GEM 32023: Remote Sensing and GPS

Introduction to Remote Sensing and GPS

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Content:

Introduction to the Course

Introduction to Remote Sensing & GPS

Concepts of Space

Earth-SYSTEMS

ENVIRONMENT

LANDUSE

WATER

AGRICULTURE

SOILS

FORESTS

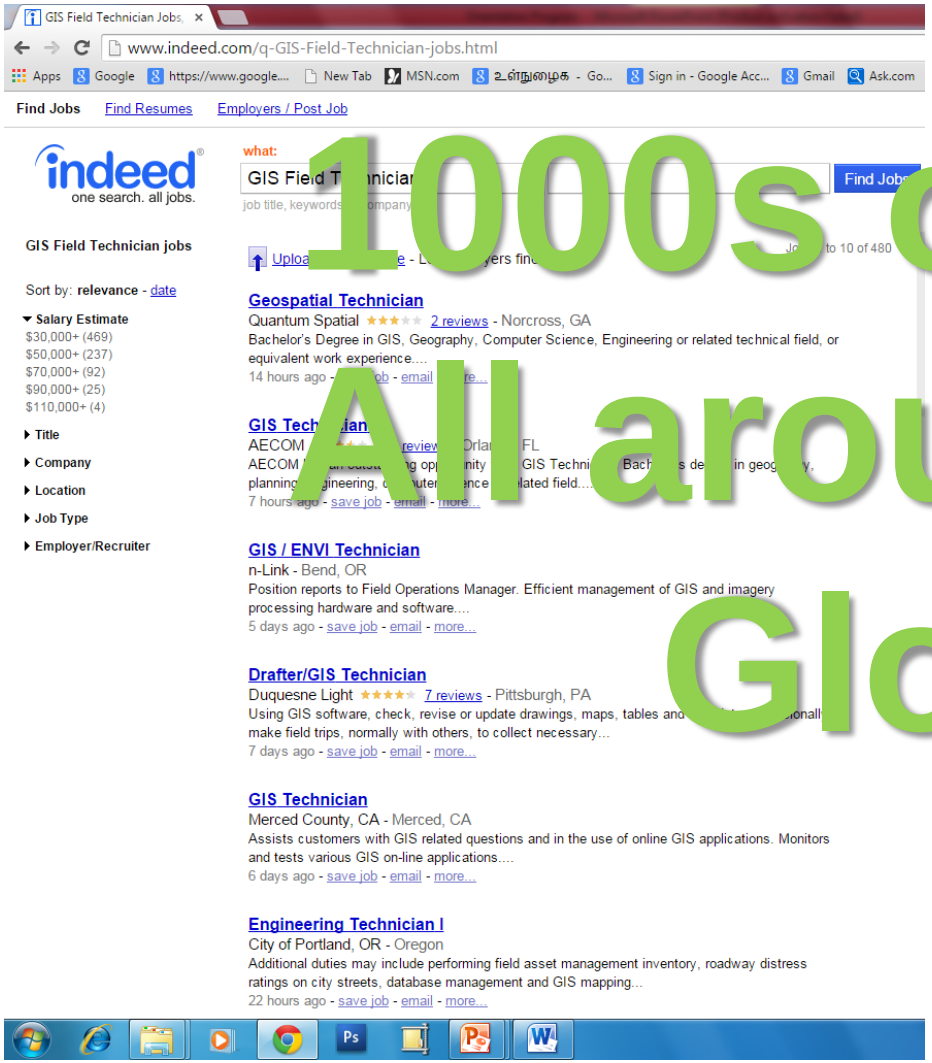
GEOSCIENCES

OCEANS

Application Areas……

- Agriculture
- Environmental Management
- Water Resources
- Conservation
- Health
- Defense and Intelligence
- Forestry
- Emergency/Disaster Management
- Land Administration
- Civil Engineering
- Community Mapping and Analysis
- Marine and Coast
- Energy and Climate Change
- Homeland Security
- Law Enforcement
- Fire Protection
- Urban and Regional Planning
- Telecommunications
- Water/Wastewater
- Transportation
- Electric and Gas
- Surveying
- Mining
- Banking and Financial Services
- Insurance
- Media and Press
- Public Works
- Elections
- Real Estate Valuation
- Facilities Management

Job Market



1000s of Jobs

All around the

Globe

Geo-Information Technologies

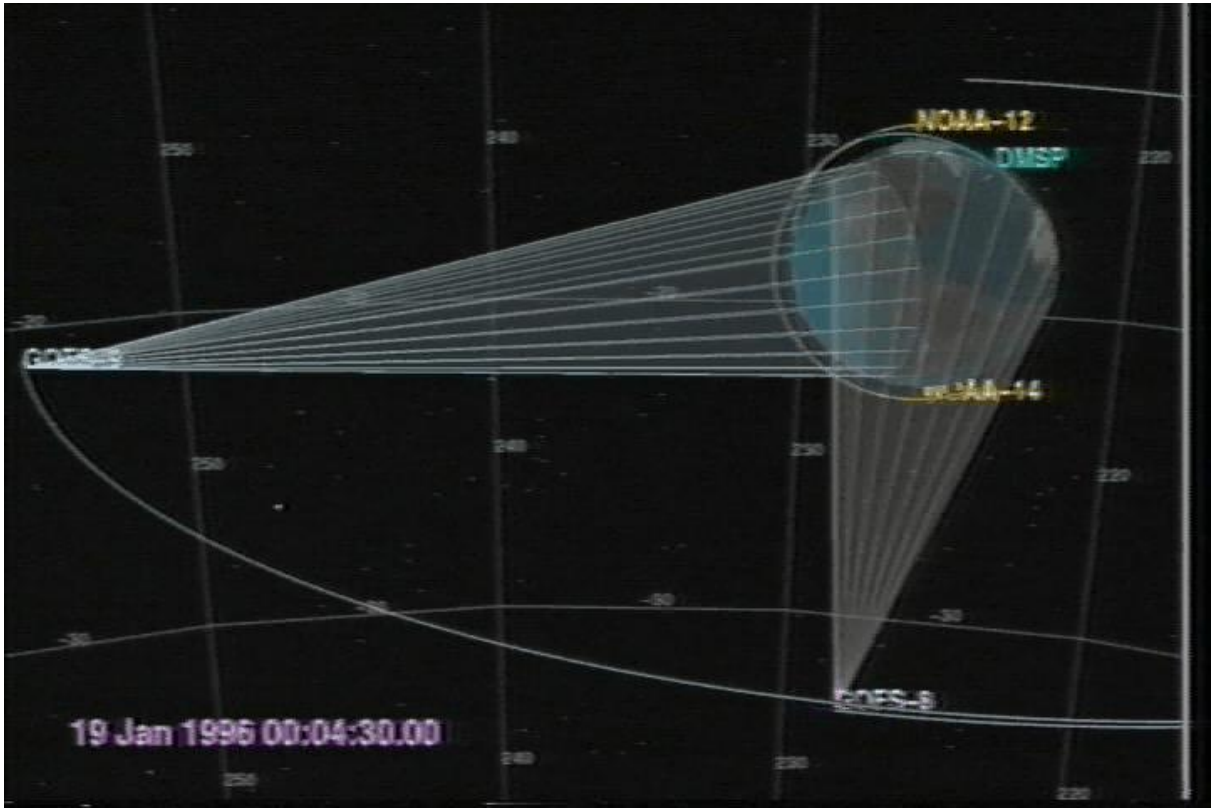
Geospatial technology is a multi-disciplinary activity which deals with

1. **Remote Sensing (RS)**
2. **Geographical Information Systems (GIS)**
3. **Global Positioning Systems (GPS)**

Remote Sensing

EYE IN THE SKY

Remote Sensing means acquiring information about an object, surface or phenomenon while at a distant from the object, surface or phenomenon.



Introduction

- **A new revolution in data collection**
- **Remote sensing was evolved as the ability of man to observe in regions of electromagnetic spectrum, beyond the range of human vision.**
- **Remote Sensing is attributed to recent technology in which satellites and spacecraft are used for collecting information about the earth's surface.**
- **The Remote Sensing is basically a multi-disciplinary science**
  - **optics**
  - **spectroscopy**
  - **photography**
  - **computer**
  - **electronics and telecommunication**
  - **satellite launching, etc.**
- **All these technologies are integrated to act as one complete system in itself, known as Remote Sensing System.**

Remote Sensing……..

Spatial Data collection methods

- Field Survey (Ground based method)
- Remote Data Acquisition

Remote Data Acquisition

- Measuring at a distance without physical contact with the object.

Remote Sensing…….

- Five senses of human
  - Sight
  - Hearing
  - Taste
  - Smell
  - Touch

Three (sight, hearing, & smell) may be considered forms of "remote sensing", where the source of information is at some distance. Other two rely on direct contact with the source information.

Eyesight is a form of Remote sensing. When the eye sees an object, electromagnetic radiation , which is the reflected light, from the surface of the object, gets registered in the eye and information is sent to the brain.

DEFINITION OF RS

Defined by the American Society for Photogrammetry and Remote Sensing (ASPRS)

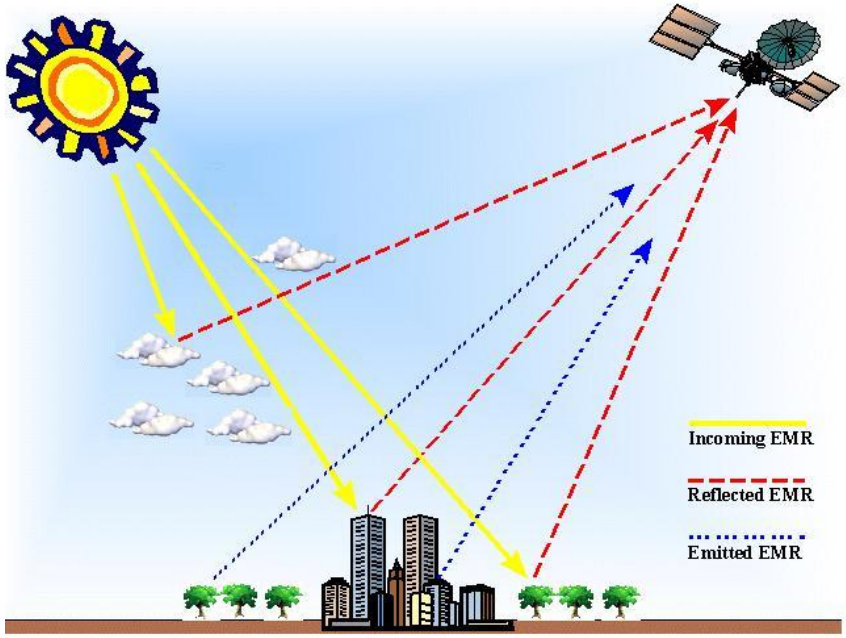
The measurement or acquisition of information of some property of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object or phenomenon under study

(Coldwell, 1983)

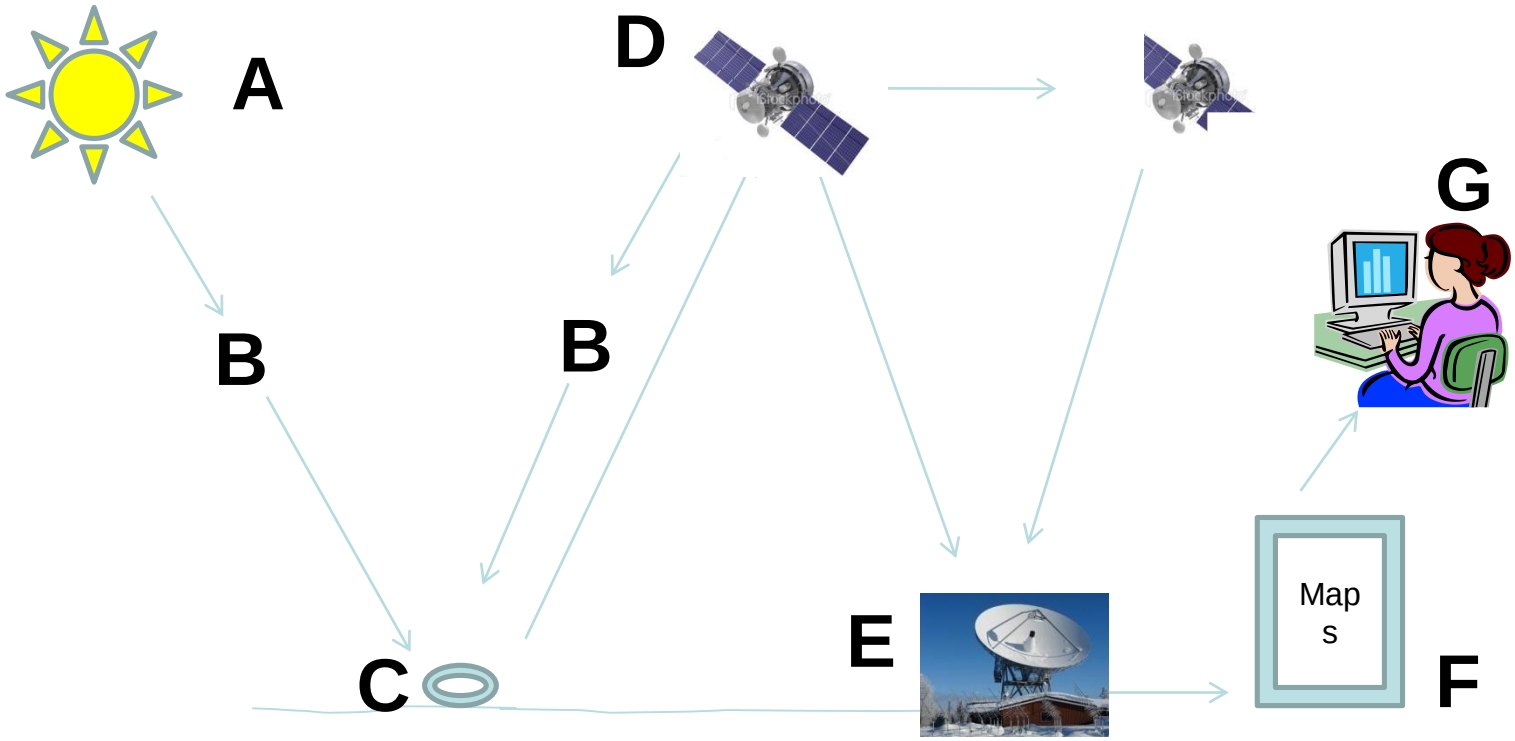
Satellite Remote Sensing

"Remote sensing is the science of acquiring information about the Earth's surface without actually being in contact with it.

This is done by sensing and recording reflected or emitted energy and processing, analyzing and applying that information"



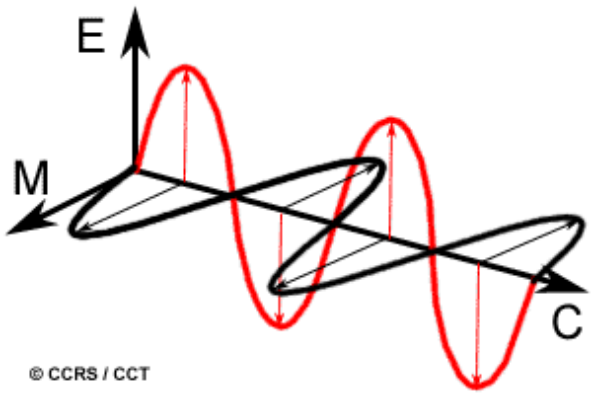
Remote sensing Process



A – Energy Source or Illumination
B – Radiation & the Atmosphere
C – Interaction with the Target
D- Recording of Energy by the Sensor
E – Transmission, Reception & Processing
F – Interpretation and Analysis
G - Applications

Electromagnetic Radiation

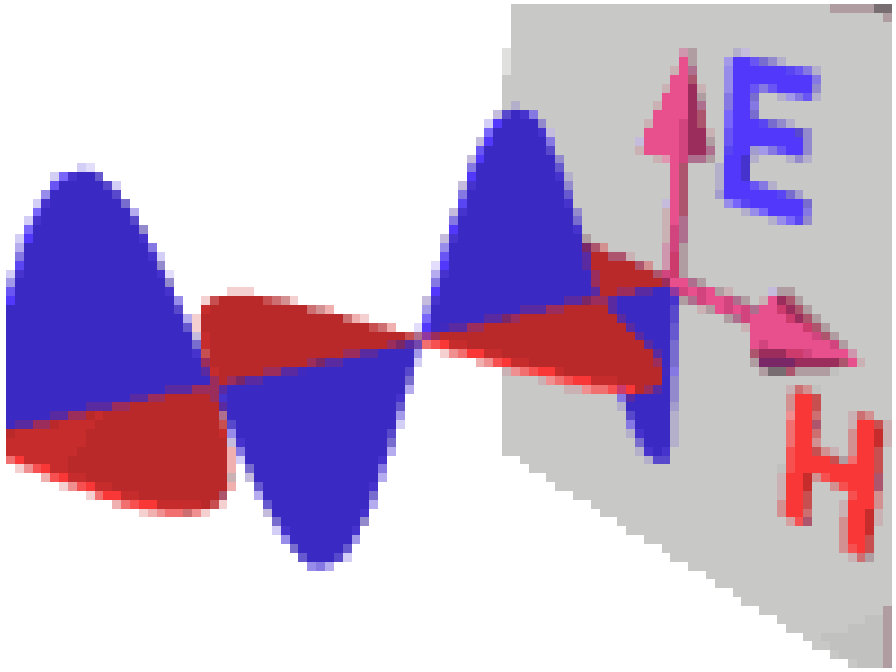
- First requirement of RS is to have an energy source to illuminate the target.
- This energy is in the form of electromagnetic radiation
- ER Transverse waves without a medium. (They can travel through space)
- Speed of electromagnetic waves =300,000,000 meters/second (Takes light 8 minutes to move from the sun to earth {150 million miles} at this speed.)



Electromagnetic Radiation

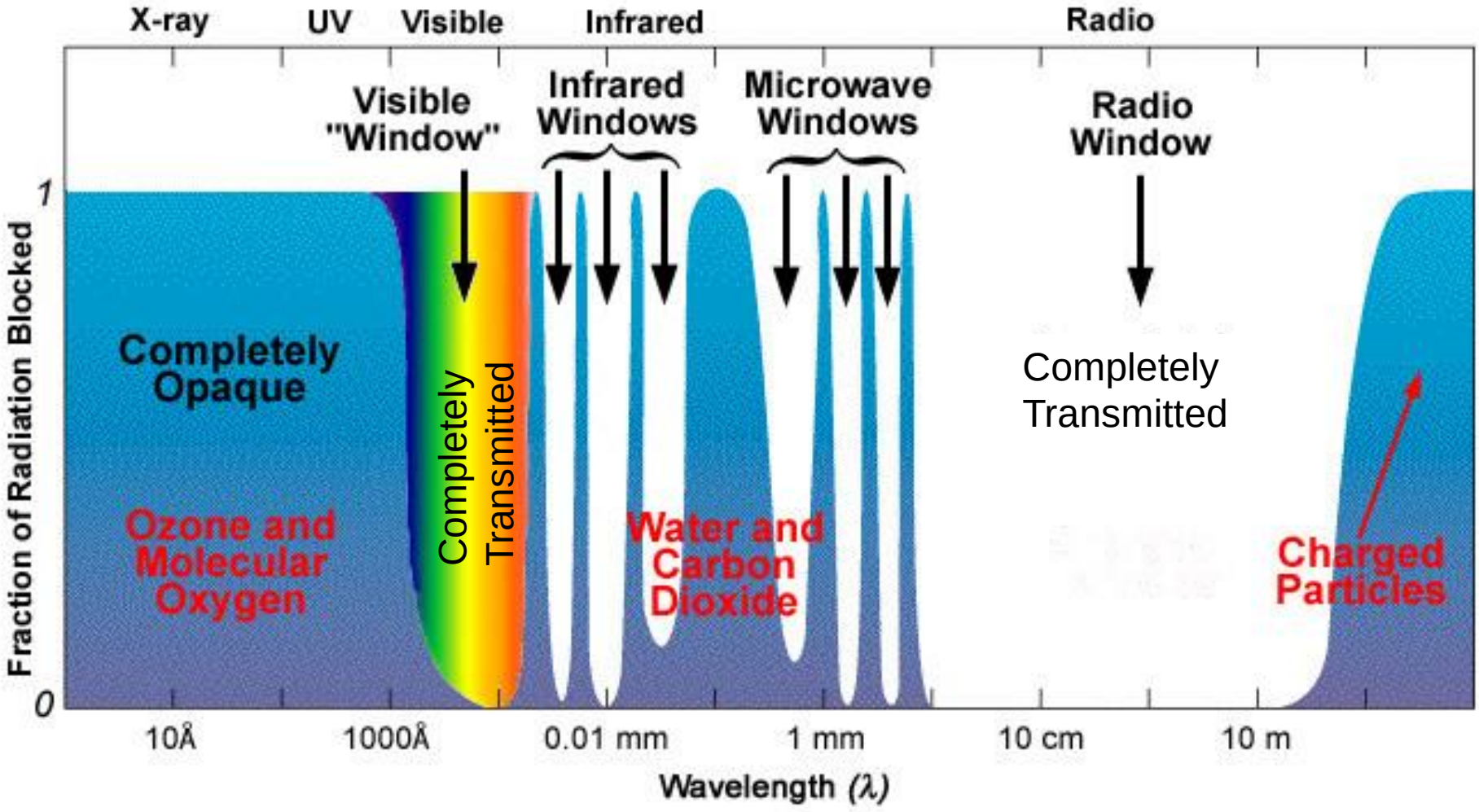
Electro Magnetic Radiation consists of….

- Electrical Field (E) which varies in magnitude in a direction perpendicular to the direction in which the radiation is traveling.
- Magnetic Field (M) oriented at right angles to the electrical field.
- Both these fields travel at the speed of light (c).

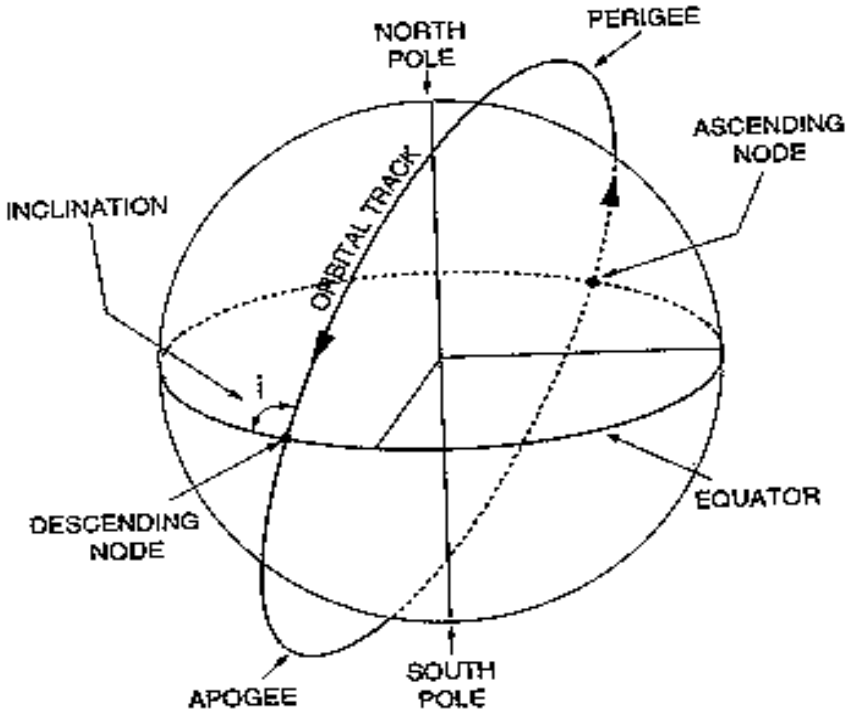


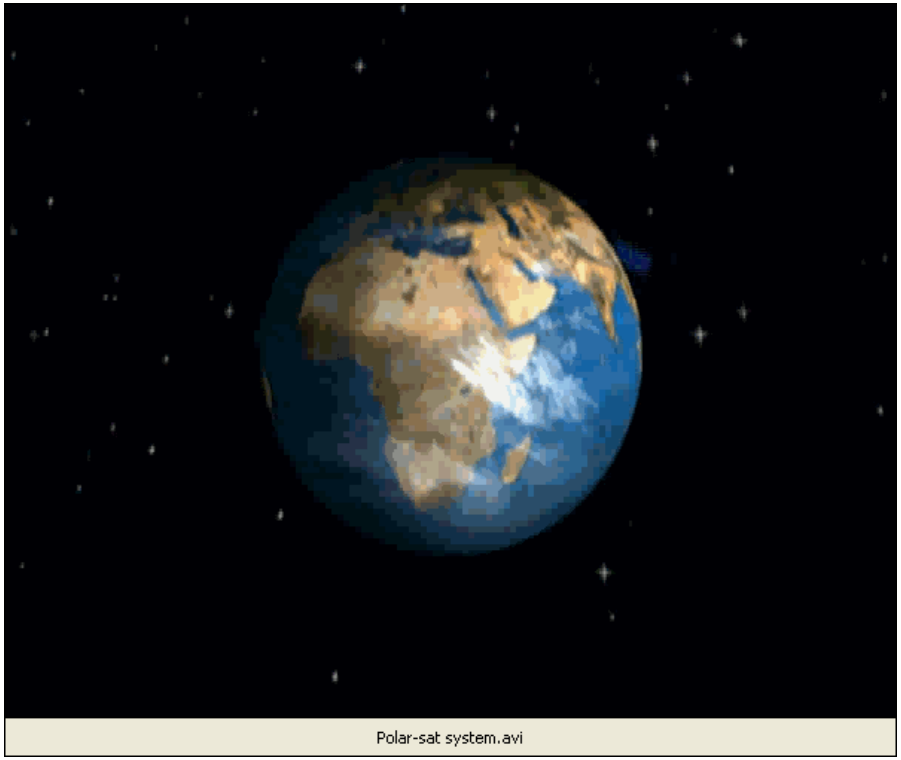
- **Click here →Animation:**

Atmospheric Window



1. Sun synchronous orbit or Polar Orbiting





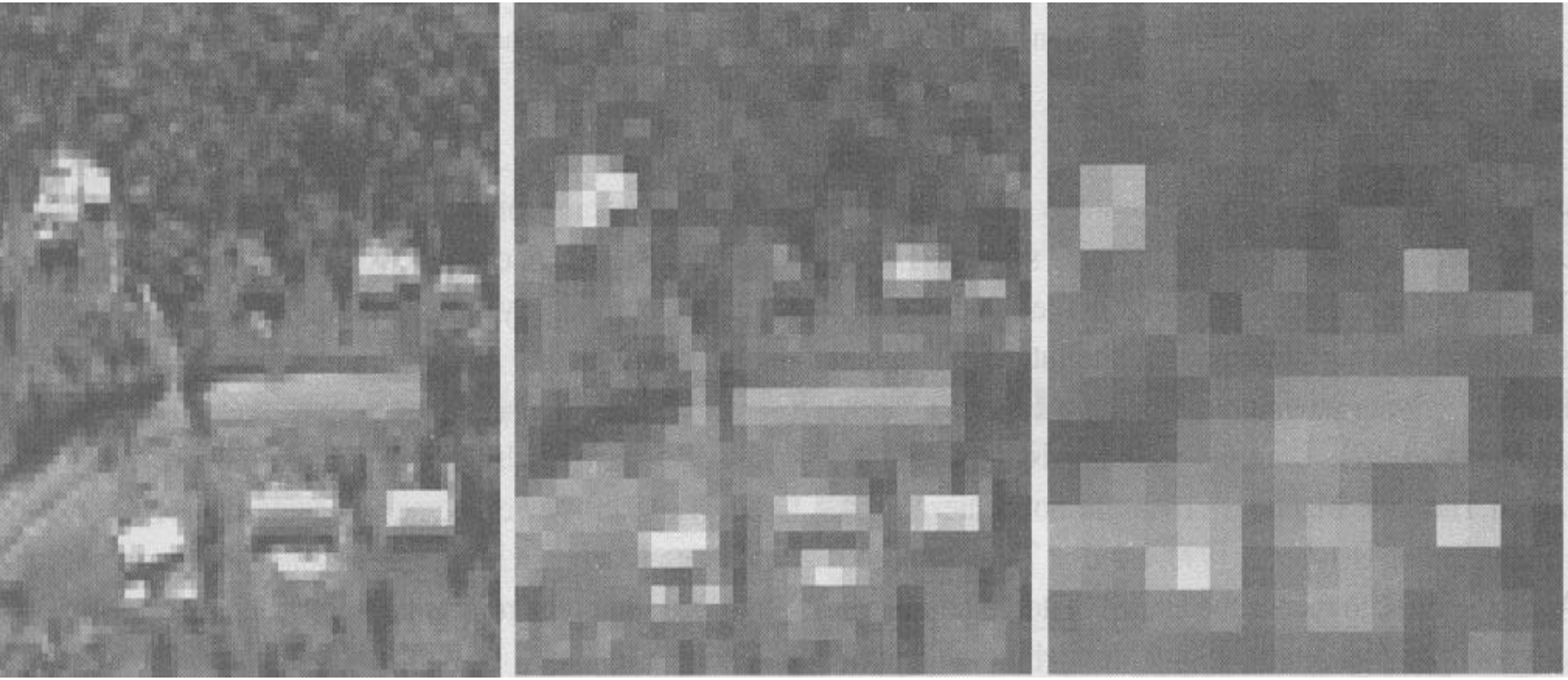
2. Geostationary orbit

A satellites period increases with altitude, at an altitude of 36000 Km a satellite has the same period as that of the earth, hence it remains stationary with respect to the earth's surface – geostationary orbit. Geostationary orbits are ideal for meteorological or communication satellites.

Remote Sensing Outputs

Photographic Remote Sensing

Non – Photographic



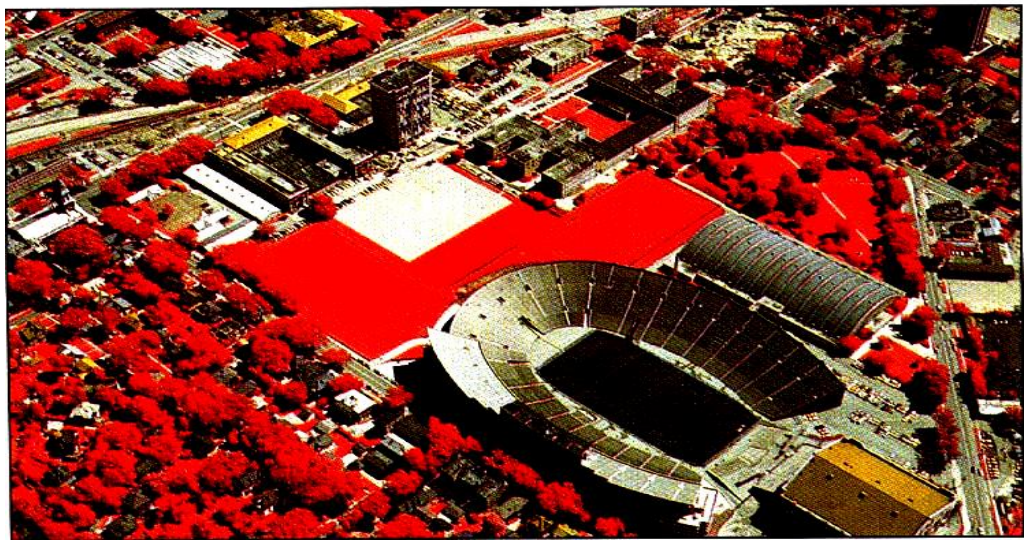

Panchromatic Photograph

PANCHROMATIC(B/W) & B/W INFRARED

Natural Photograph

Infrared Photograph

COLOURED AND COLOURED INFRARED



Applications of Remote Sensing

- Environmental Management
- Natural Resource Management
- Disaster Mitigation
- Telecommunication
- Mapping
- Geo-Science
- Urban Development
- Military Application
- Meteorology
- Navigation
- Agriculture

Agriculture
- Crop type mapping
- Crop Monitoring

Forestry
- Burn Mapping
- Clear cut mapping
- Species identifications

Geology
- Structural Mapping
- Geological Units Identifications

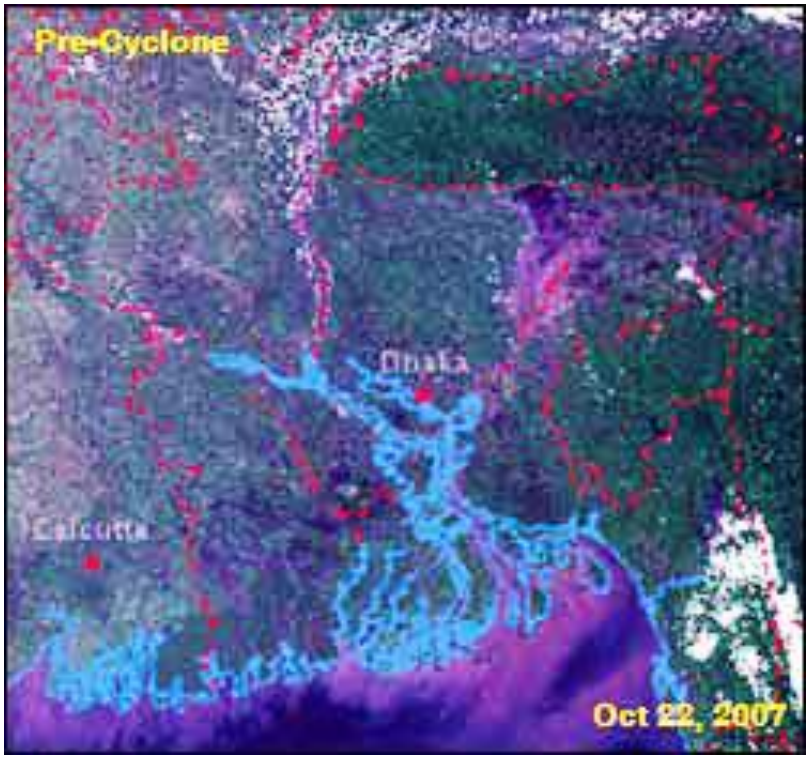
Hydrology
- Flood monitoring
- Soil content/ soil moisture

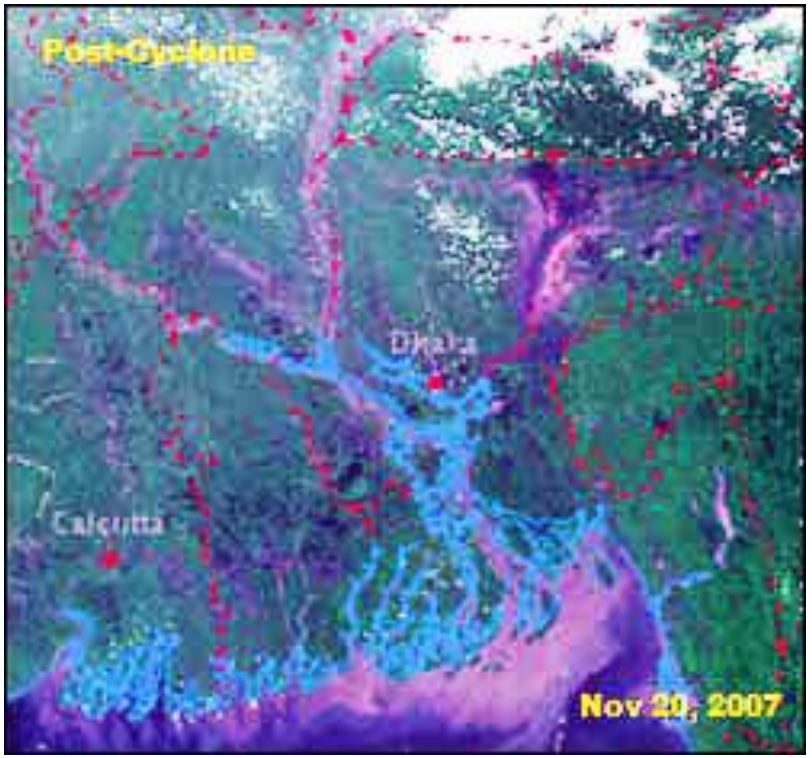
Land Cover
- Rural urban change
- Biomass mapping
- Urban Planning

Mapping
- Create DEM
- Topo Mapping

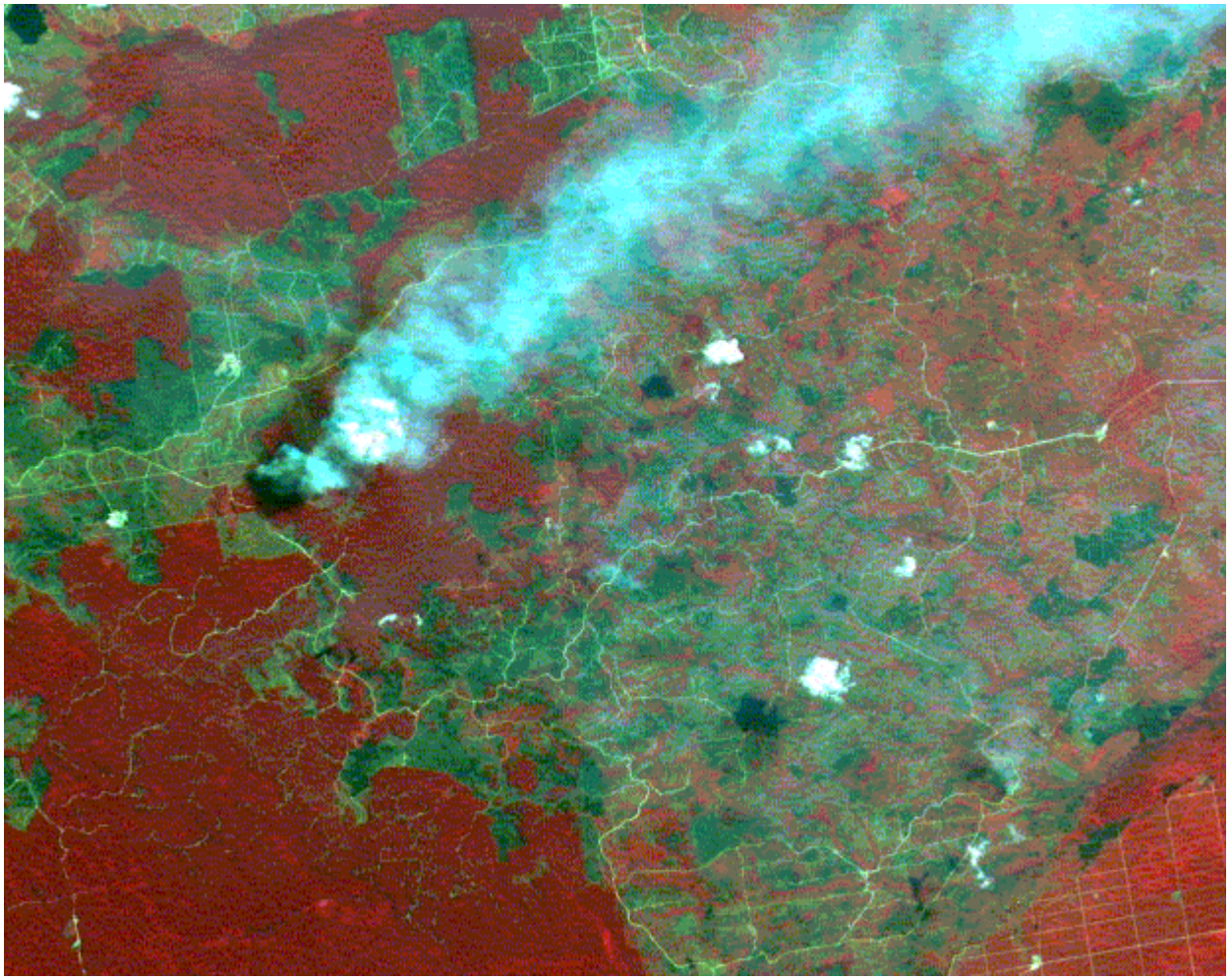
Applications

Post Disaster Detections





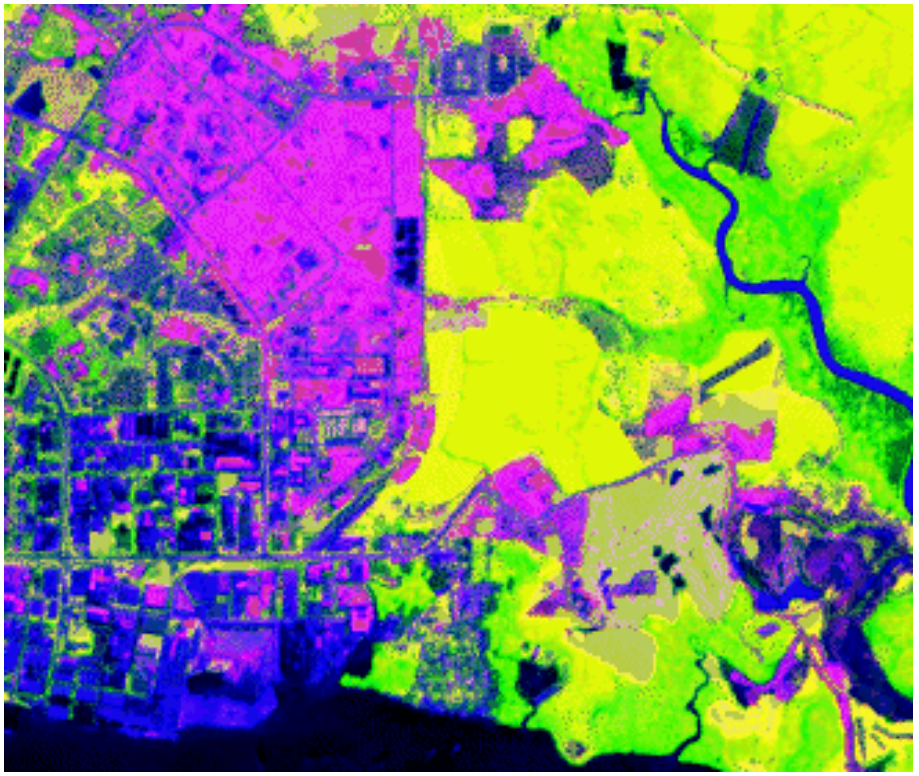
Burn Mapping



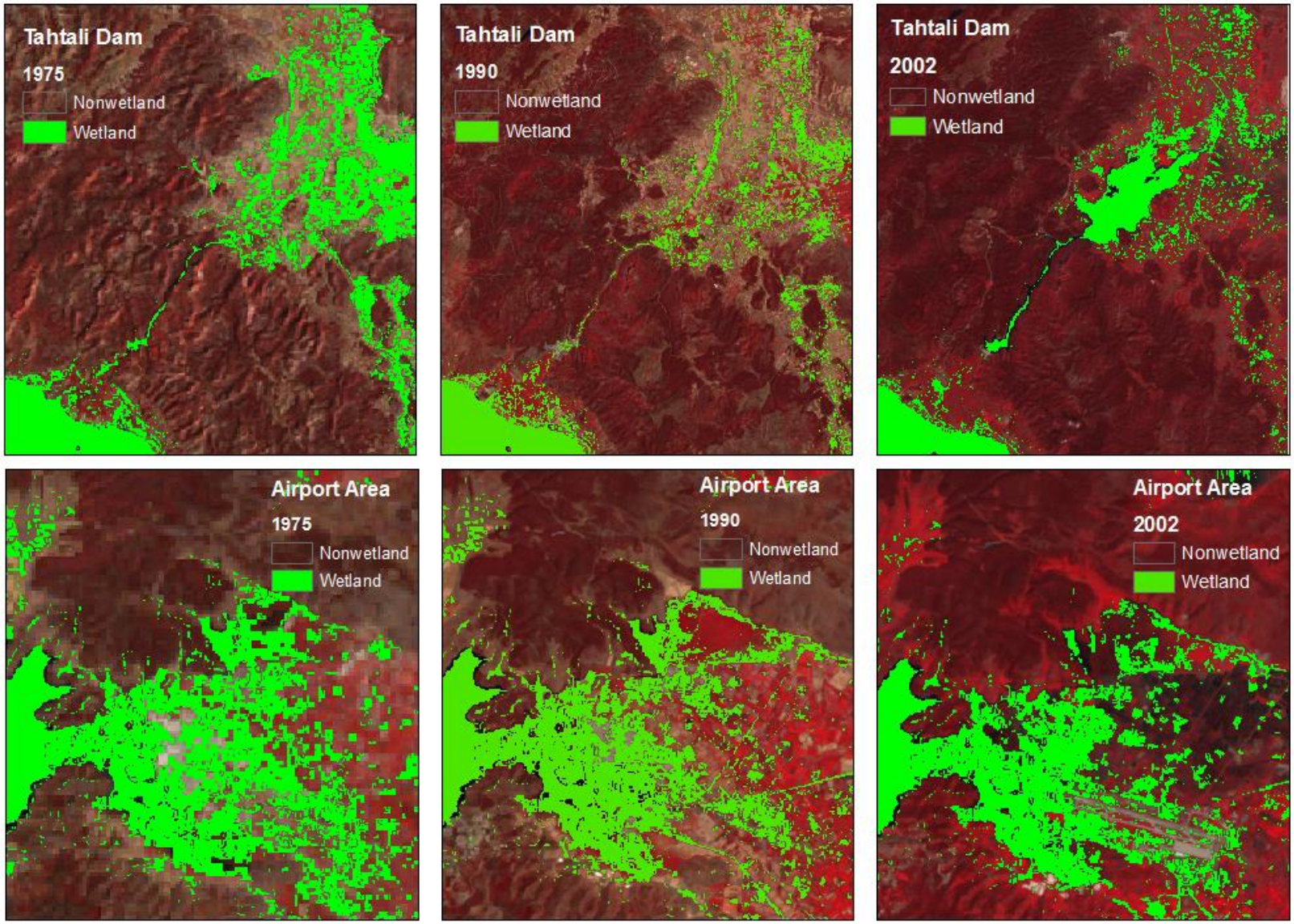
Applications

Urban Planning

Vegetation type identifications



Applications



Why Remote Sensing ?

- Remote sensing provides a regional view
- Remote sensing provides repetitive looks at the same area
- Remote sensors can "see" a broad portion of the spectrum
- Sensors can focus in on a very specific wavelength range and distinguish subtle differences
- They can also look at a number of wavelengths simultaneously
- Remote sensors often record signals electronically or photographically
- Some remote sensors operate in all seasons, at night, and in bad weather

Thank You