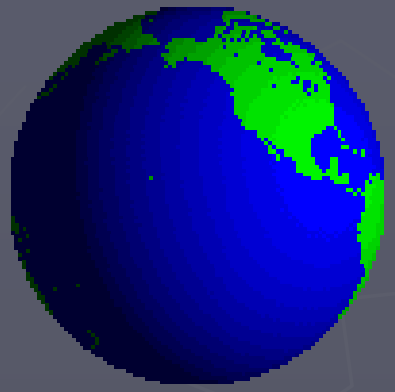
Fundamentals of Remote Sensing



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Remote Sensing

- Remote sensing is defined as the acquisition and recording of information about an object without being in direct contact with that object
- In the general sense of the term, Remote sensing is referred in relation to EMR sensors which are operated from space borne platforms

Why Remote Sensing?

- To recognize macro-patterns which may not be visible from ground
- To gain an OVERVIEW of an area
- To gather information on large areas in short time
- To gather information cost-effectively
- To gather information on inaccessible places
- To replace conventional sources of information (topo sheets, census data etc.)

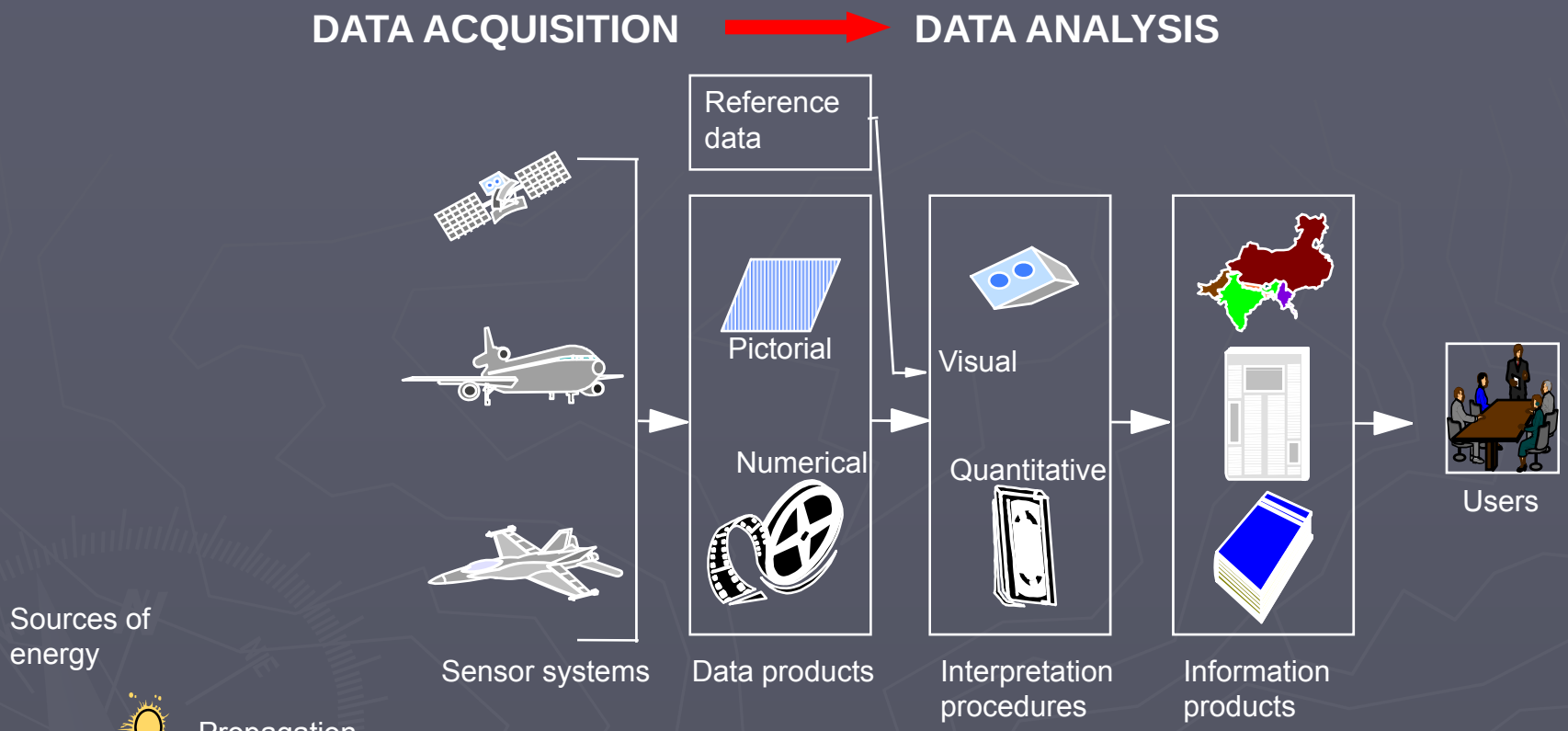
Application of Satellite Technology

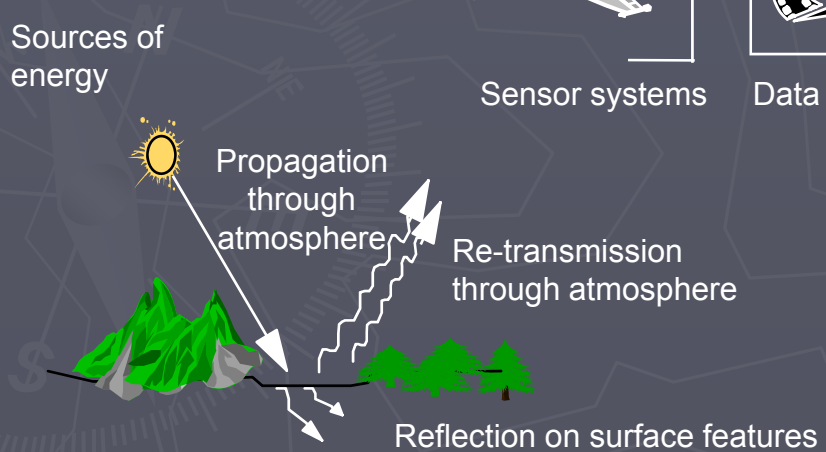
- weather forecasting and monitoring
- communication
- navigation
- military
- earth resource observation

Important Missions

- LANDSAT
- SPOT
- IRS
- NOAA
- SEASAT
- TIROS
- HCMM
- RADARSAT

Remote Sensing Systems





Types of Remote Sensing

- Passive Remote Sensing
- Active Remote Sensing

Passive Remote Sensing

- Makes use of sensors that detect the reflected or emitted electro-magnetic radiation from natural sources, most notably the sun.

Active Remote Sensing

makes use of sensors that detect reflected responses from objects that are irradiated from artificially-generated energy sources, such as radar.

The Major Components of Remote-sensing Technology

1. ENERGY SOURCE (PASSIVE SYSTEM: sun, irradiance from earth's materials; ACTIVE SYSTEM: irradiance from artificially-generated energy sources such as radar)

2. PLATFORMS (Vehicle to carry the sensor) (truck, aircraft, space shuttle, satellite, etc.)

3. SENSORS (Device to detect electro-magnetic radiation) (camera, scanner, etc)

4. DETECTORS (To convert electro-magnetic radiation into recorded signals) (film, silicon detectors, etc)

5. PROCESSING (Handling signal data) (photographic, digital, etc)

6. INSTITUTIONALISATION (Organization for execution at all stages of remote-sensing technology: international and national organizations, centers, universities, etc

Types of Satellites

Geostationary Satellites

Sun- synchronous Satellites

Geostationary Satellites

- altitude (36,000 km)
- makes one revolution in 24 hours
- synchronous with the earth's rotation
- communication and meteorological applications

Sun-synchronous Satellites

- Orbital plane is near polar
- altitude such that the satellite passes overall places on earth having the same latitude twice in each orbit at the same local sun time

Diagram showing orbit of Sun Synchronous satellite

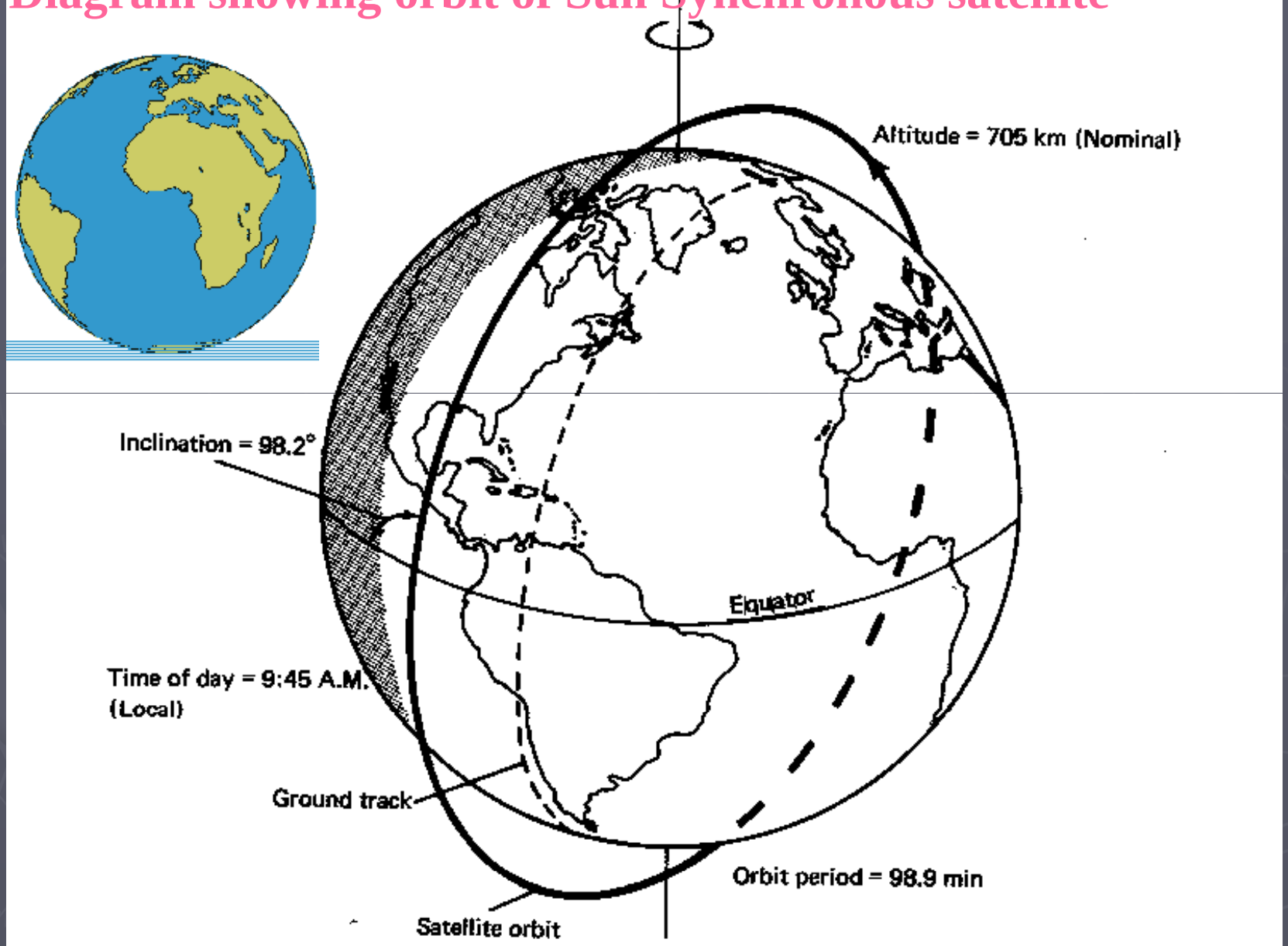
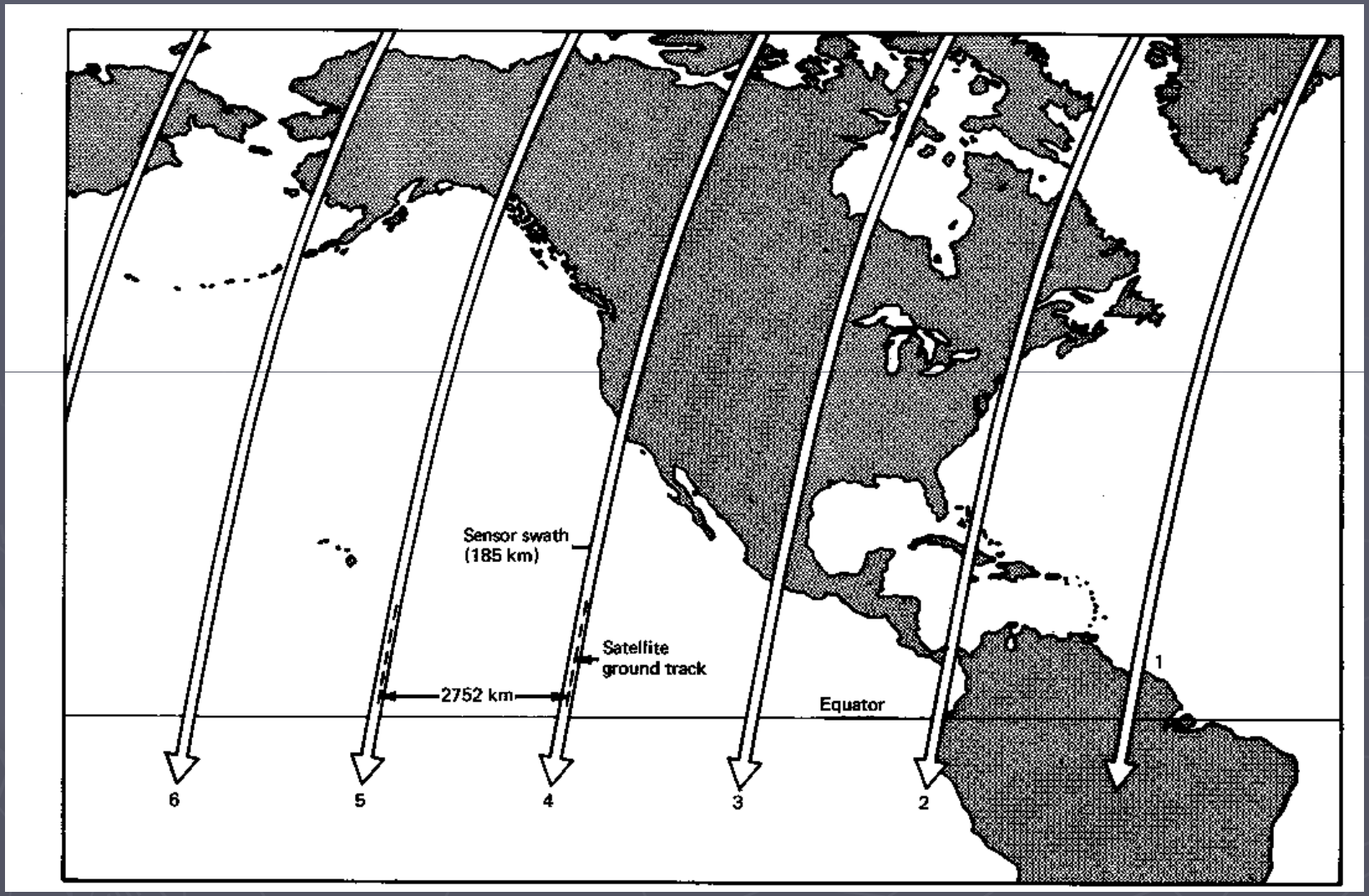
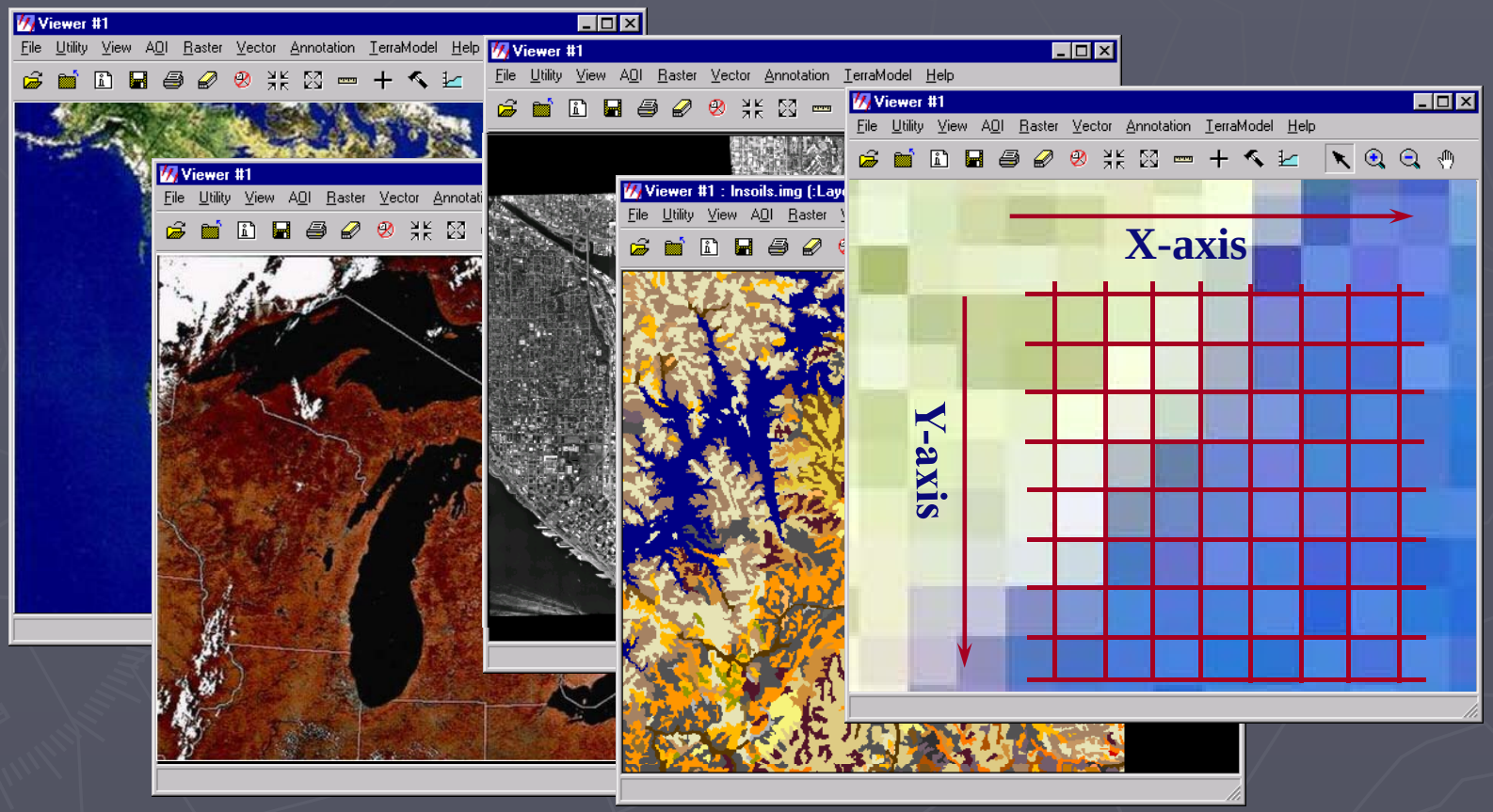


Diagram Showing adjacent tracks (passes)



What is an image?

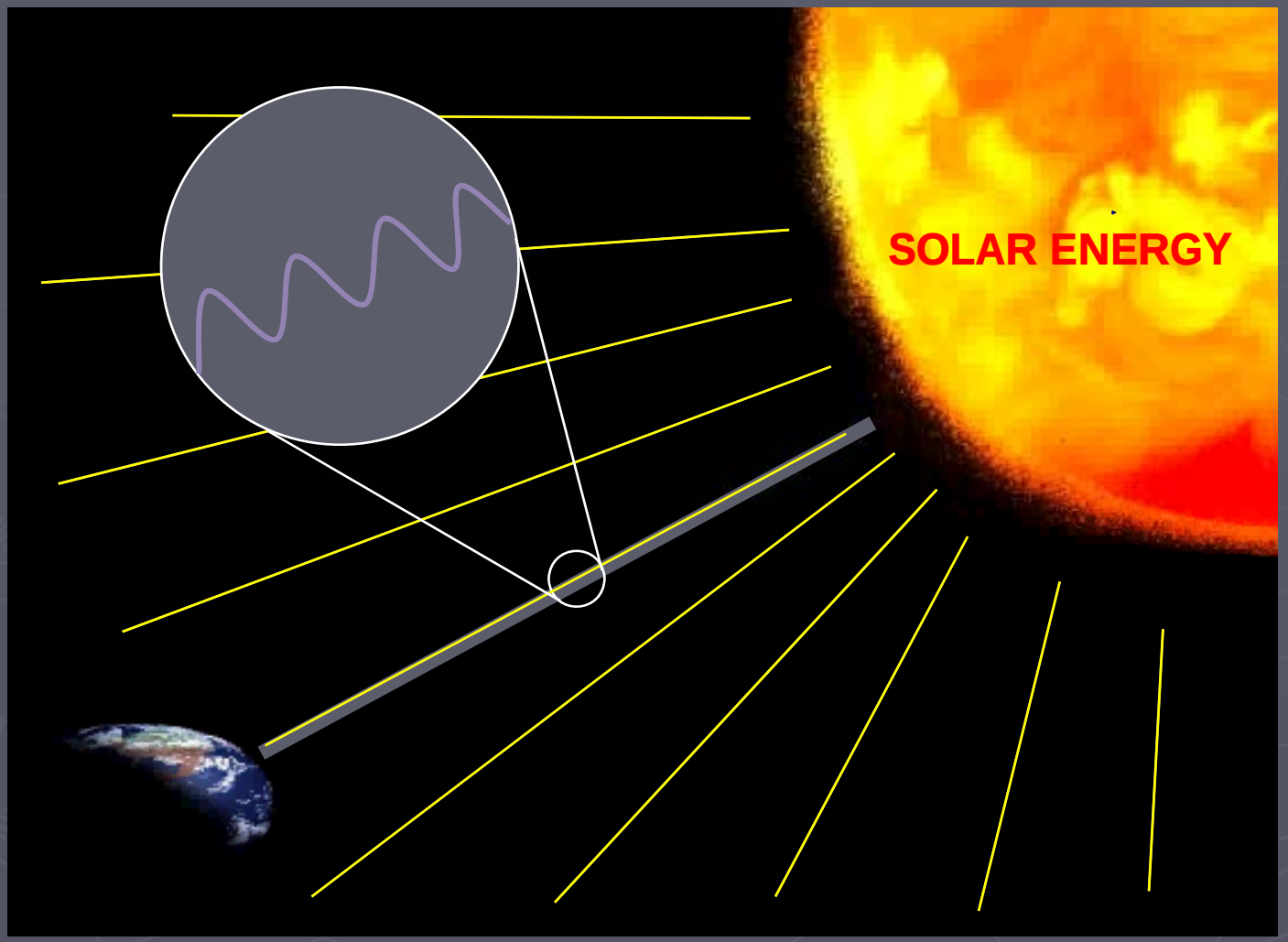
- Data that are organized in a grid of columns and rows
- Usually represents a geographical area



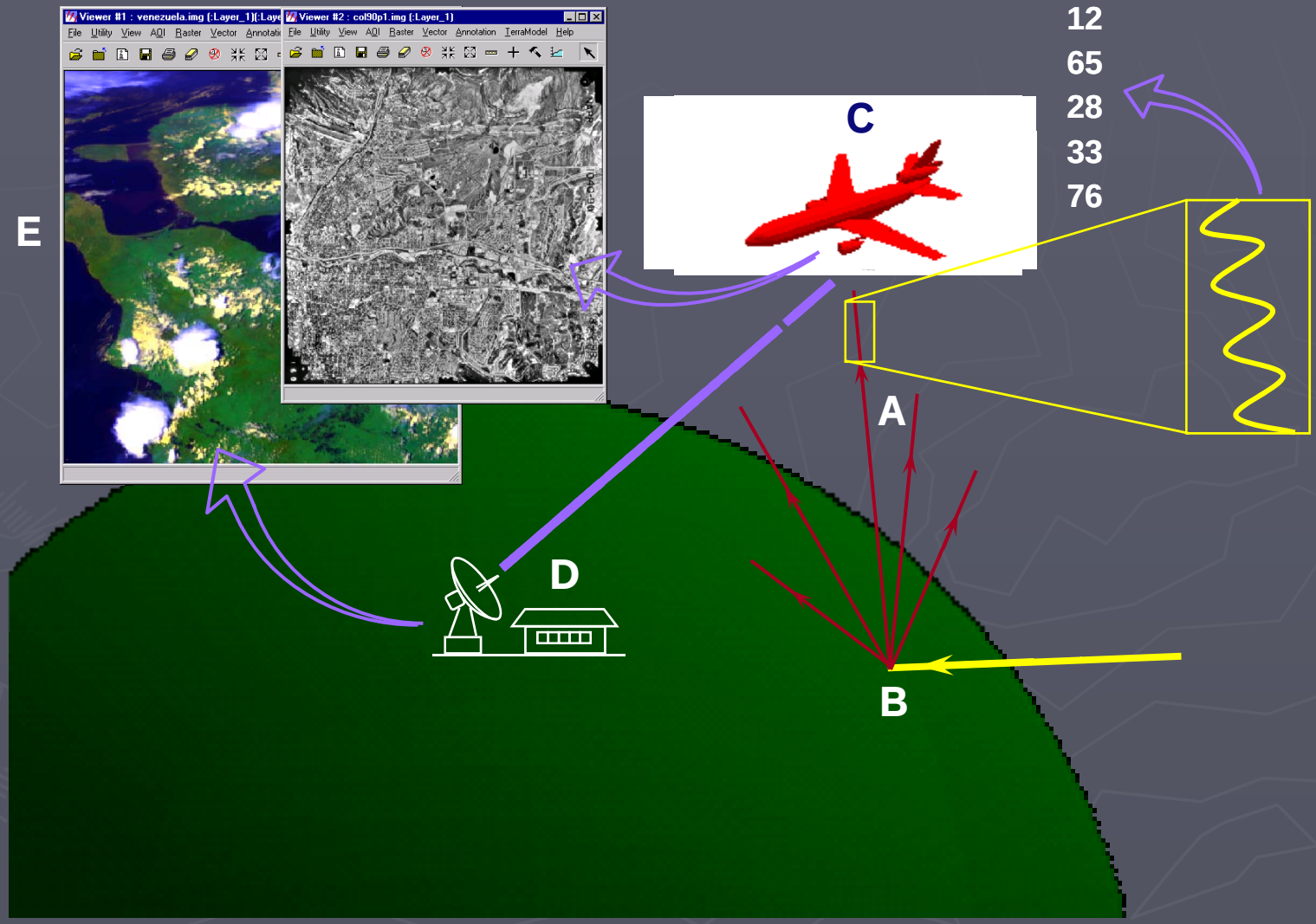
How are images made?

- Some simple theoretical concepts need to be understood
- Light from the sun reflects off the earth's surface

The process of remote sensing

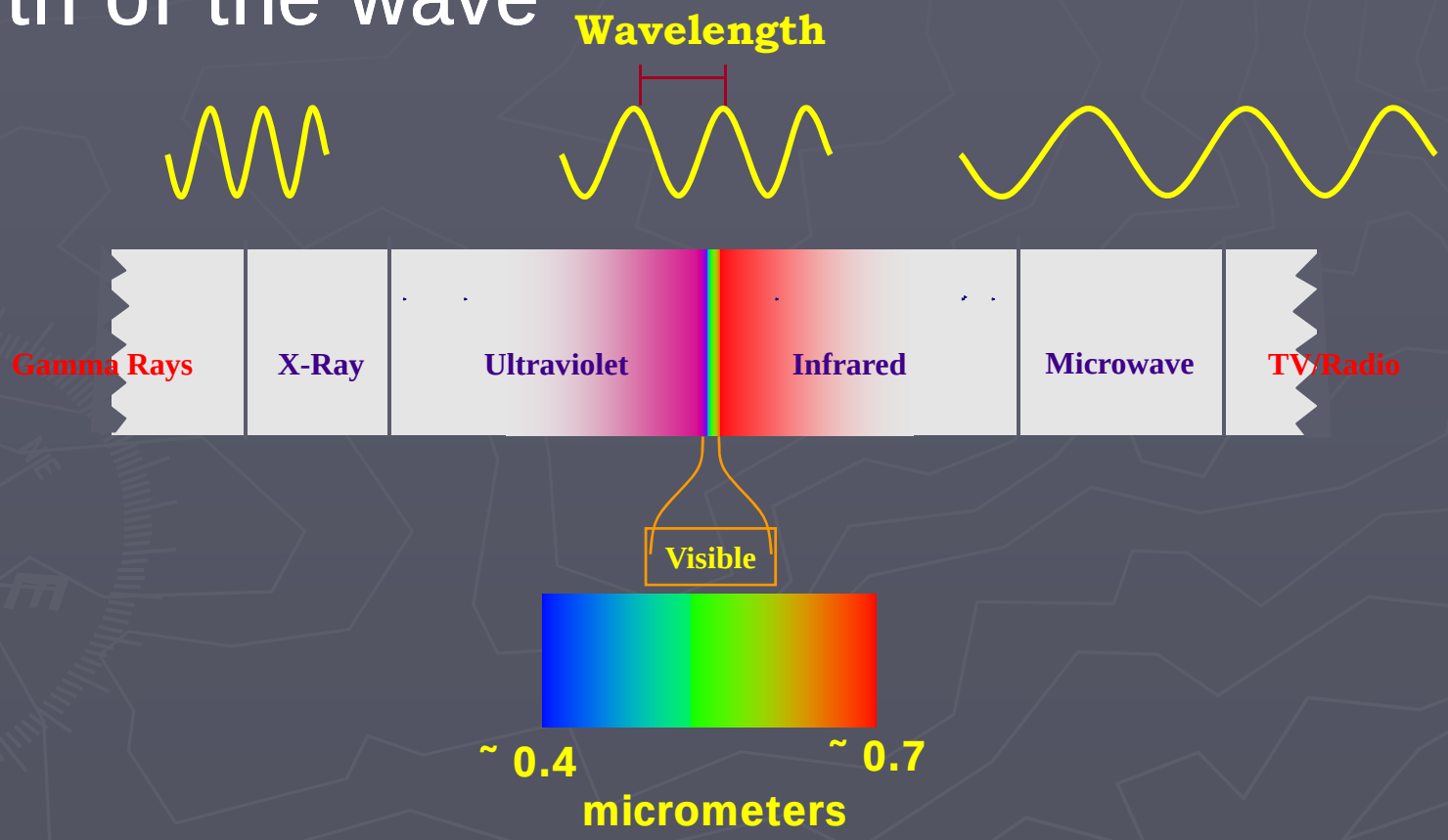


The process of remote sensing



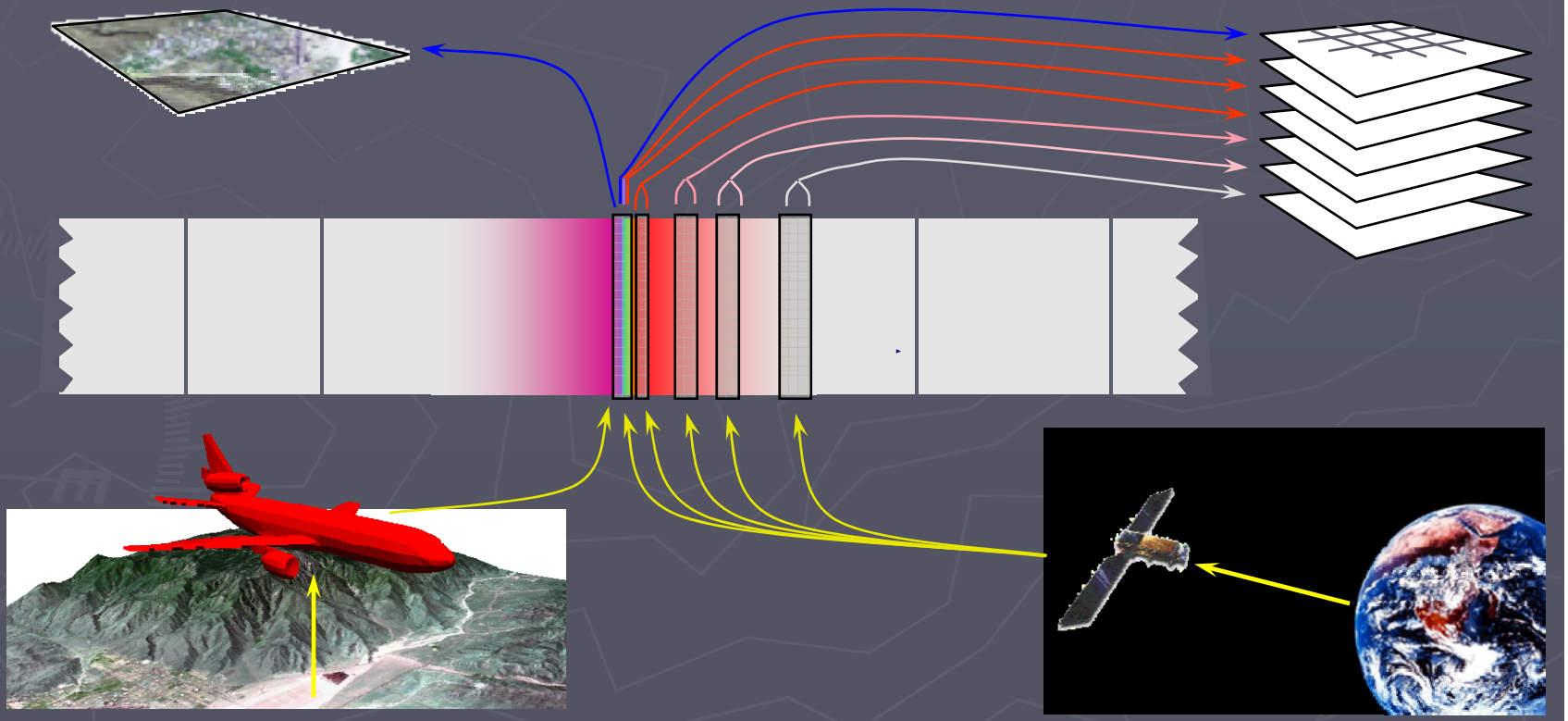
Measuring Light

- Light can be classified according to the length of the wave



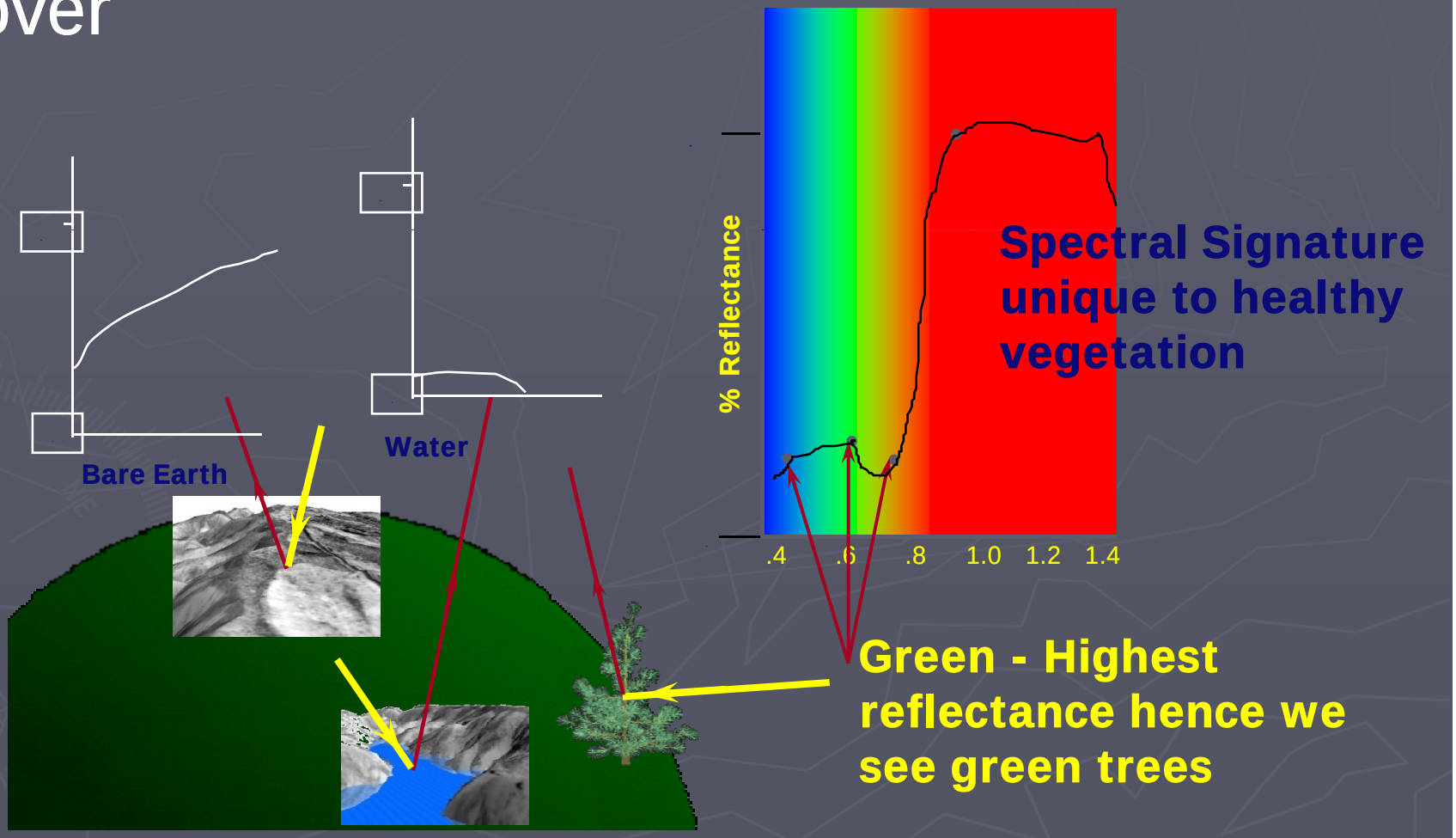
Measuring Light: Bands

- Human eyes only ‘measure’ visible light
- Sensors can measure other portions of EMS

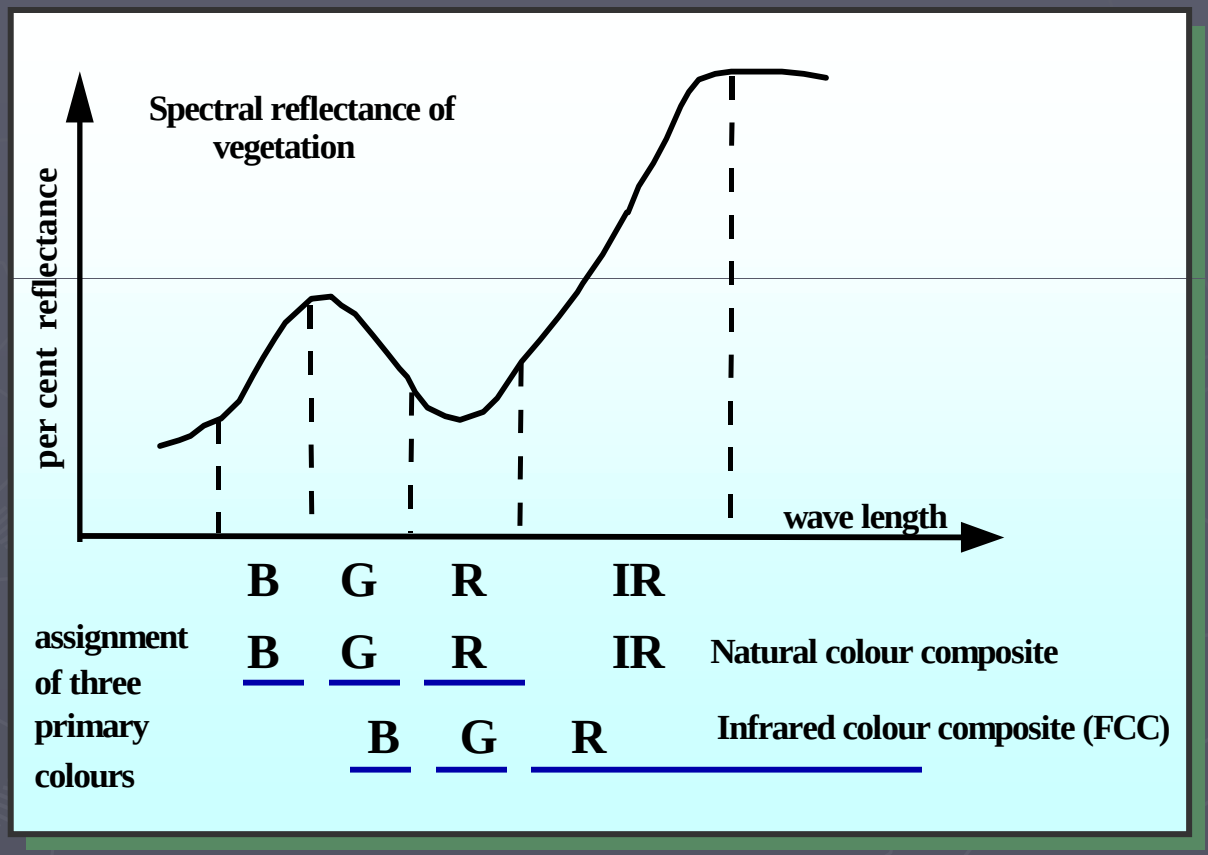


Spectral Signatures

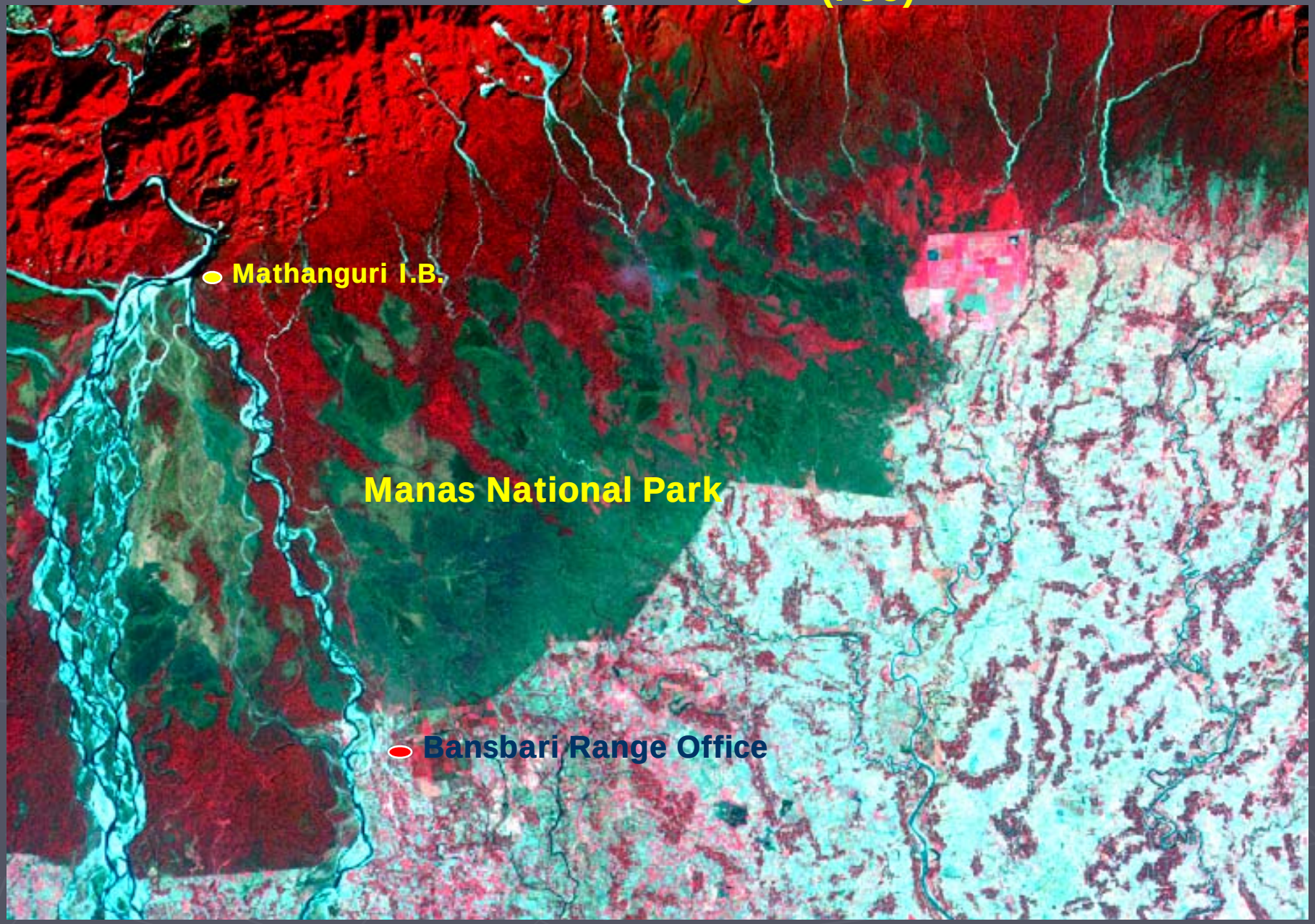
- Signal received by sensor depends on land cover



Examples of Colour Composites

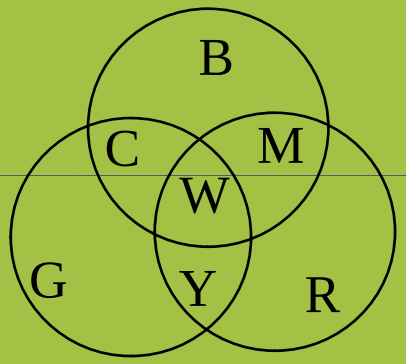


IRS LISS III Image (FCC)

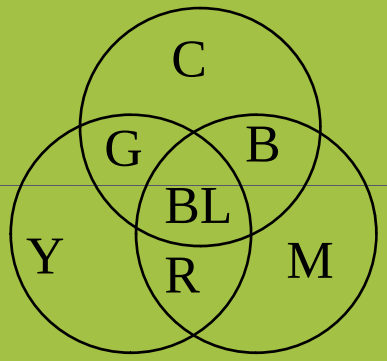


Satellite Imagery of Manas National Park

Methods of Colour Composite



Additive color composite



Subtractive color composite

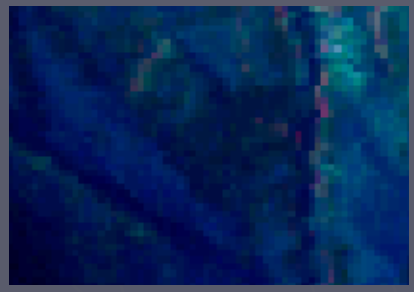
B = Blue
G = Green
R = Red
W = White

C = Cyan
M = Magenta
Y = Yellow
BL = Black

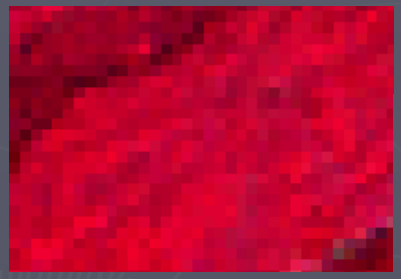
METHODS OF COLOUR COMPOSITE

Dense Forest

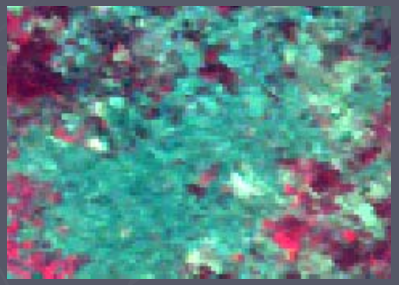
River



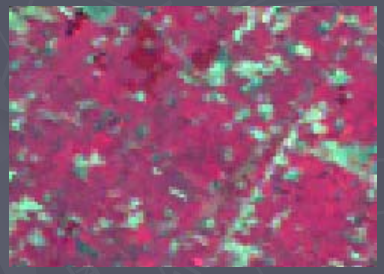
Water Body



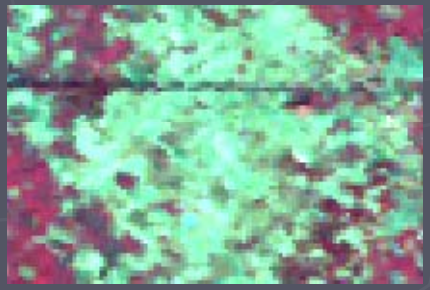
Open Forest



Settlement



Agriculture

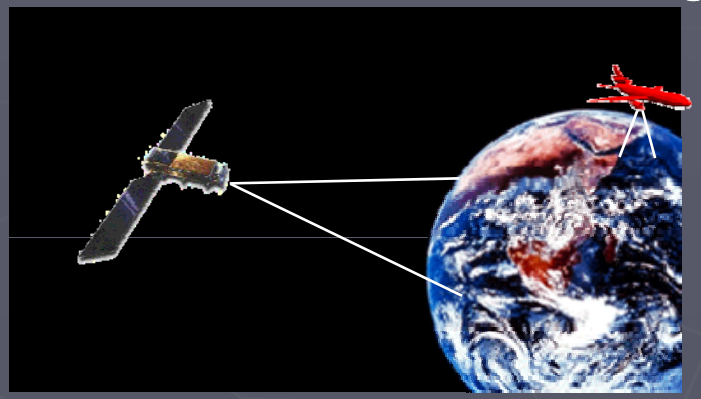


Fallow Land

Typical Tone and Texture of Common Features

Two types of images

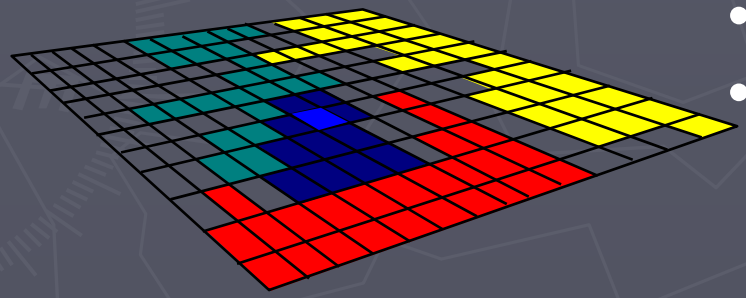
- REMOTELY SENSED images



Continuous data

- **Measured Values (light)**
- **Quantitative**

- **THEMATIC Images**



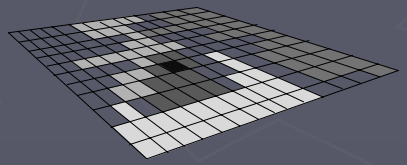
Discrete data

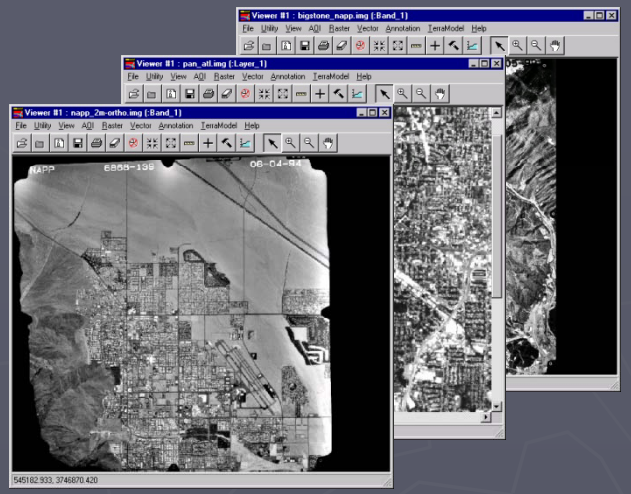
- **Values only indicate class**
- **Qualitative**

Continuous data

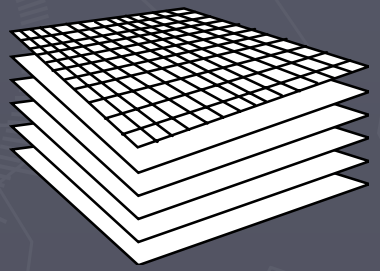
- **Two types:**

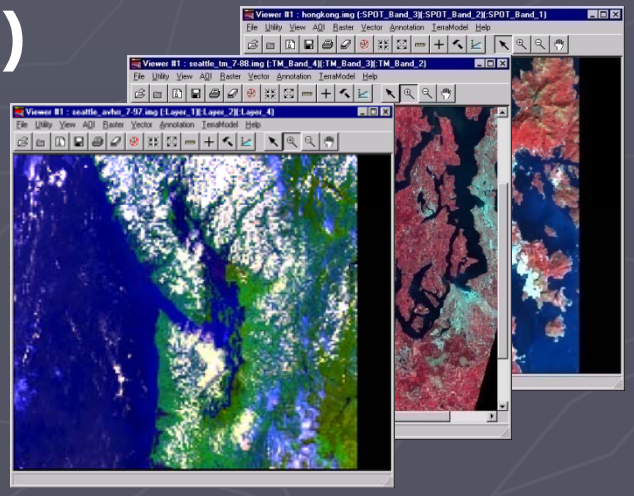
- **Panchromatic (1 Band / layer)**





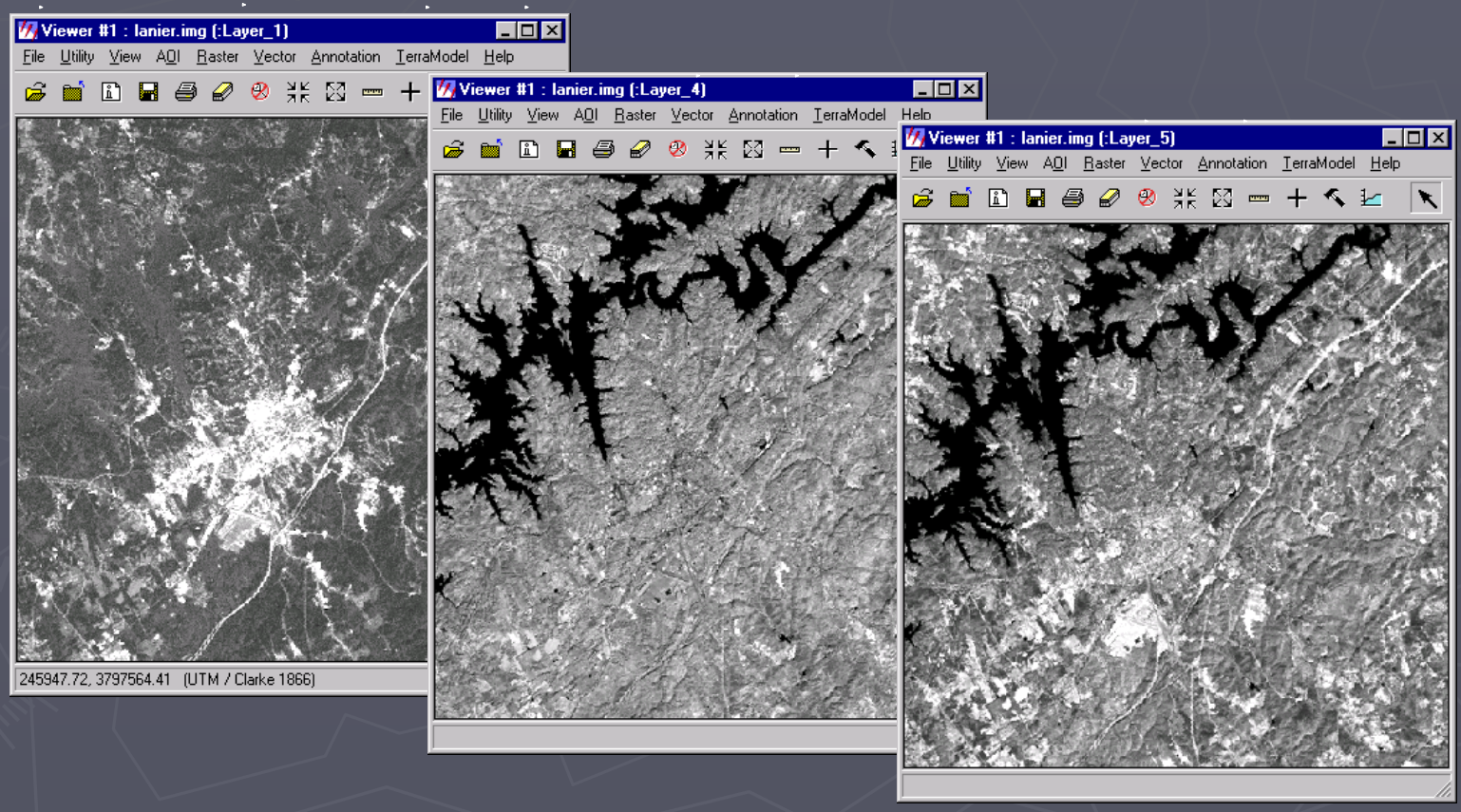
- **Multispectral (2 or more Bands)**





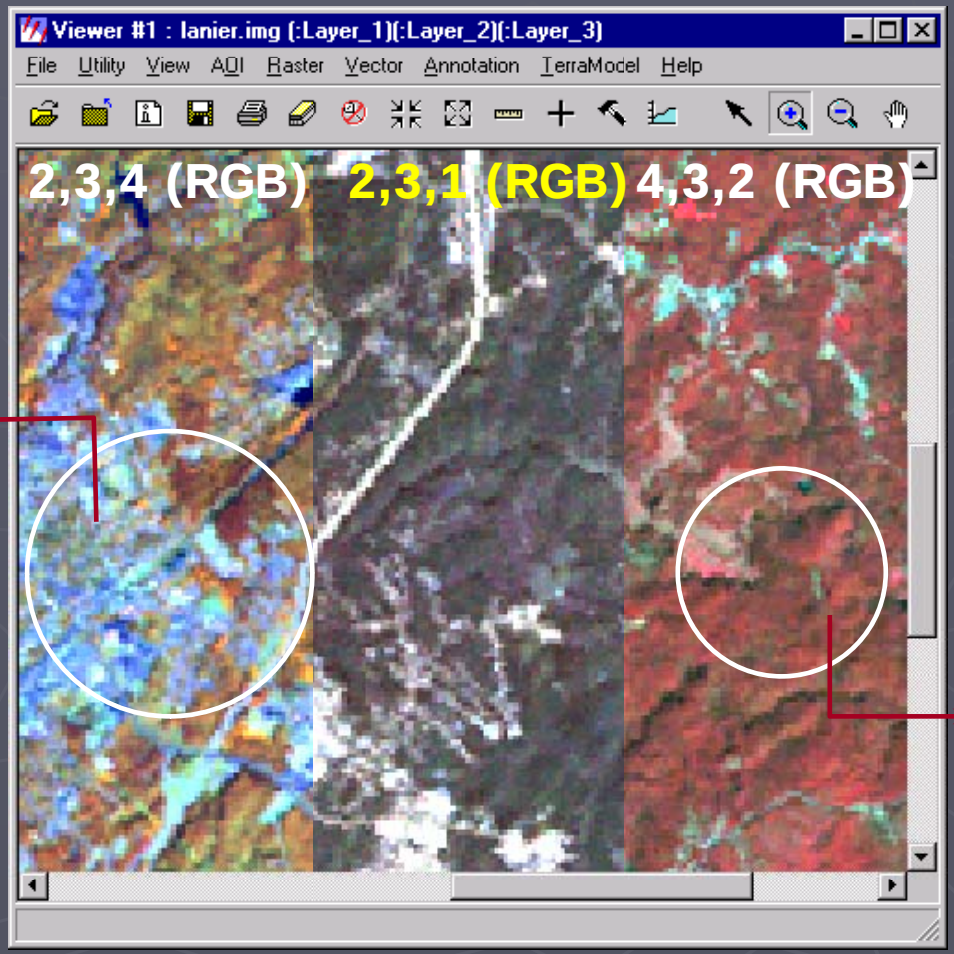
Viewing continuous images

- Each band or layer is viewable as a separate image



Band Combinations

- Features can become more obvious



Exe...

Thank You