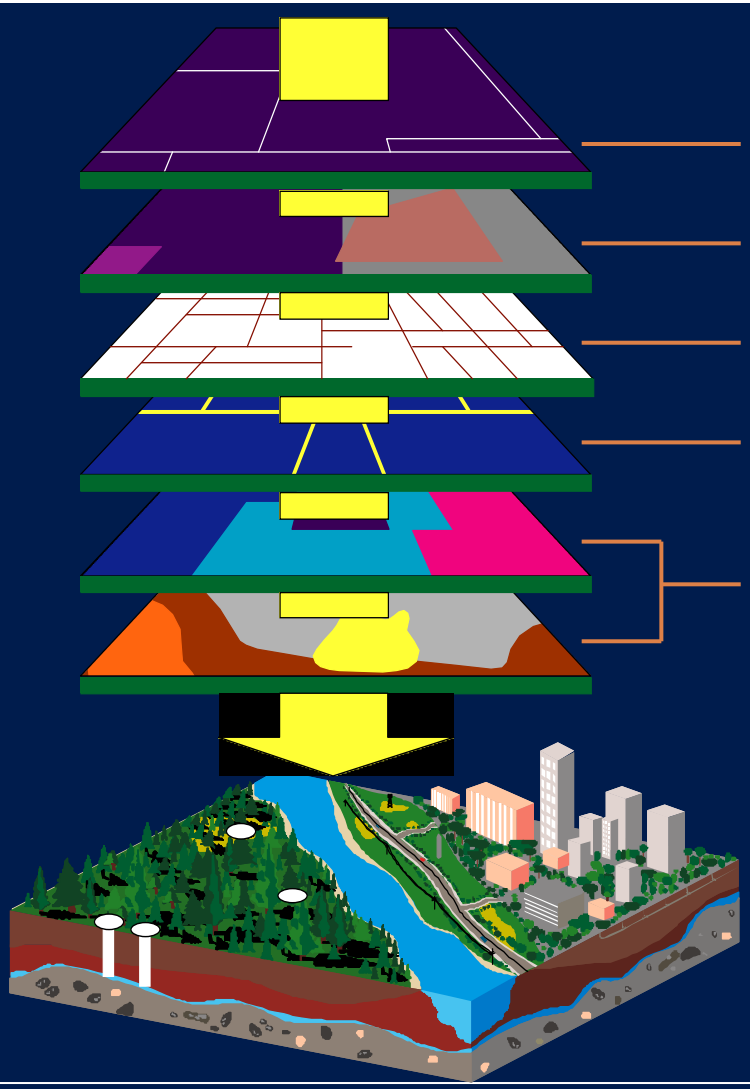
Name	Address	Flat	Street	Zip	Shape
xxx	cll	01	45	17	
xyy	cr	02	45	18	
yyyyy	dg	03	75	19	

is

The Integration of the Spatial and Descriptive Data

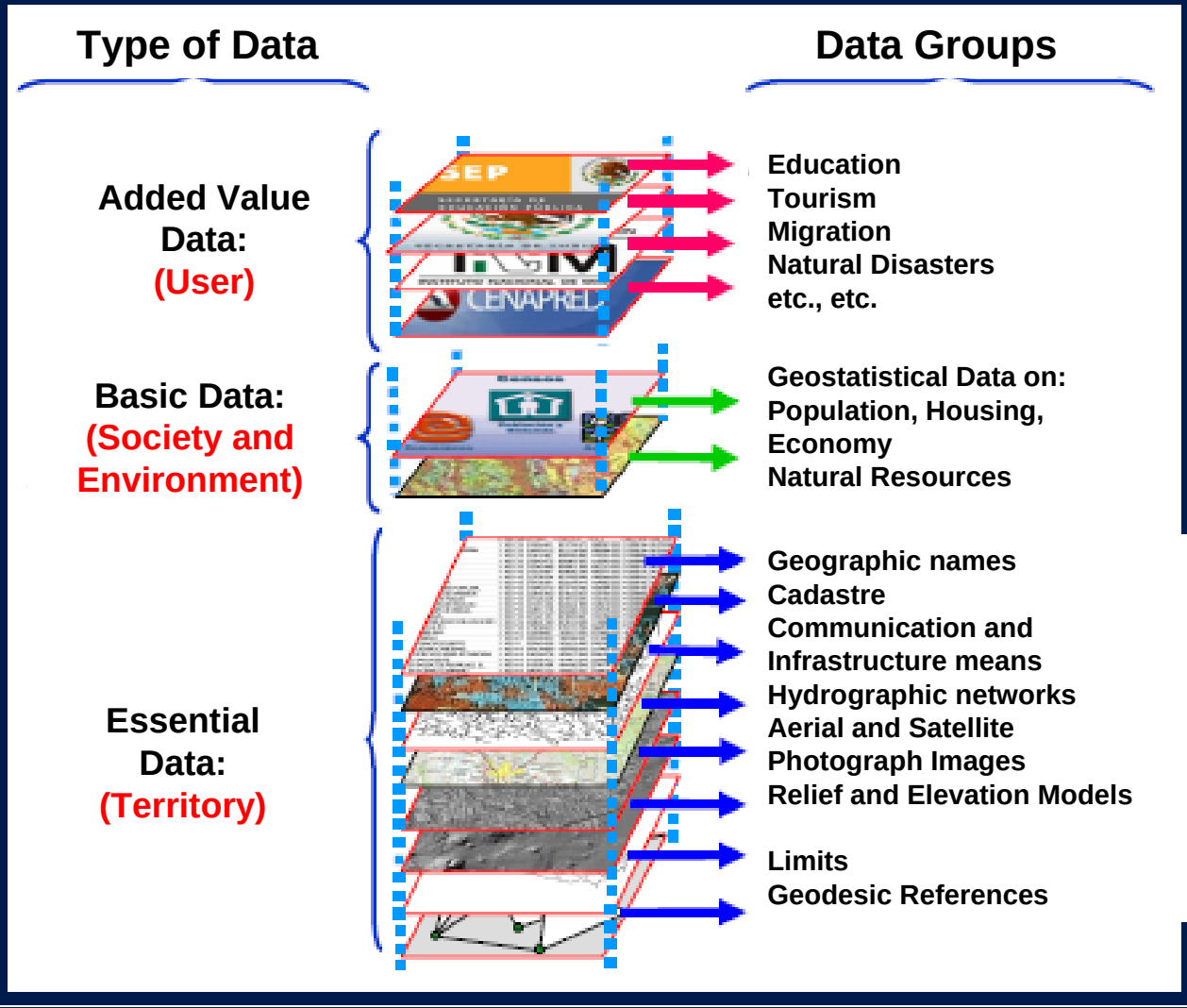
Geographic Information System – SIG, in Spanish

Representation of the real world



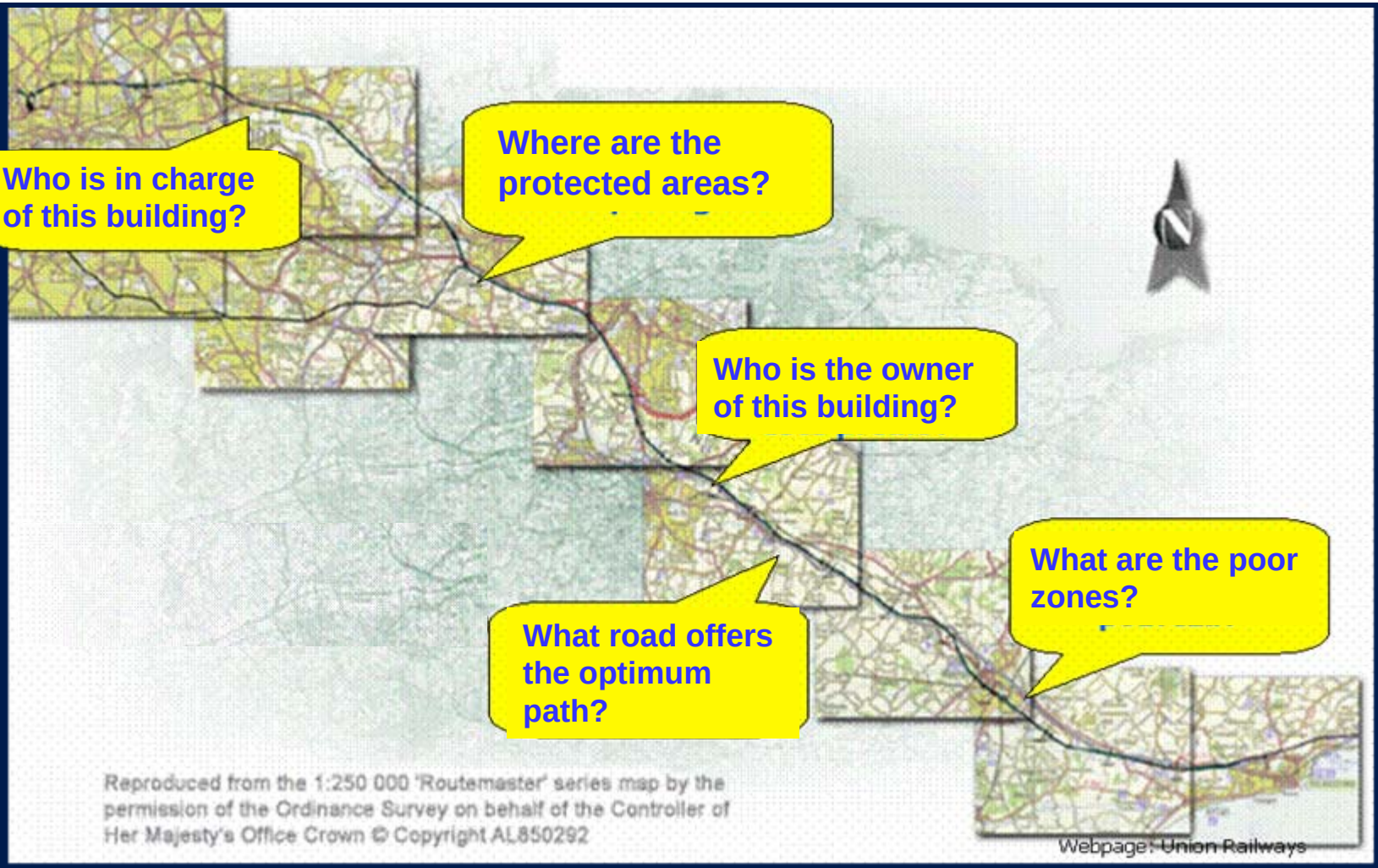
Geographic Information System – SIG, in Spanish

Representation of the real world



Geographic Information System – SIG, in Spanish

The SIG allows us to provide answers



Geographic Information
Everyday Use

The main matters that a SIG can solve are as follows:

Localization:	**to ask about the characteristics of a given place**
Status:	**fulfillment or not fulfillment of conditions related to the system**
Trend:	**comparison among temporal or spatial situations with any different characteristic**
Roads:	**estimation of optimum roads between two or more points**
Models:	**creation of models from simulated phenomena or acting**

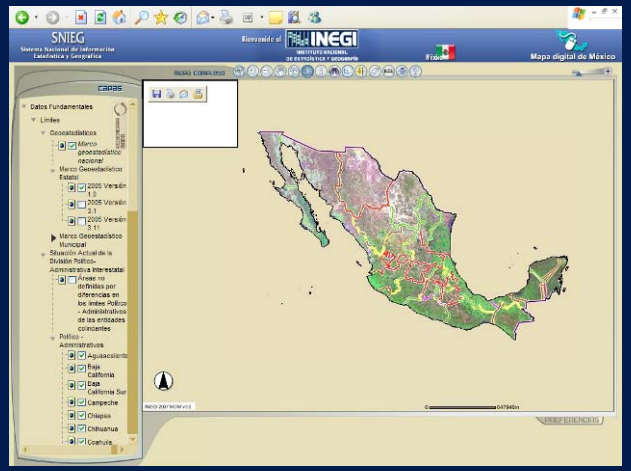
Geographic Information

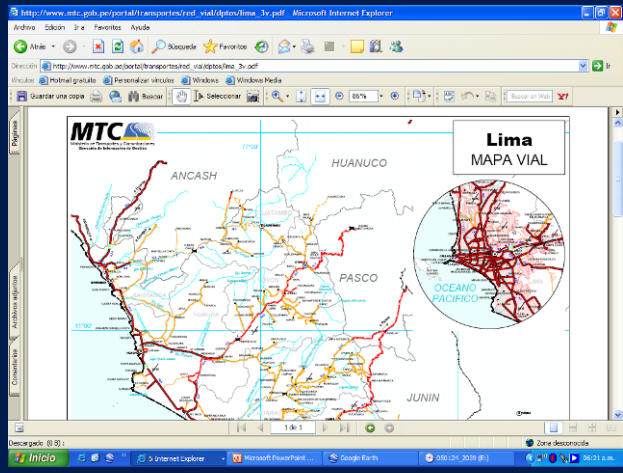
- The decision-making process depends, mainly, on the quality, precision and up-to-date nature of this spatial information.

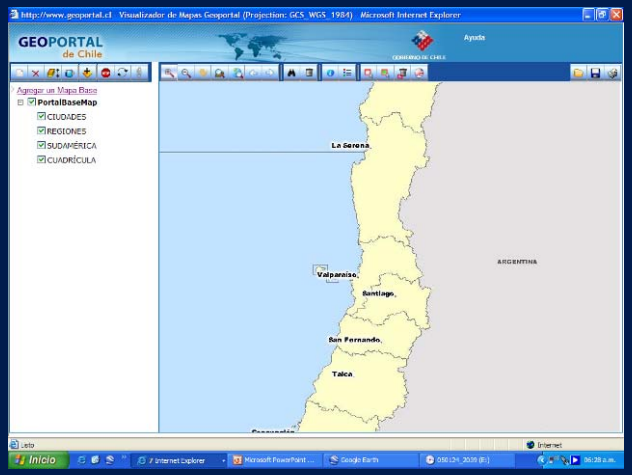
- The Geographic Information Systems have become, over the last 25 years, in one of the most important tools for researchers, analysts and planners.

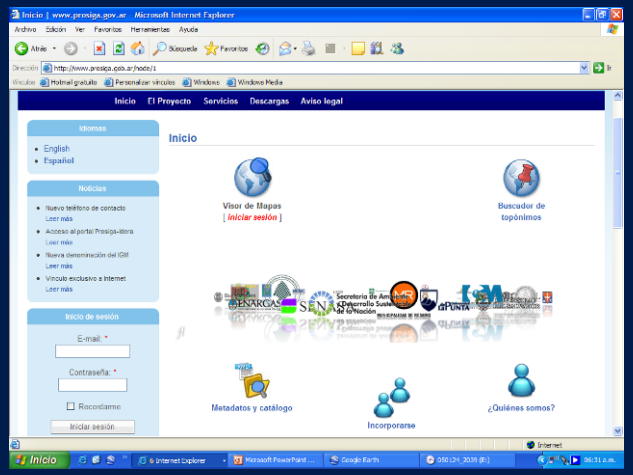
- The SIG Geographic Information Systems cannot exist by themselves. They are the result of the interaction among the parts of a system.

Online Geographic Information
Online SIG



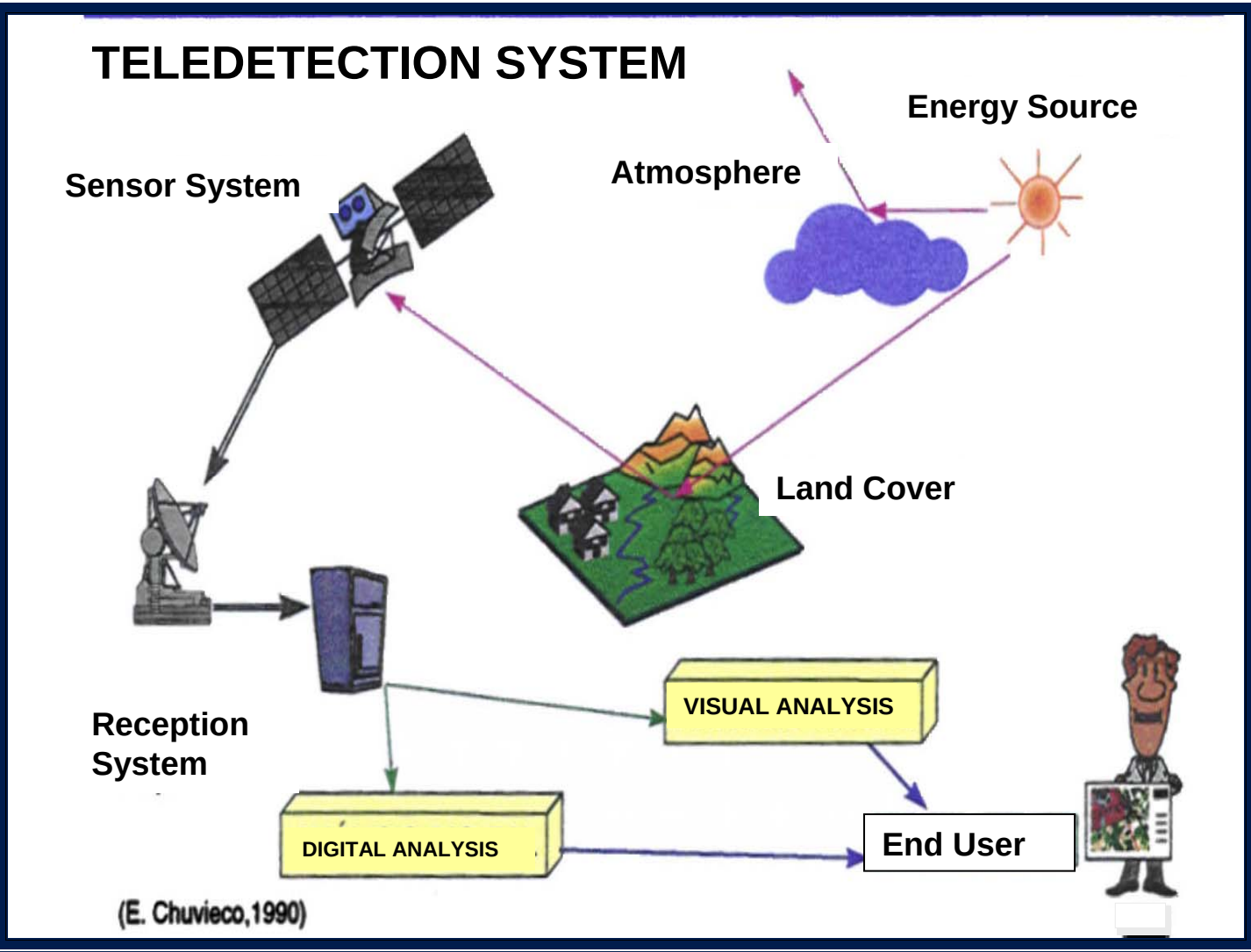






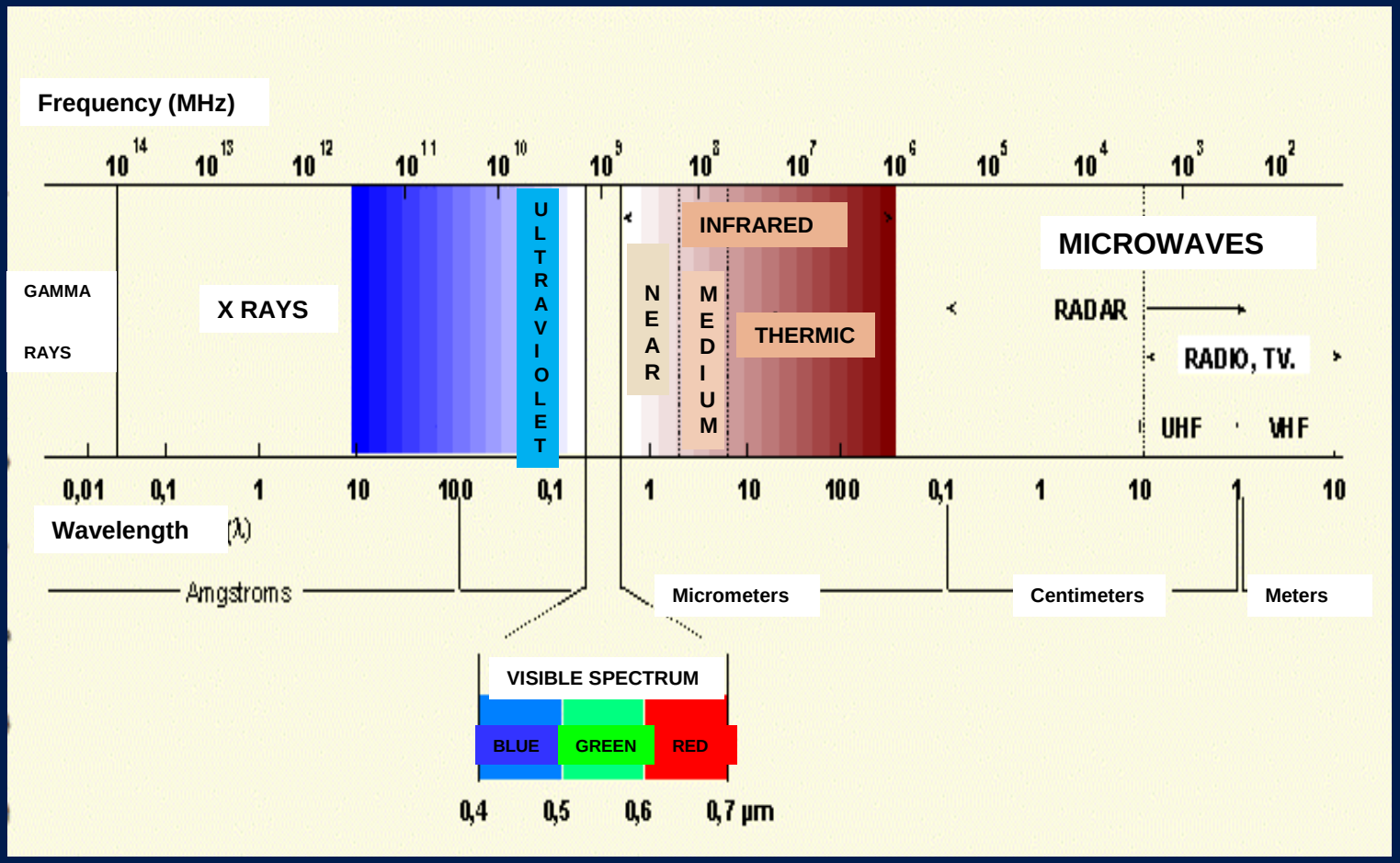
Satellite Images

Introduction



Satellite Images

Introduction



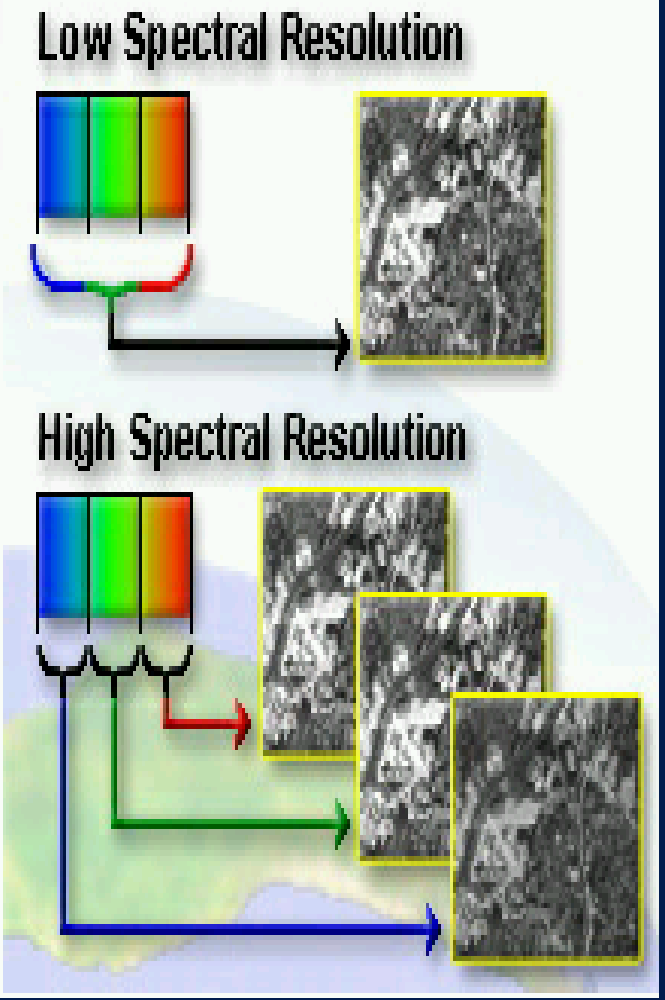
Satellite Images
Introduction

Spectral Resolution

Each band records a specific portion of the electromagnetic spectrum.

Spectral resolution refers to the specific wavelength intervals in the electromagnetic spectrum that a sensor can record.

Narrower bands have higher spectral resolution.

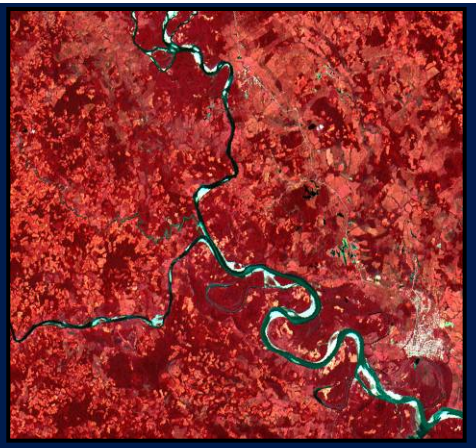


Satellite Images

Introduction

1-Meter Panchromatic IKONOS
Denver, Colorado

5-Meter color IRS-1C
Washington, D.C.



20-Meter – SPOT 1,2,3 Bands
Puerto Asis, Putumayo

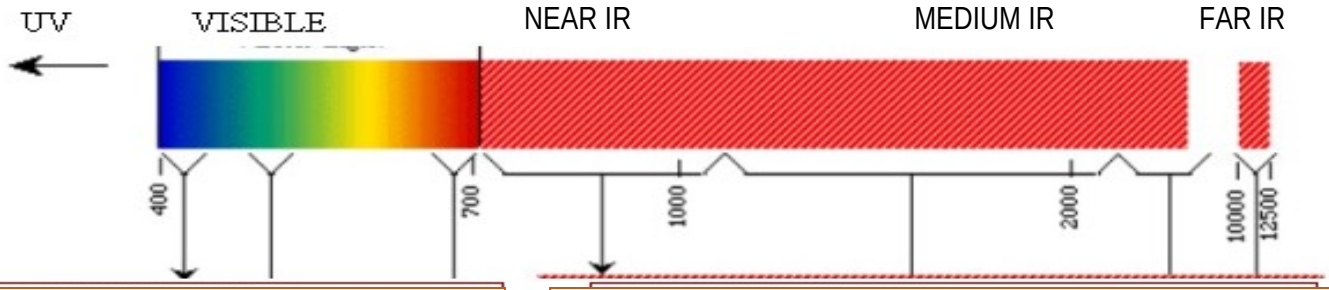
8-Meter - RadarSat
Fayetteville, North Carolina

30-Meter - Landsat TM 4, 3, 1 Bands
Washington, D.C.

Less than 1 Meter IKONOS MS
Colorado, D.C.

Satellite Images

Introduction



- ATMOSPHERIC DISPERSION
- BETTER PENETRATION IN CLEAR WATER

-PENETRATION IN CLEAR WATER
- DISCRIMINATION BETWEEN CLEAR AND MURKY WATER
- DETECTION OF OIL SPILLS
- REFLECTANCE PEAK FOR VEGETATION FOR VISIBLE RANGE

ABSORPTION OF CHLOROPHILA BY VEGETATION
LIMITED WATER PENETRATION
DETECTION OF ILL OR DEAD VEGETATION
DISCRIMINATION OF FOLIAGE COLOR

-STRESS IN VEGETATION
-BIOMASS STUDY
- DISCRIMINATION BETWEEN CONIFERS AND BROADLEAF TRESS

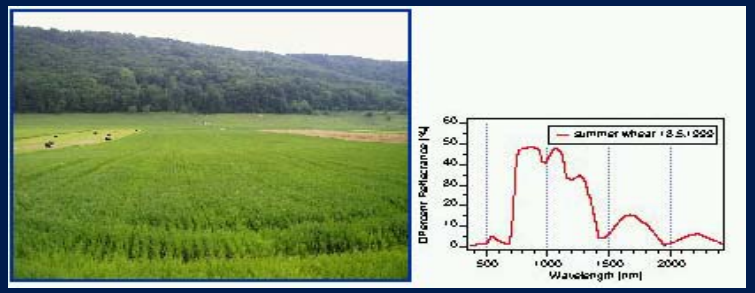
DETECTION OF OIL SPILLS
MOISTURE CONTENT IN SOILS AND VEGETATION
LIMITED CLOUD PENETRATION
DISCRIMINATION BETWEEN TYPES OF VEGETATION

EMISSION OF HEAT, GAS AND SMOKE DUE TO SMOG AND FIRES
SMOG PENETRATION
REFLECTED / EMITTED DIURNAL HEAT

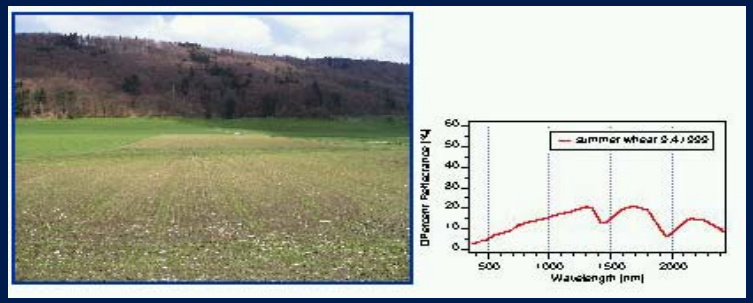
THERMAL ANALYSIS
DENSITY OF SOME VEGETAL COVERS
DISCRIMINATION AMONG TYPES OF COVER
DIURNAL THERMAL AND SEASONAL INERTIA

Satellite Images

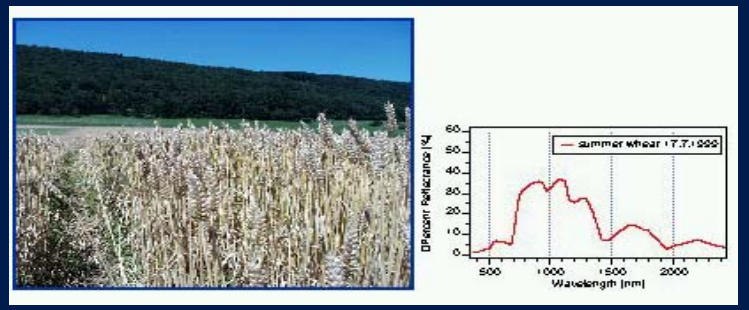
Introduction



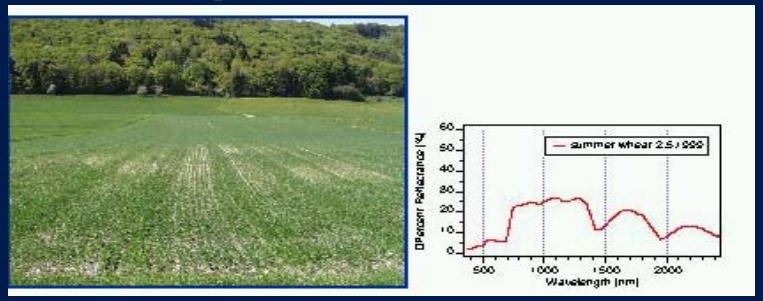
Wheat, June 24th 1999



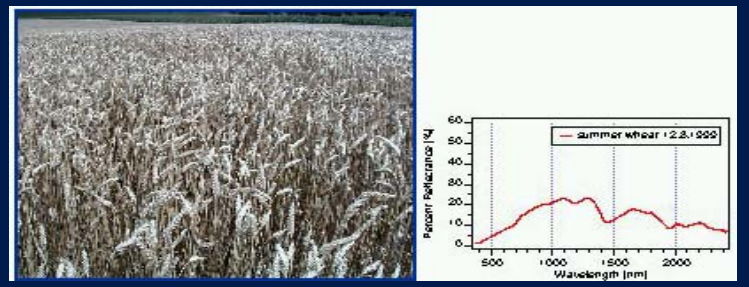
Wheat, April 4th 1999



Wheat, July 17th 1999



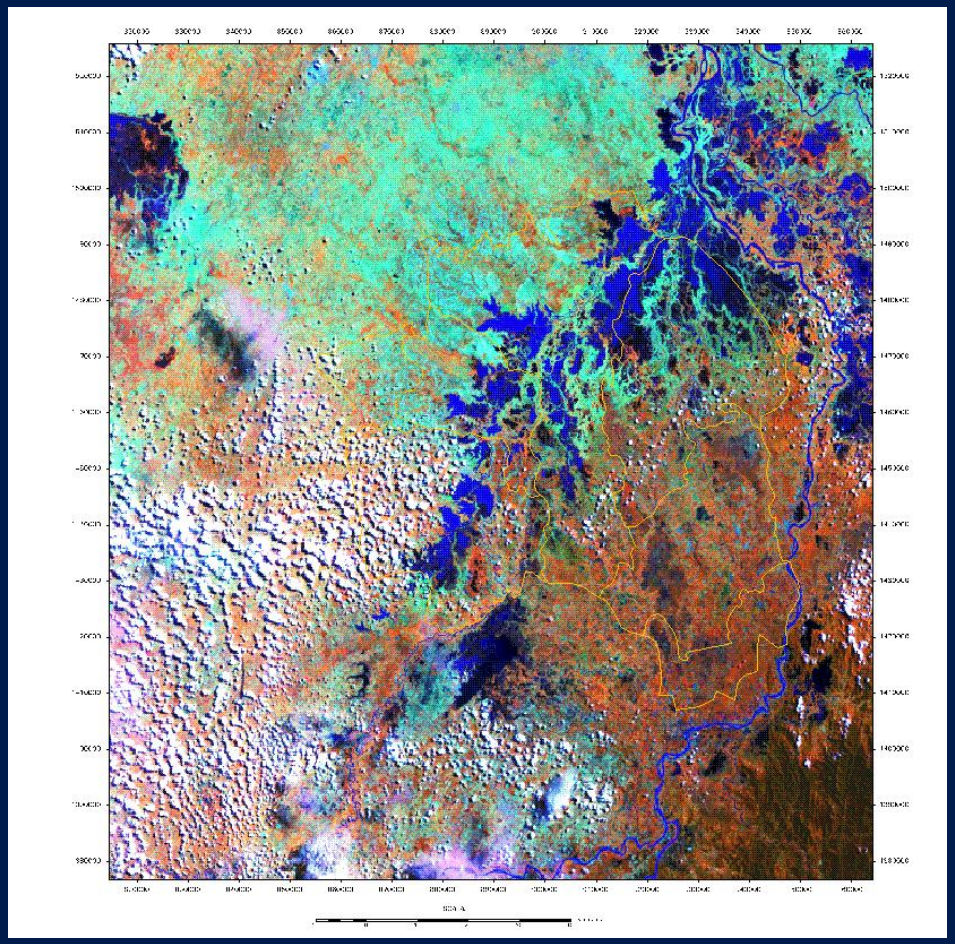
Wheat, May 2nd 1999

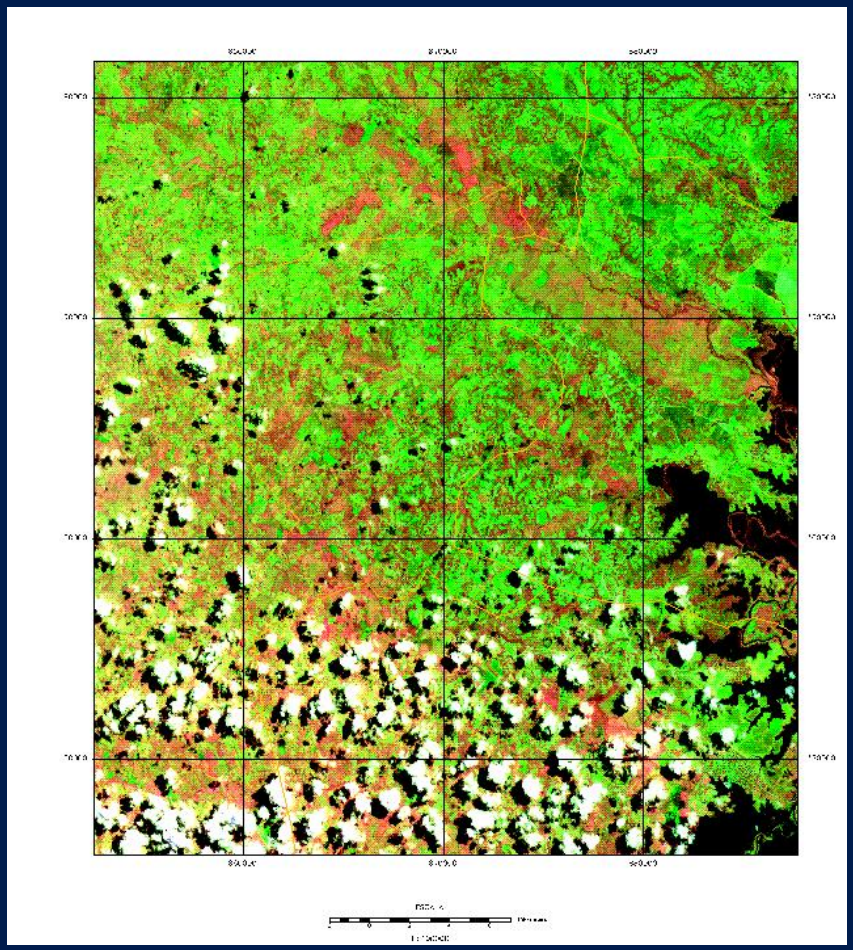


Wheat, August 12th 1999

Satellite Images

Introduction





How do we get information for a SIG?

- Information gathered directly *in situ*,
- Remote sensors (remote perception)
- Published information (thematic mapping)
- Censuses, surveys, interviews

Main producers:

- Military Organizations
- National offices
- Remote perception companies and “satellite” agencies
- Universities and research centers
- Studies on natural resources: Geology, Hydrology, Geography and Edaphology; Ecology; Meteorology and Climatology; Oceanography

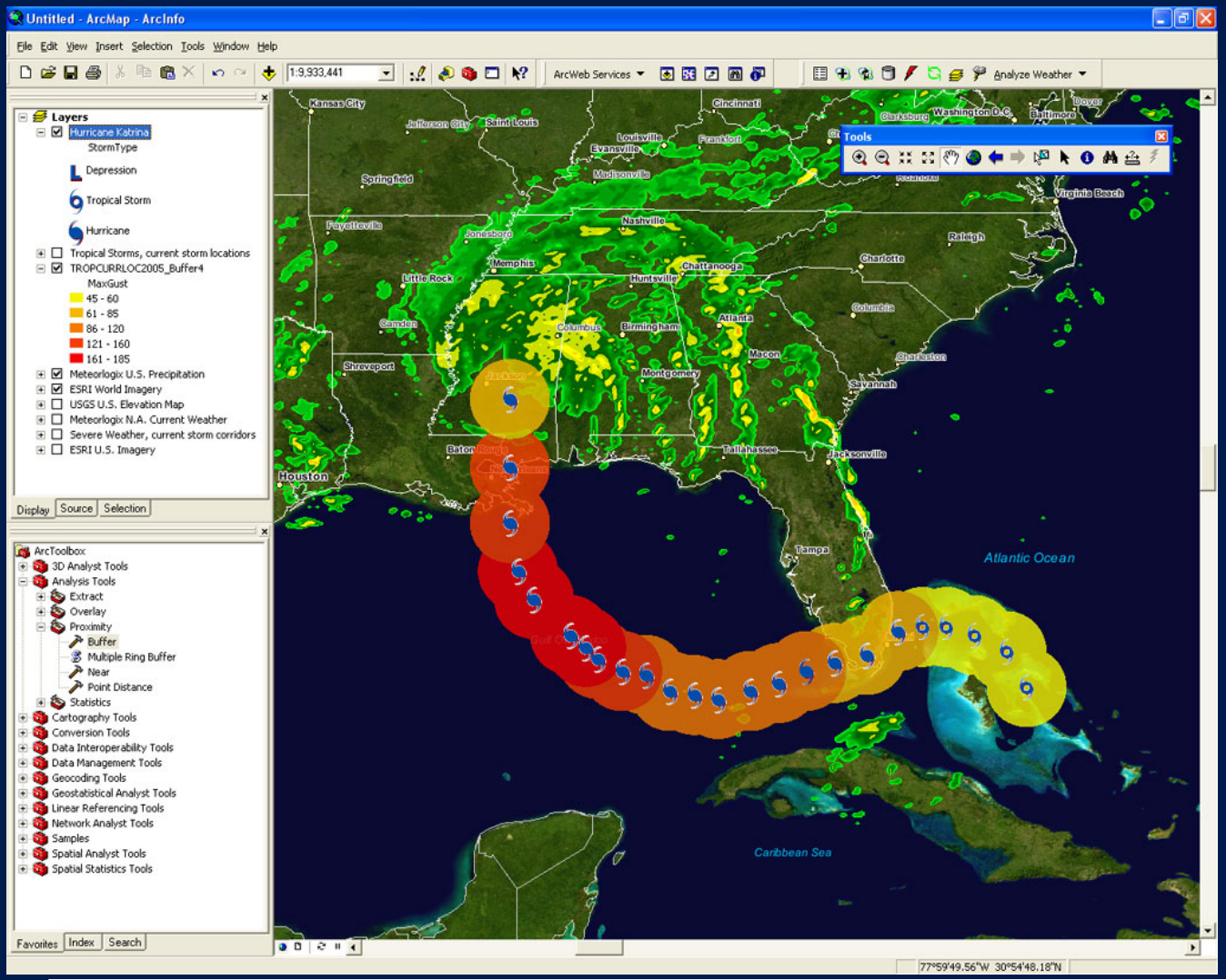
Uses

1. - Agriculture
2. - Archeology
3. - Epidemiology and health
4. - Forestry
5. - Emergency services
6. - Sailing
7. - Market studies
8. - Real estate
9. - Local / regional planning
10. - Airports, docks, roads and railway networks
11. - Social studies
12. - Tourism
13. - Public services

Uses

- Socio-economics statistical information
- Statistical information on resources: Vegetal cover and use of the soil at various levels
- Information on studies
- Cadastre
- Environmental studies, Hydrography, Meteorology, Infrastructure, Mining
- Analysis and forecasting studies
- Information on public services (gas, electricity, water) and their location
- Characterization: types of soils, water, atmosphere, biological processes, disaster risks in a wide range of spatial and temporal resolution

Example



Follow-up of the development and path of a twister in the Caribbean.

Geographic Metadata

- Organized group of descriptors that allow to identify a data set
- It comes from the Greek root: Meta (change)
  - Record of the changes that the data has presented
- General or detailed information (structured and organized) of a data set that allows to consult, assess, compare, access and / or use the information

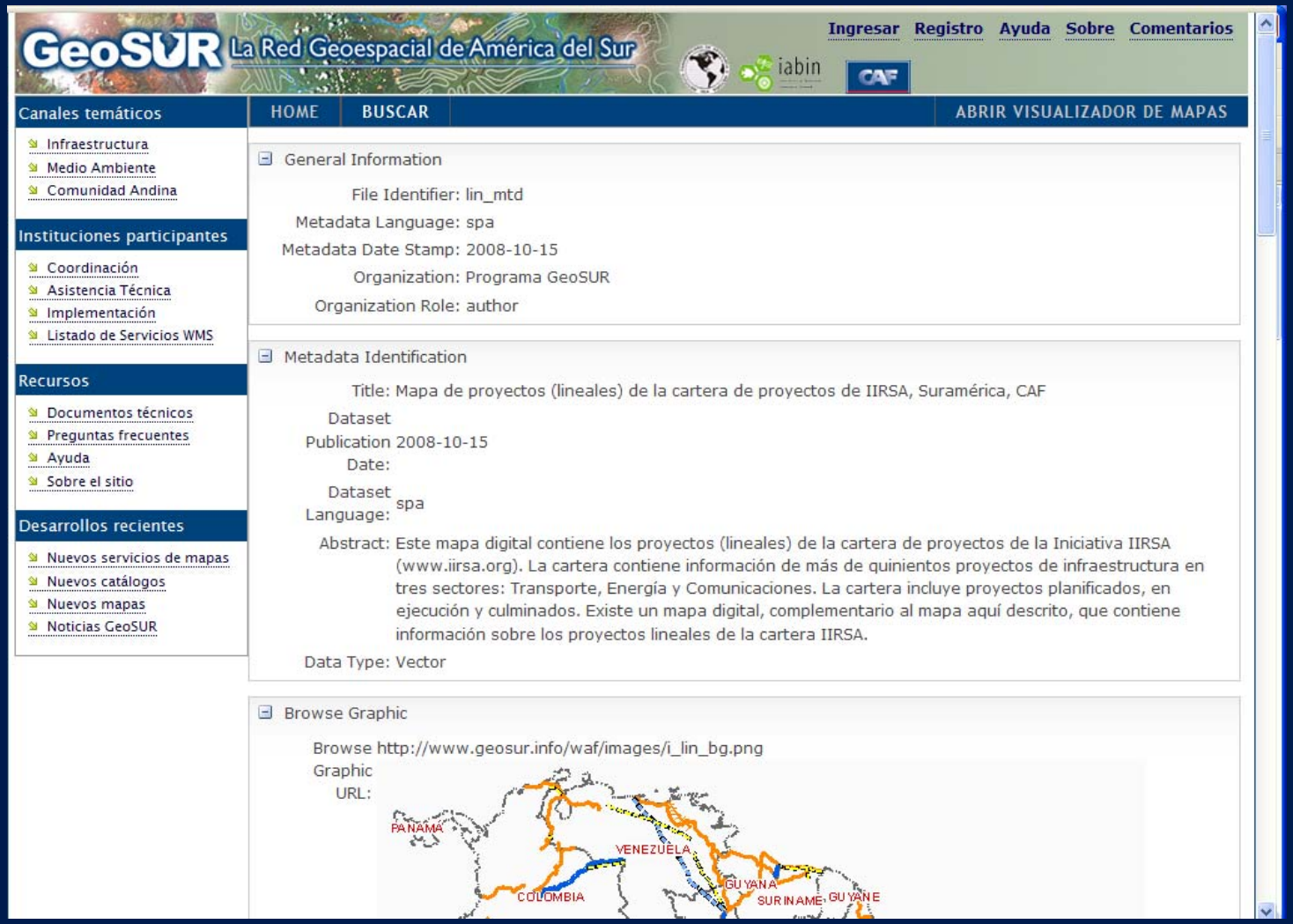
Geographic Metadata

Geographic metadata are useful to locate the information and get to know data of the information that we need.

We can know who produces the data, his / her standards and projection system, where to get the information from, how to ask for it, how much it costs, how to contact the person that produces or distributes it.

It brings the information closer and in a fast way.

Geographic Metadata



Geographic Metadata

Type:

Data Theme

Theme Topics: Transporte

Reference System Information

Reference System URN: EPSG:4326

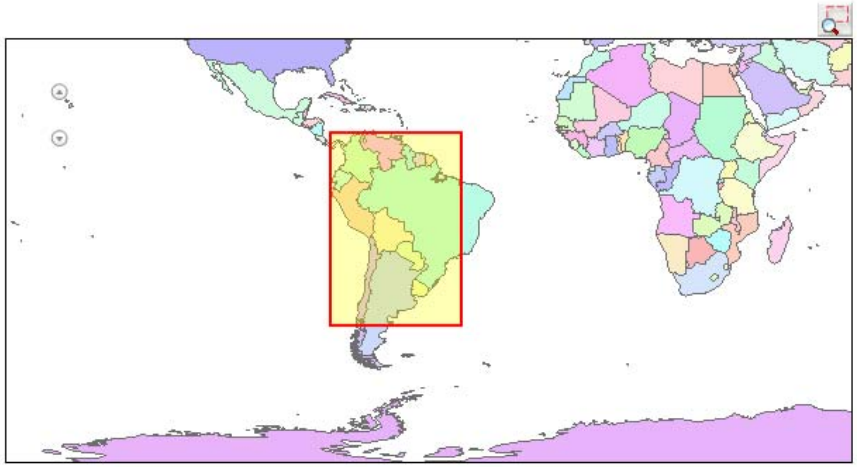
Spatial Domain

West Bounding Longitude: -81.273

South Bounding Latitude: -43.285491943359375

East Bounding Longitude: -43.91899652467667

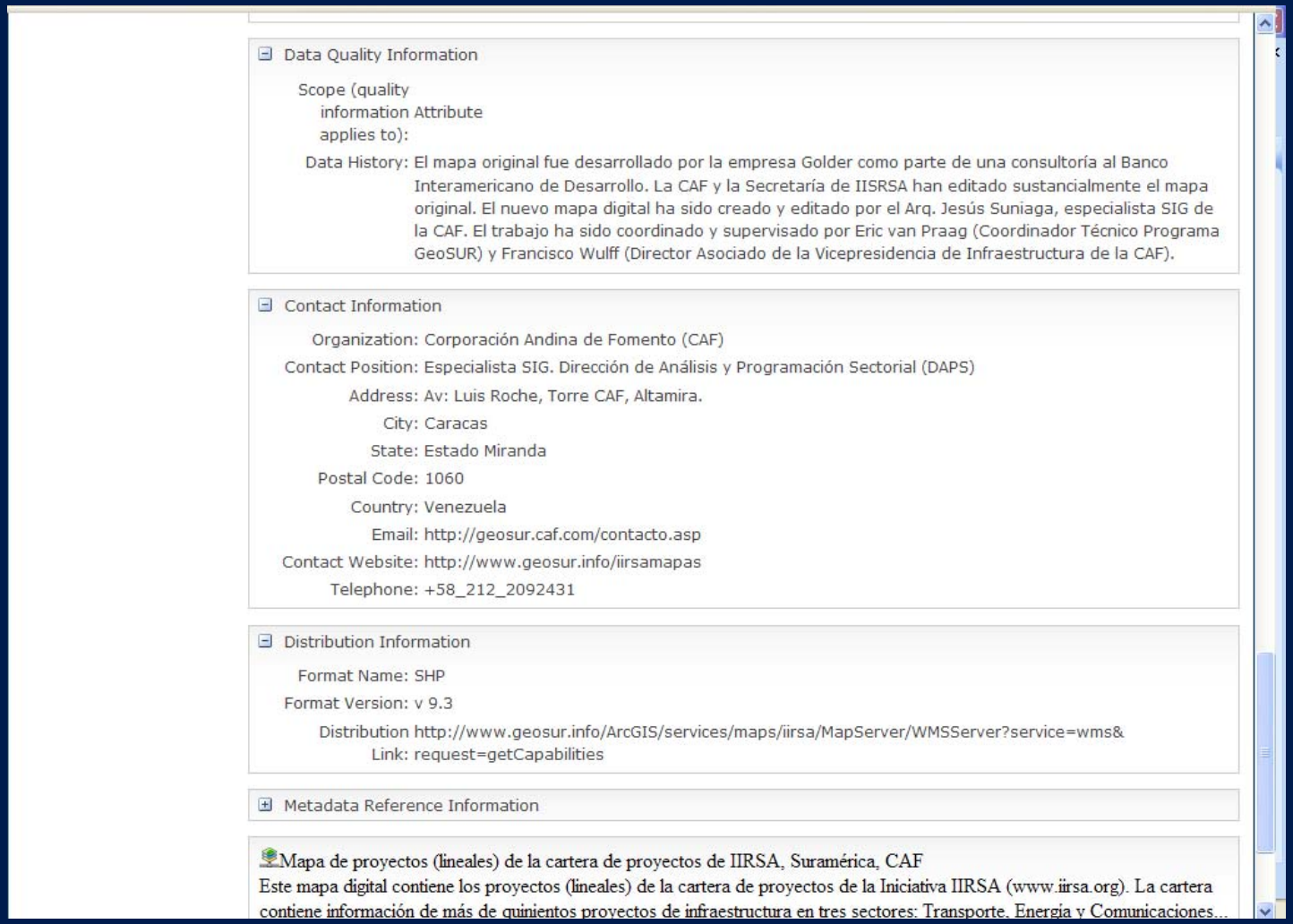
North Bounding Latitude: 11.551977157592773



Data Quality Information

Scope (quality information Attribute applies to):

Geographic Metadata



Data Quality Information

Scope (quality information Attribute applies to):

Data History: El mapa original fue desarrollado por la empresa Golder como parte de una consultoría al Banco Interamericano de Desarrollo. La CAF y la Secretaría de IISRSA han editado sustancialmente el mapa original. El nuevo mapa digital ha sido creado y editado por el Arq. Jesús Suniaga, especialista SIG de la CAF. El trabajo ha sido coordinado y supervisado por Eric van Praag (Coordinador Técnico Programa GeoSUR) y Francisco Wulff (Director Asociado de la Vicepresidencia de Infraestructura de la CAF).

Contact Information

Organization: Corporación Andina de Fomento (CAF)
Contact Position: Especialista SIG. Dirección de Análisis y Programación Sectorial (DAPS)
Address: Av: Luis Roche, Torre CAF, Altamira.
City: Caracas
State: Estado Miranda
Postal Code: 1060
Country: Venezuela
Email: http://geosur.caf.com/contacto.asp
Contact Website: http://www.geosur.info/iirsamapas
Telephone: +58_212_2092431

Distribution Information

Format Name: SHP
Format Version: v 9.3
Distribution Link: http://www.geosur.info/ArcGIS/services/maps/iirsa/MapServer/WMSServer?service=wms&request=getCapabilities

Metadata Reference Information

Mapa de proyectos (lineales) de la cartera de proyectos de IIRSA, Suramérica, CAF
Este mapa digital contiene los proyectos (lineales) de la cartera de proyectos de la Iniciativa IIRSA (www.iirsa.org). La cartera contiene información de más de quinientos proyectos de infraestructura en tres sectores: Transporte, Energía y Comunicaciones...

Spatial Data Infrastructure (Infraestructura de datos espaciales - IDE, in Spanish)

IDE is a set of strategies

Policies (political framework - rules)
Organizations
Standards (access to services and data)
Data (essential data)
Technologies
Capacities (capacity building)

Spatial Data Infrastructure (Infraestructura de datos espaciales - IDE, in Spanish)

A computer system composed of a set of resources (catalogues, servers, program, data, applications, web pages,…) aimed at managing geographic information (maps, orthophotographs, satellite images, toponyms,…) available in the Internet, which fulfill a set of interoperability conditions (rules, specifications, protocols, interfaces,…) that allow a user, by means of a simple browser, to use and combine them according to his / her needs. IDEE

IDEs
Benefits

The IDEs provide assistance to the national government by supporting the planning activities related to the use of the territory, the State decentralization and the citizens' participation (transparency).

Geographic information for legislative and political development will be available.

They will materialize the objectives stated in the National Information Policy by making it easier for citizens to have access to the information (socialization of the information)

IDEs
Benefits

Economic and social development:

The IDE is essential to support an objective decision-making process and also for a sound policy regarding land management

The spatialization of the information allows to relate the activities among themselves, as well as to estimate distances and make decisions within a complex and inter-related context.

The nations are favored in terms of knowledge, prosperity and development and they will also be able to project themselves, in a competitive way, at an international level.

IDEs
Benefits

The IDE

Supports the political decision-making process (decision-making)

Contributes to the development of the countries

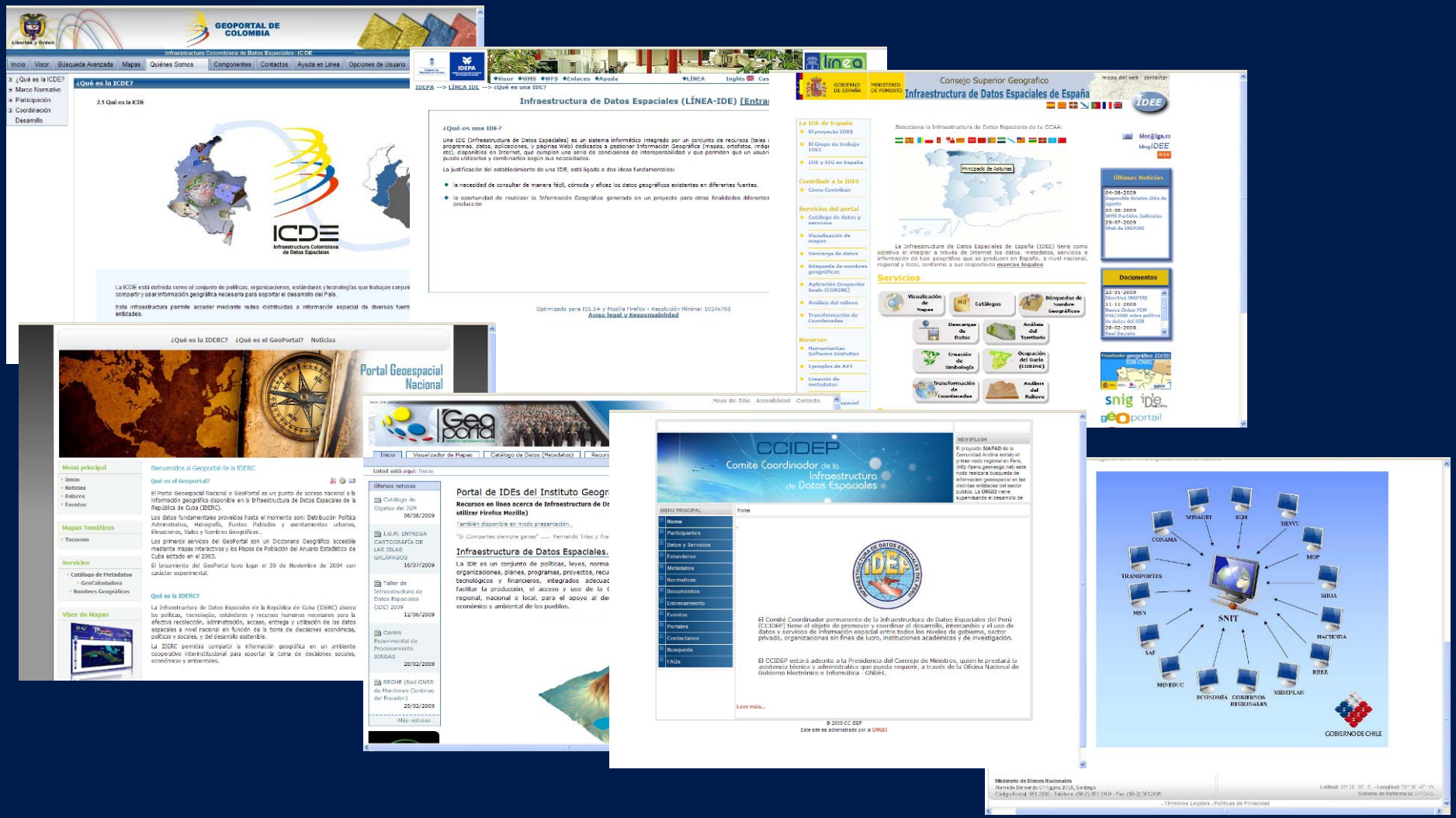
Includes procedures, technologies and guidelines

Contributes to the institutional integration (standardization, interoperability)

Contributes to the knowledge of the territory

Fosters transparency

IDEs
Latin America



GeoSUR Program and geoservices in the Web

August 27th and 28th, 2009

Thanks!

¡Gracias!

Obrigado!

jsuniaga@caf.com