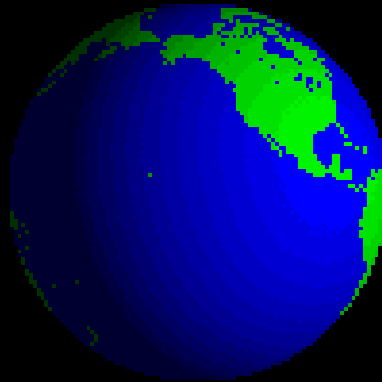


FUNDAMENTALS OF REMOTE SENSING



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Mangaldai College

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

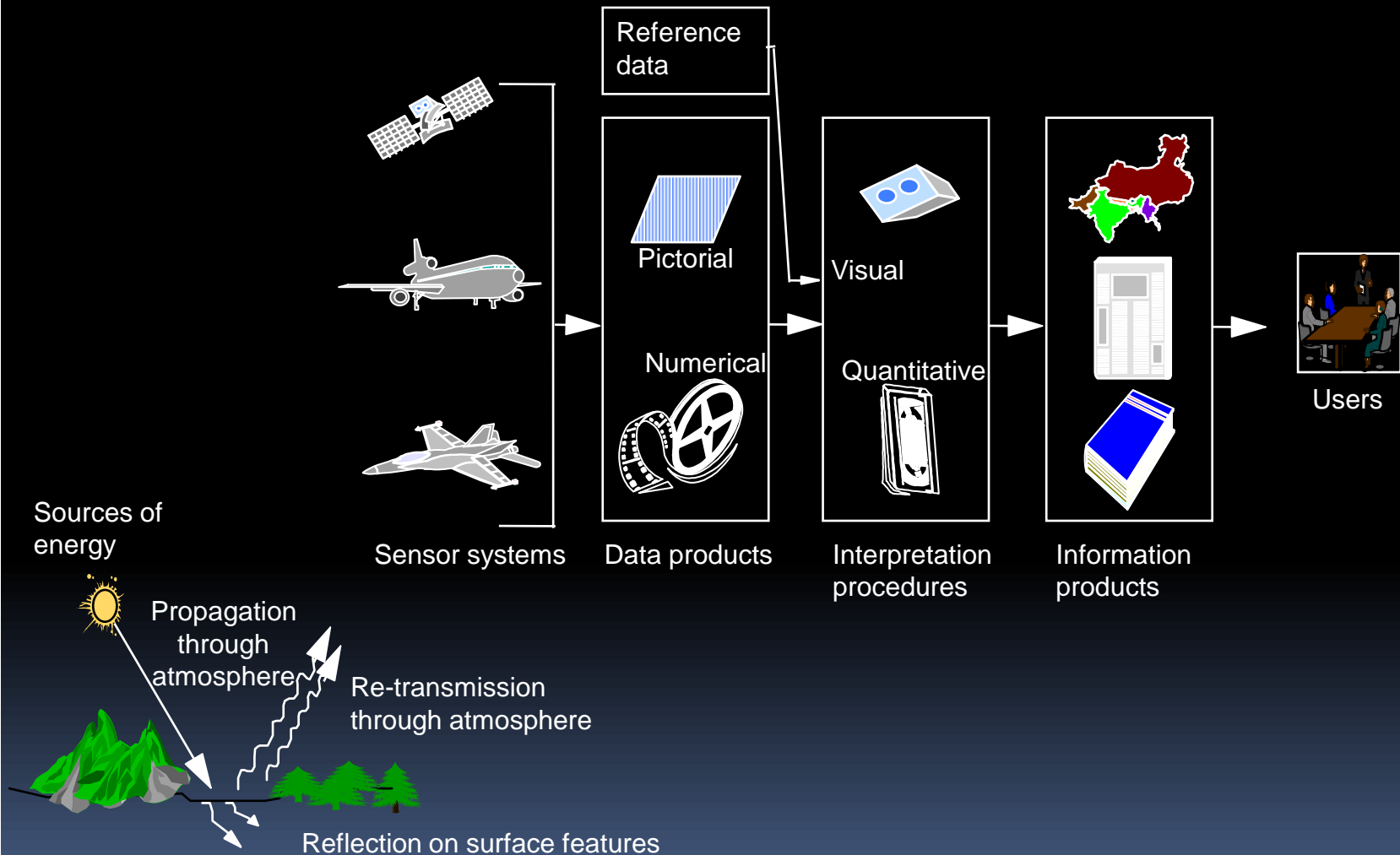


Important Missions

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

Remote Sensing Systems

DATA ACQUISITION → DATA ANALYSIS



Types of Remote Sensing

- Passive Remote Sensing
- Active Remote Sensing

Passive Remote Sensing

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

Advantages of Passive R S

- Its can give good quality high resolution satellite images.
- Multiple band information will be there in the images

Disadvantages of Passive R S

- It can't penetrate through cloud cover.
- No data or images in rainy season

Active Remote Sensing

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

Advantages of Active R S

- It can penetrate through cloud.

Disadvantages of Active R S

- Resolution is coarse and poor
- Need special training for image interpretation

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

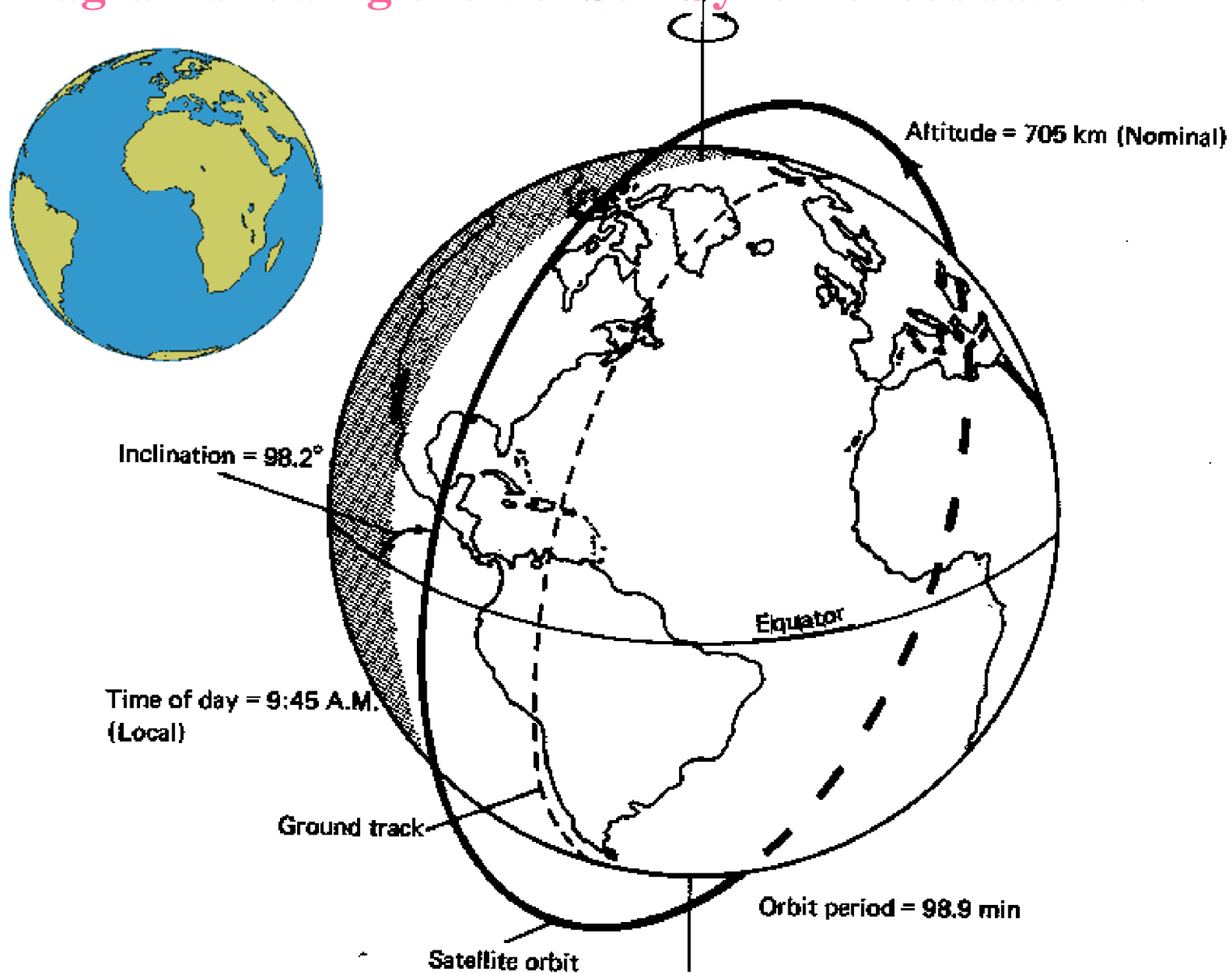
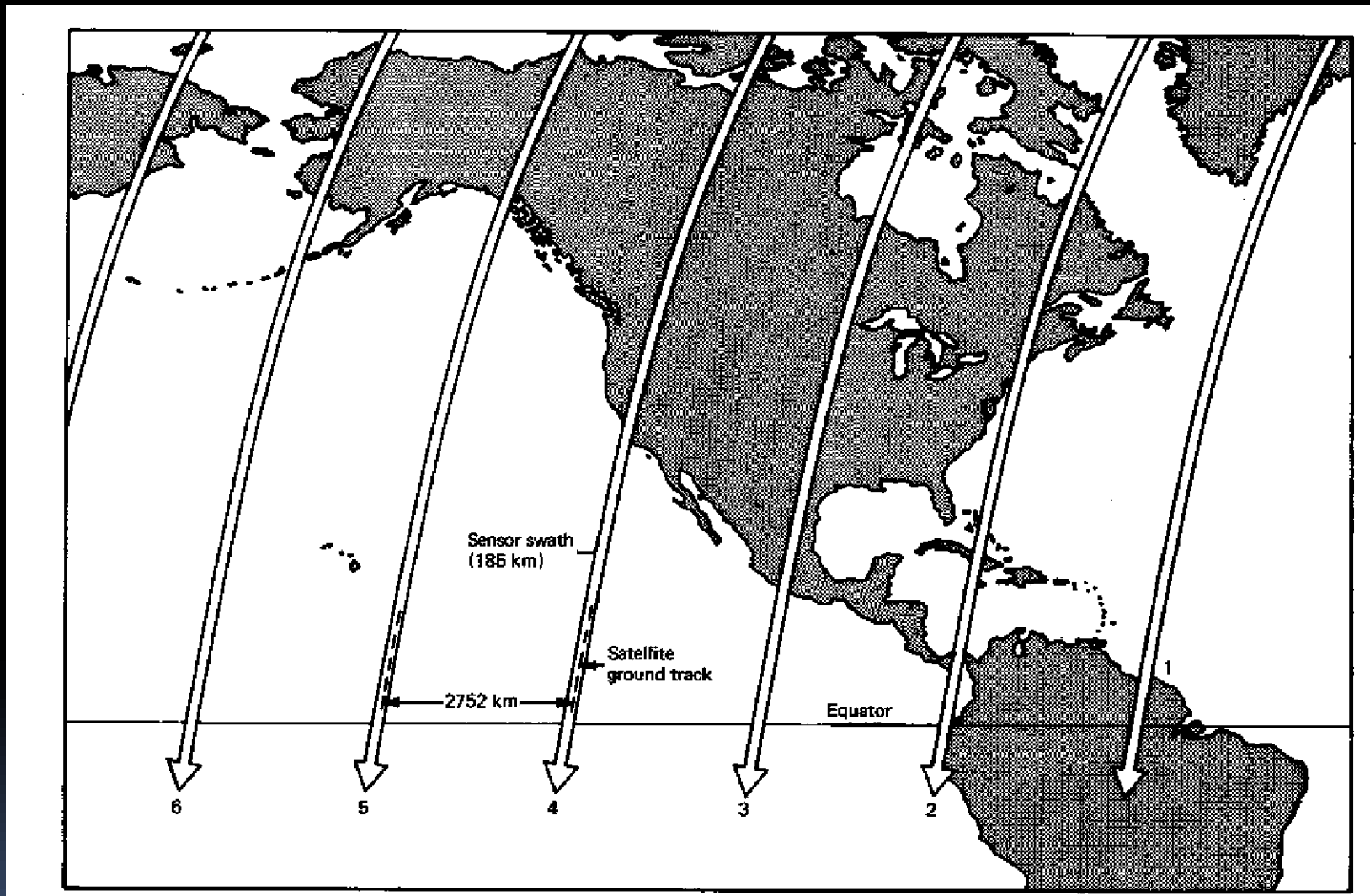
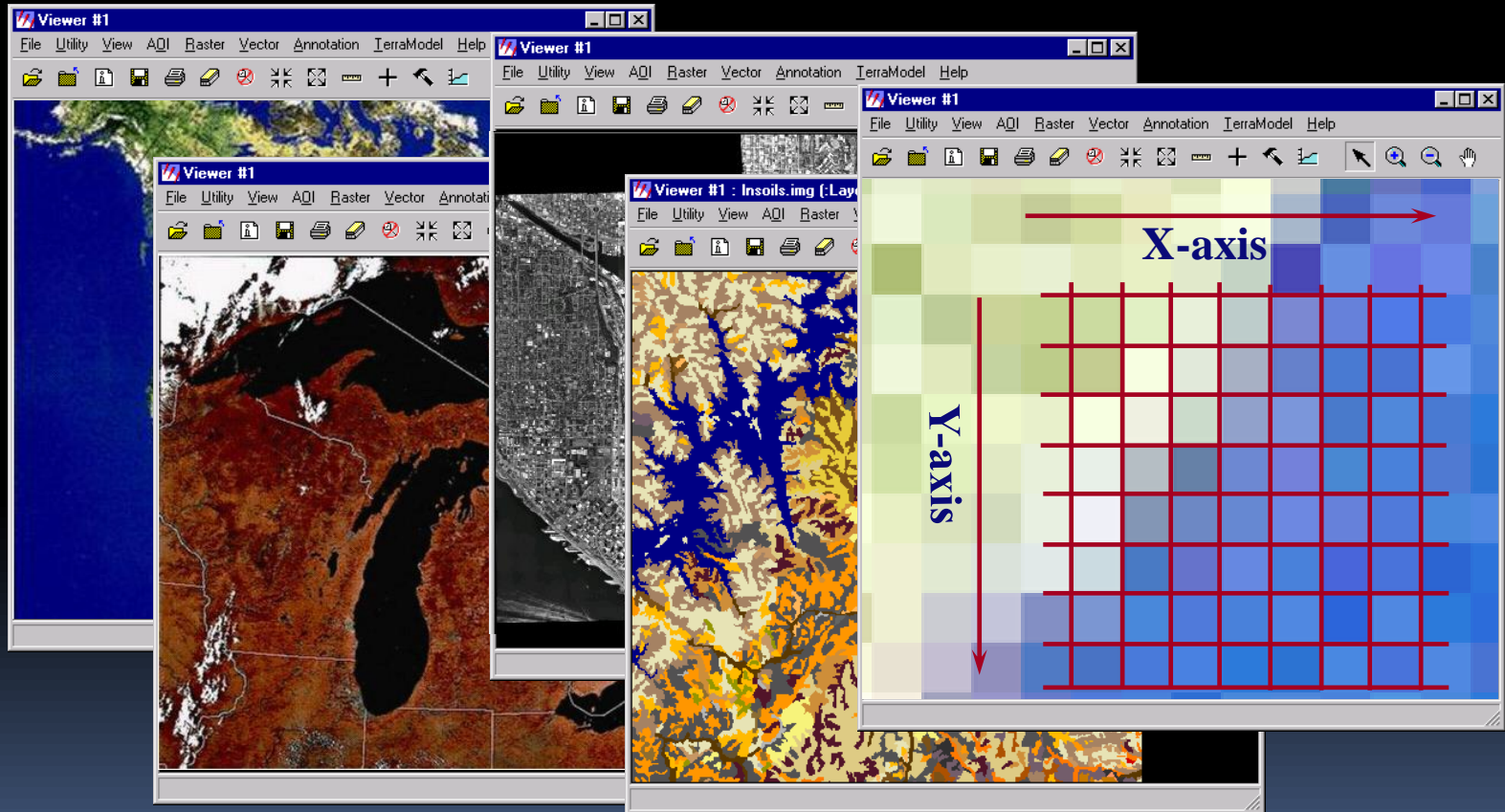


Diagram Showing adjacent tracks (passes)



What is an image?

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

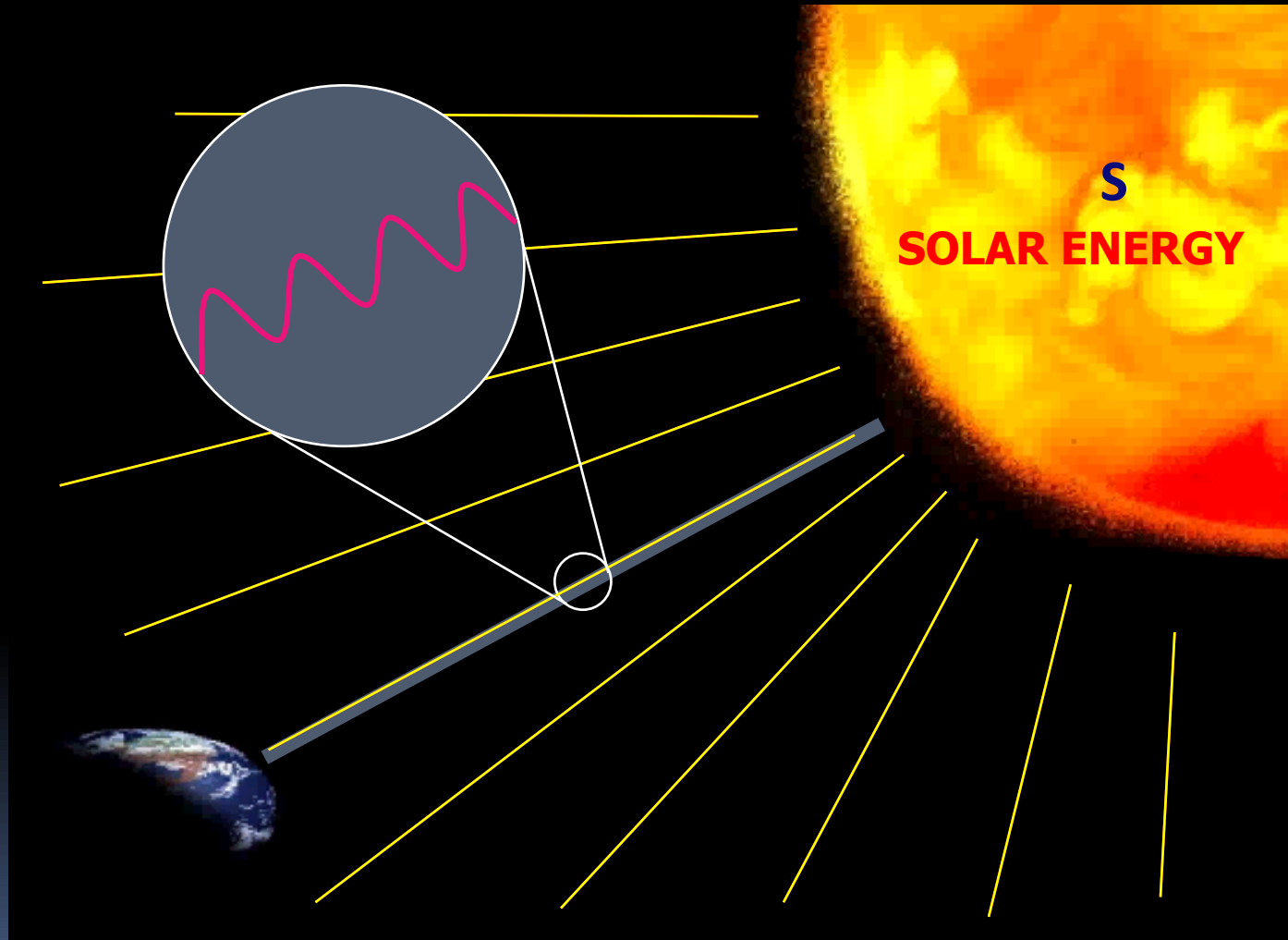




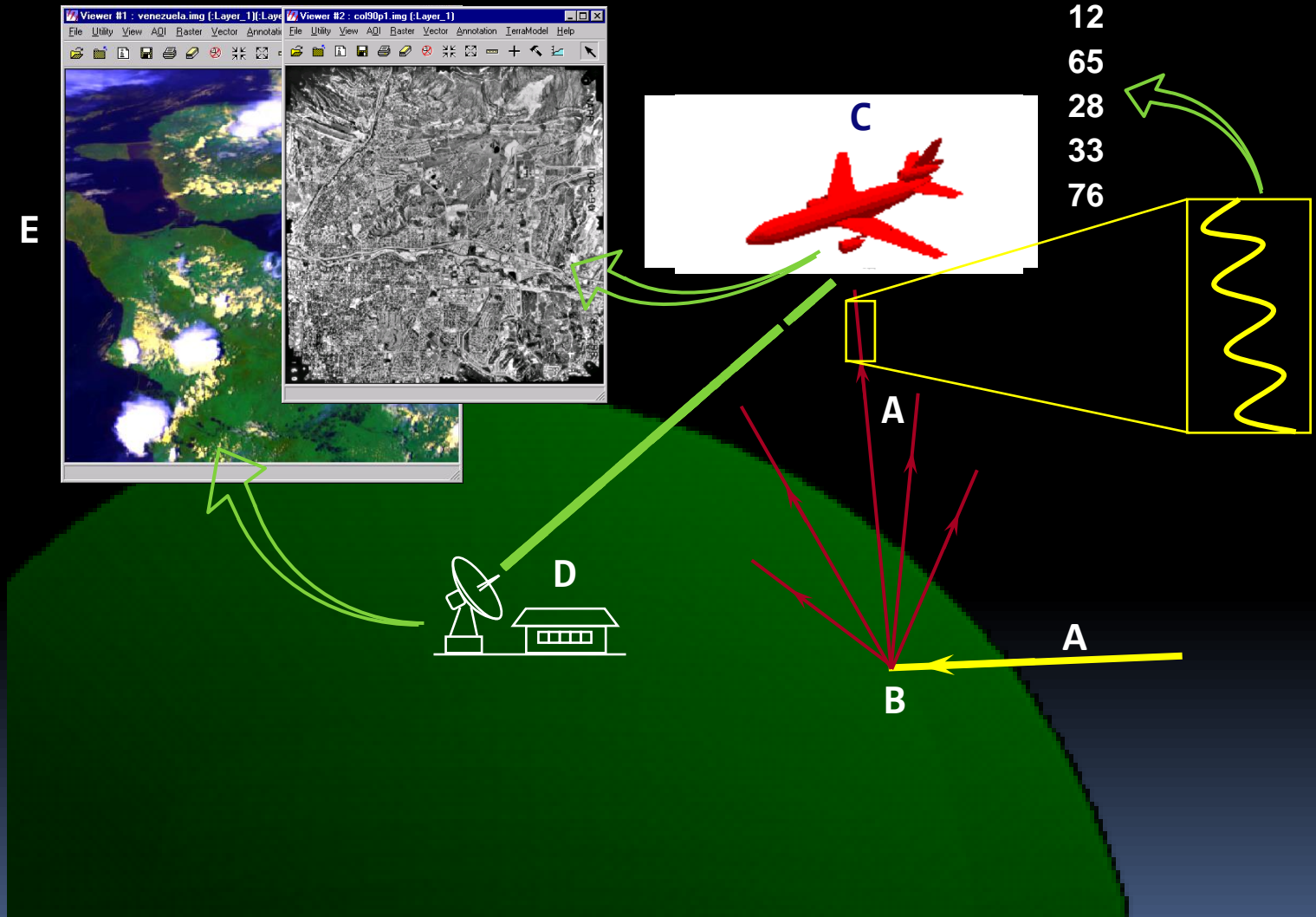
How are images made?

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

The process of remote sensing

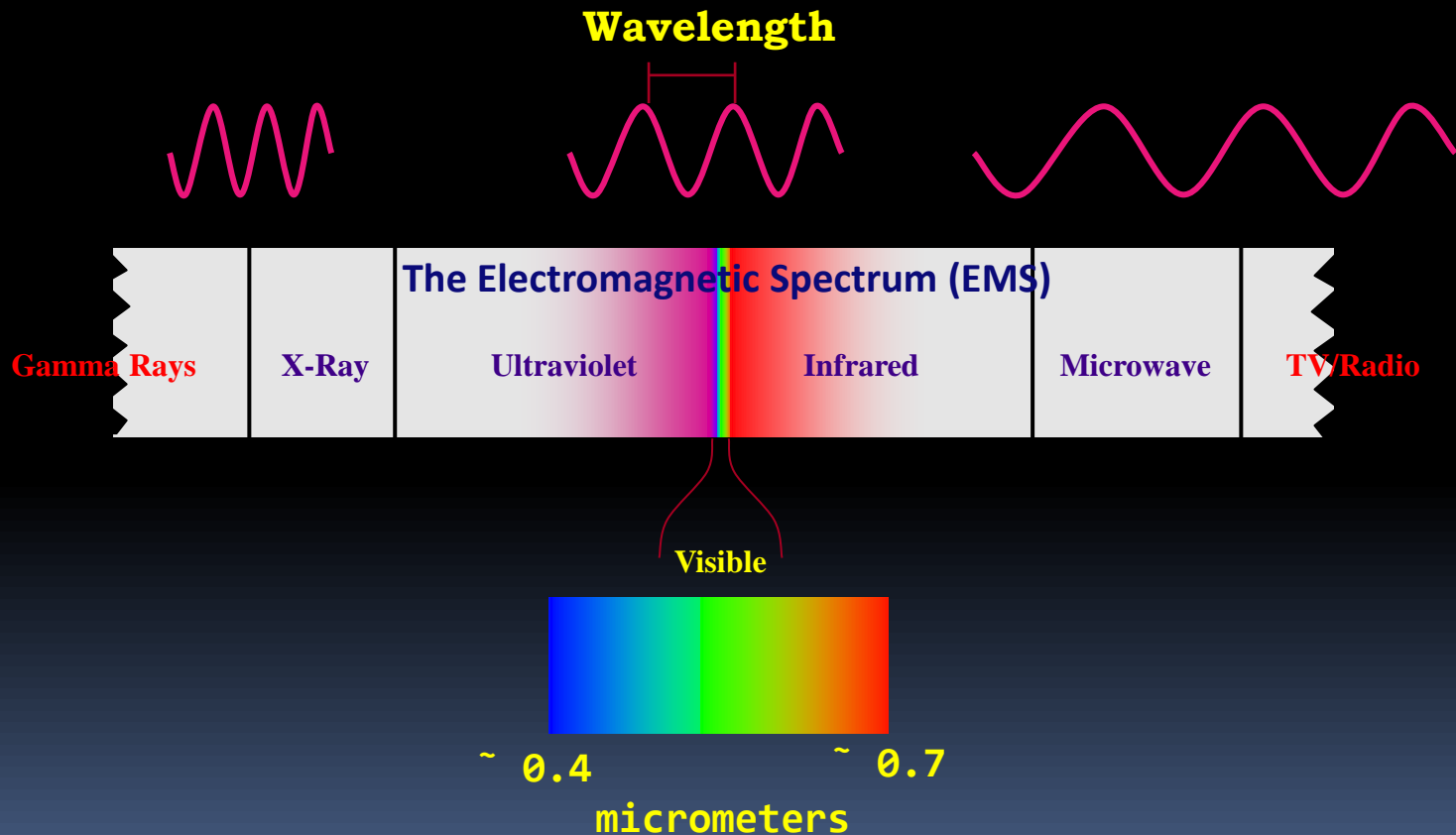


The process of remote sensing



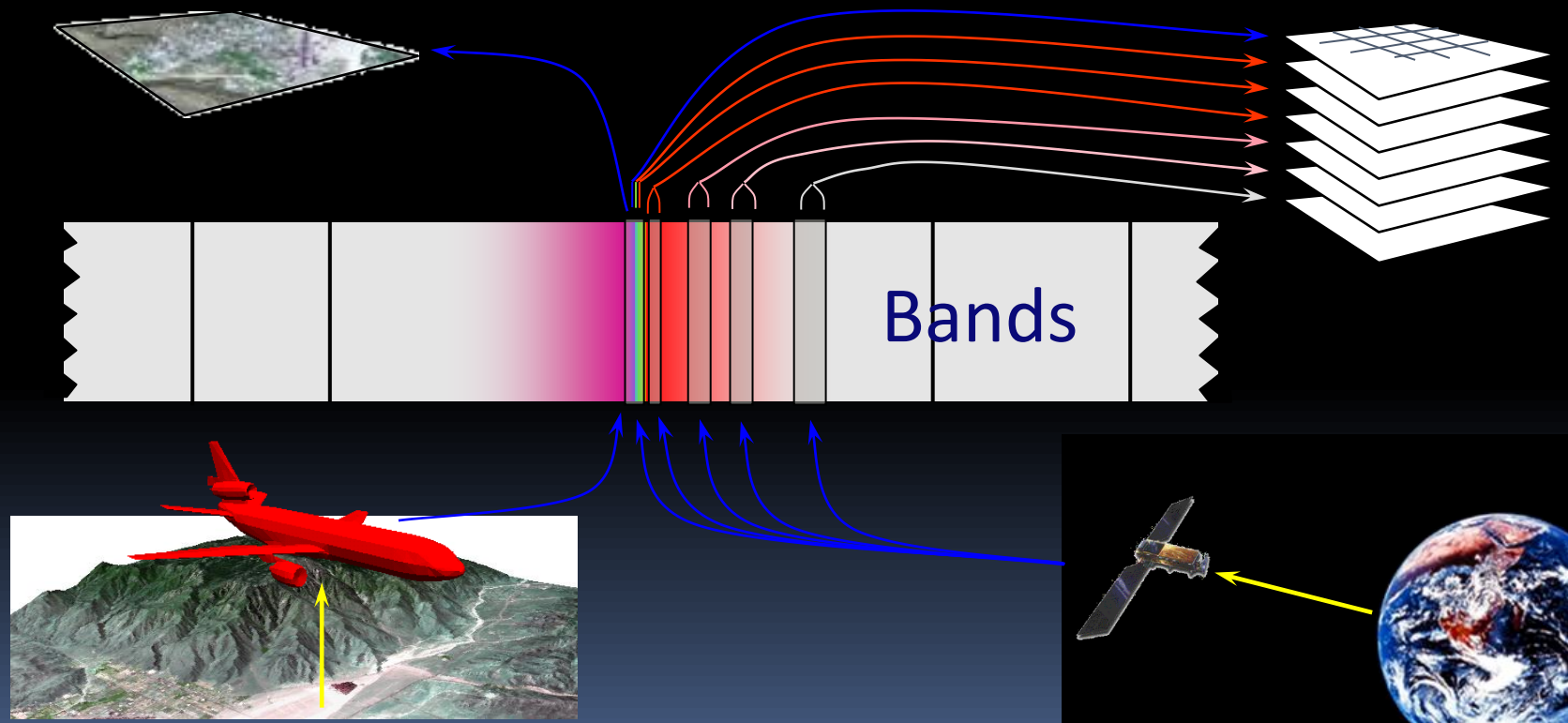
Measuring Light

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

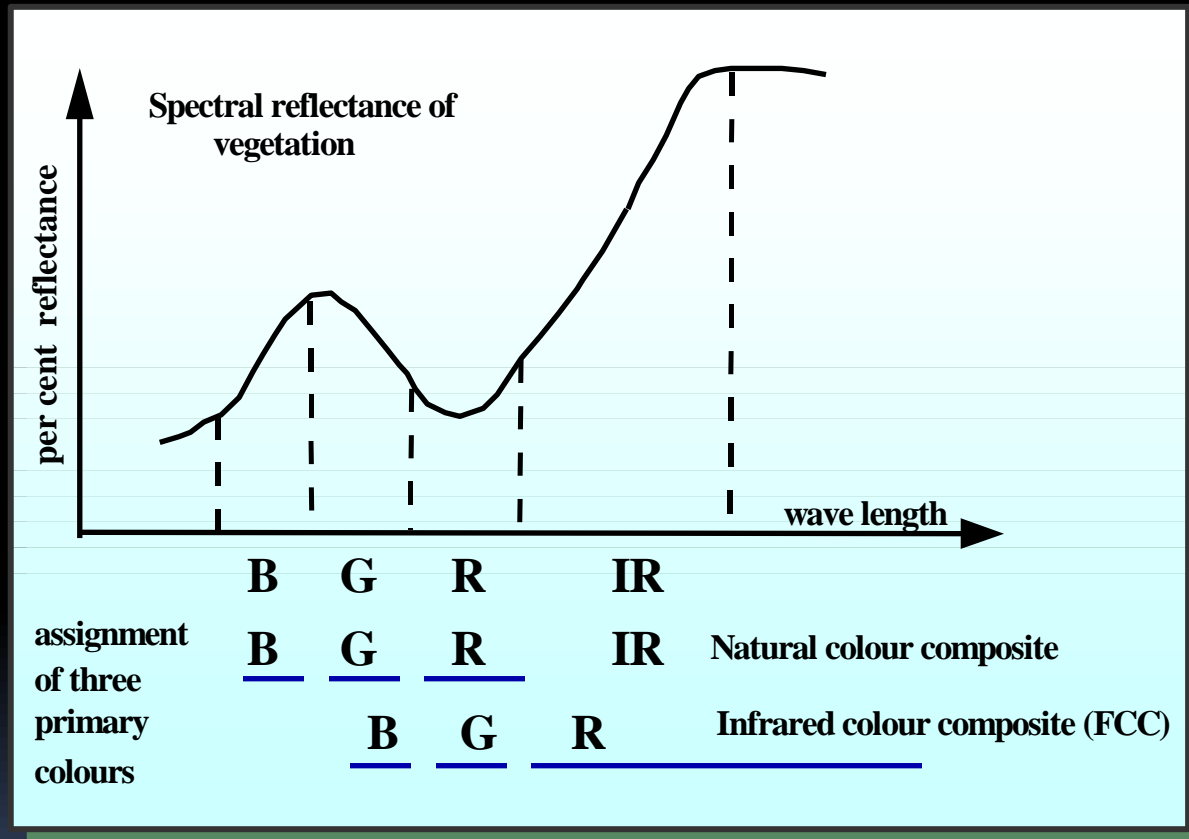


Measuring Light: Bands

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

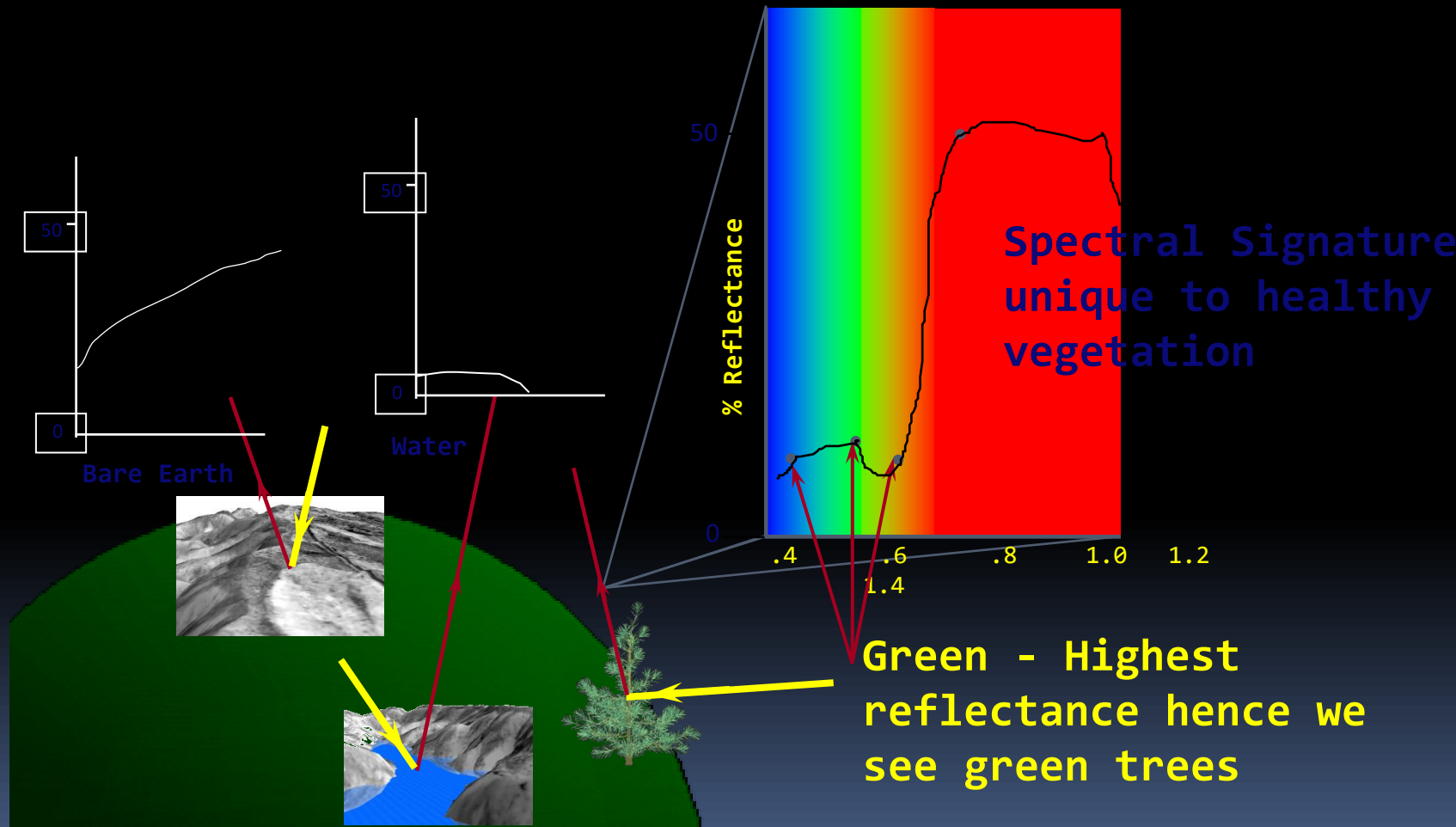


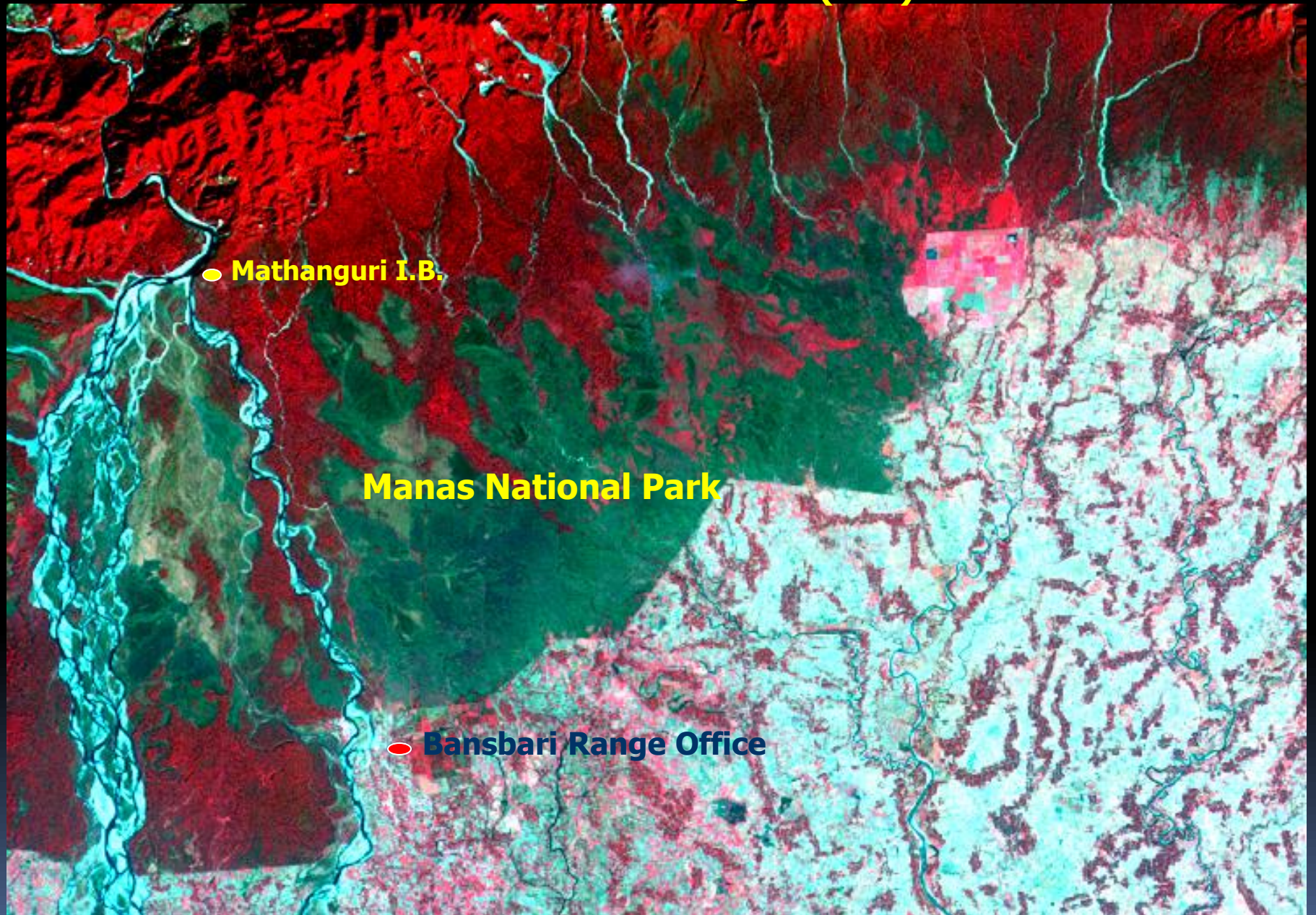
Examples of Colour Composites



Spectral Signatures

- Signal received by sensor depends on land cover



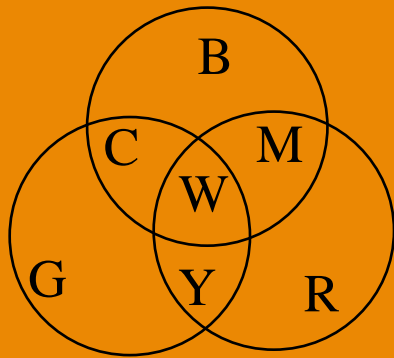


● **Mathanguri I.B.**

Manas National Park

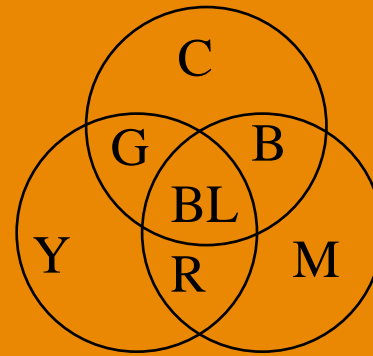
● **Bansbari Range Office**

Methods of Colour Composite



Additive color composite

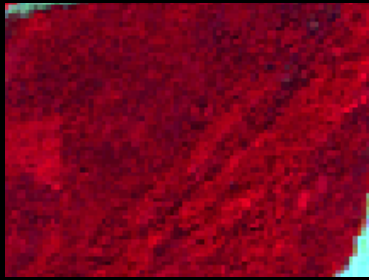
B = Blue
G = Green
R = Red
W = White



Subtractive color composite

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

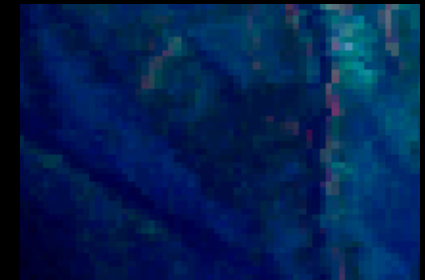
METHODS OF COLOUR COMPOSITE



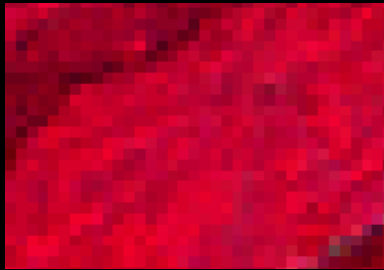
Dense Forest



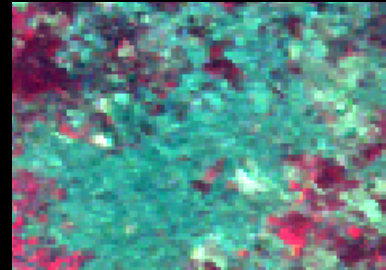
River



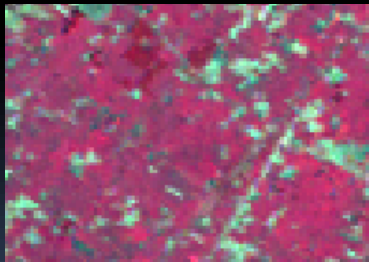
Water Body



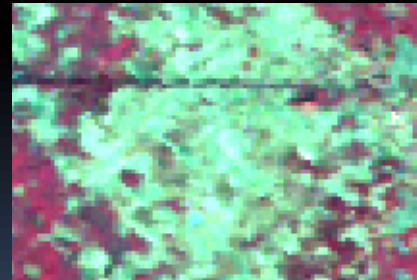
Open Forest



Settlement



Agriculture



Fallow Land

Typical Tone and Texture of Common Features

(c) Dr. Pranjit Kumar Sarma

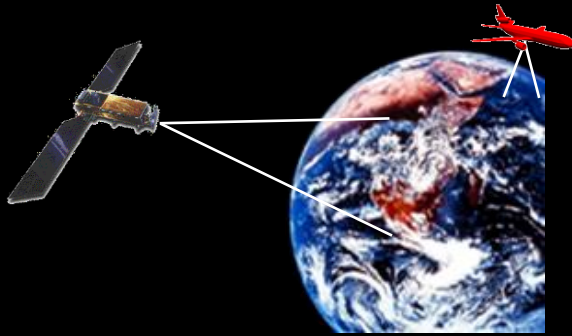
GIS UNIT,



Two types of images

- REMOTELY SENSED images

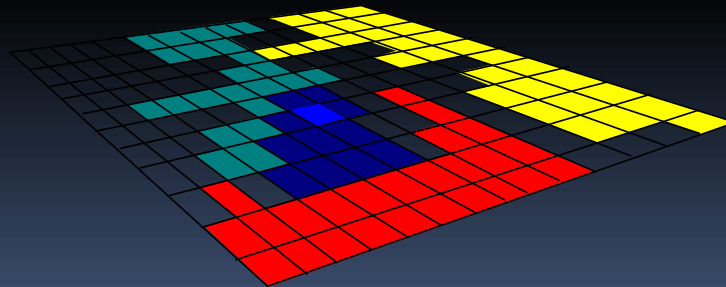
Continuous data



- Measured Values (light)
- Quantitative

- THEMATIC Images

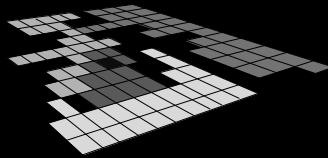
Discrete data



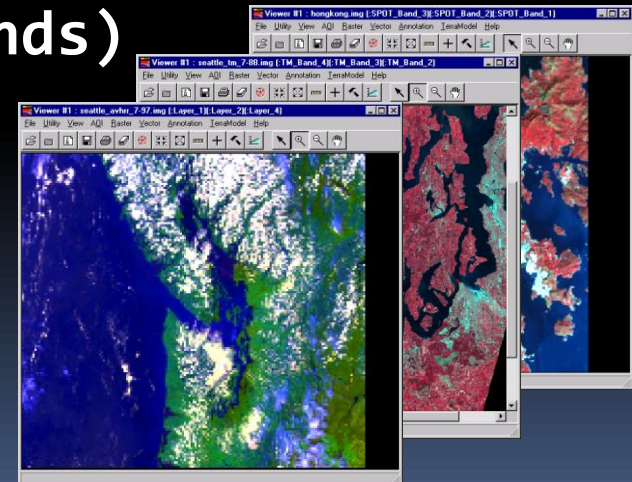
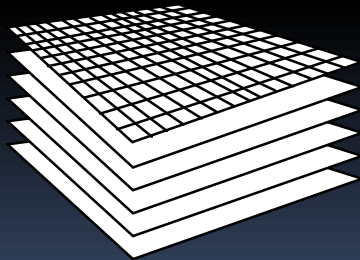
- Values only indicate class
- Qualitative

Continuous data

- Two types:
- Panchromatic (1 Band/layer)



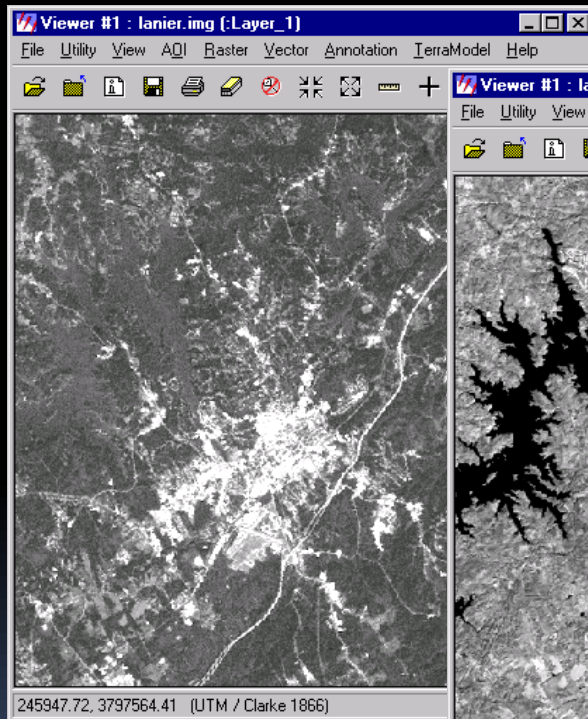
- Multispectral (2 or more Bands)



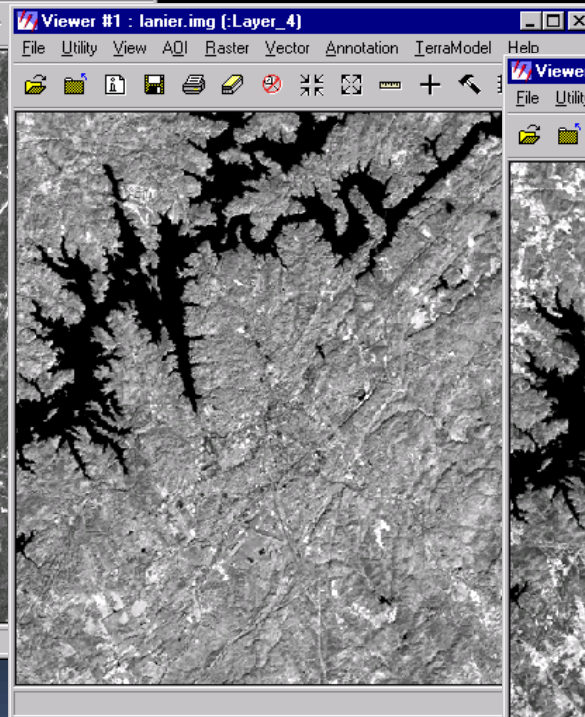
Viewing continuous images

- Each band or layer is viewable as a separate image

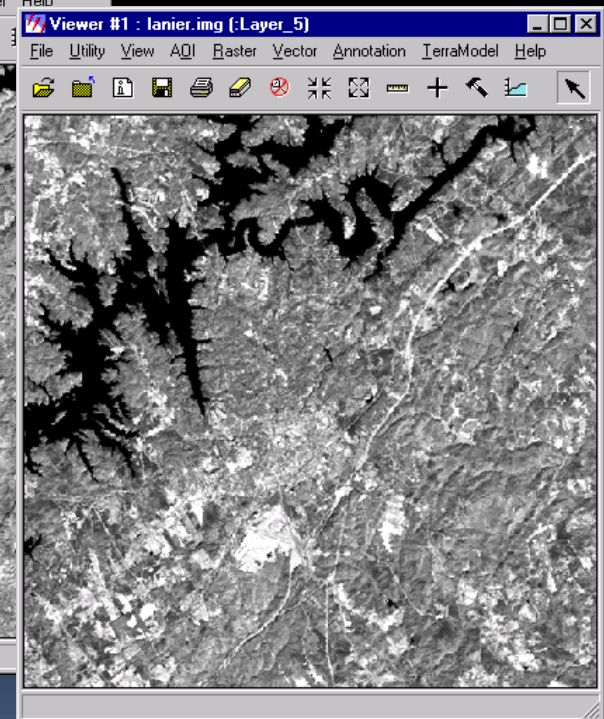
Thematic Mapper Band 1



Band 4

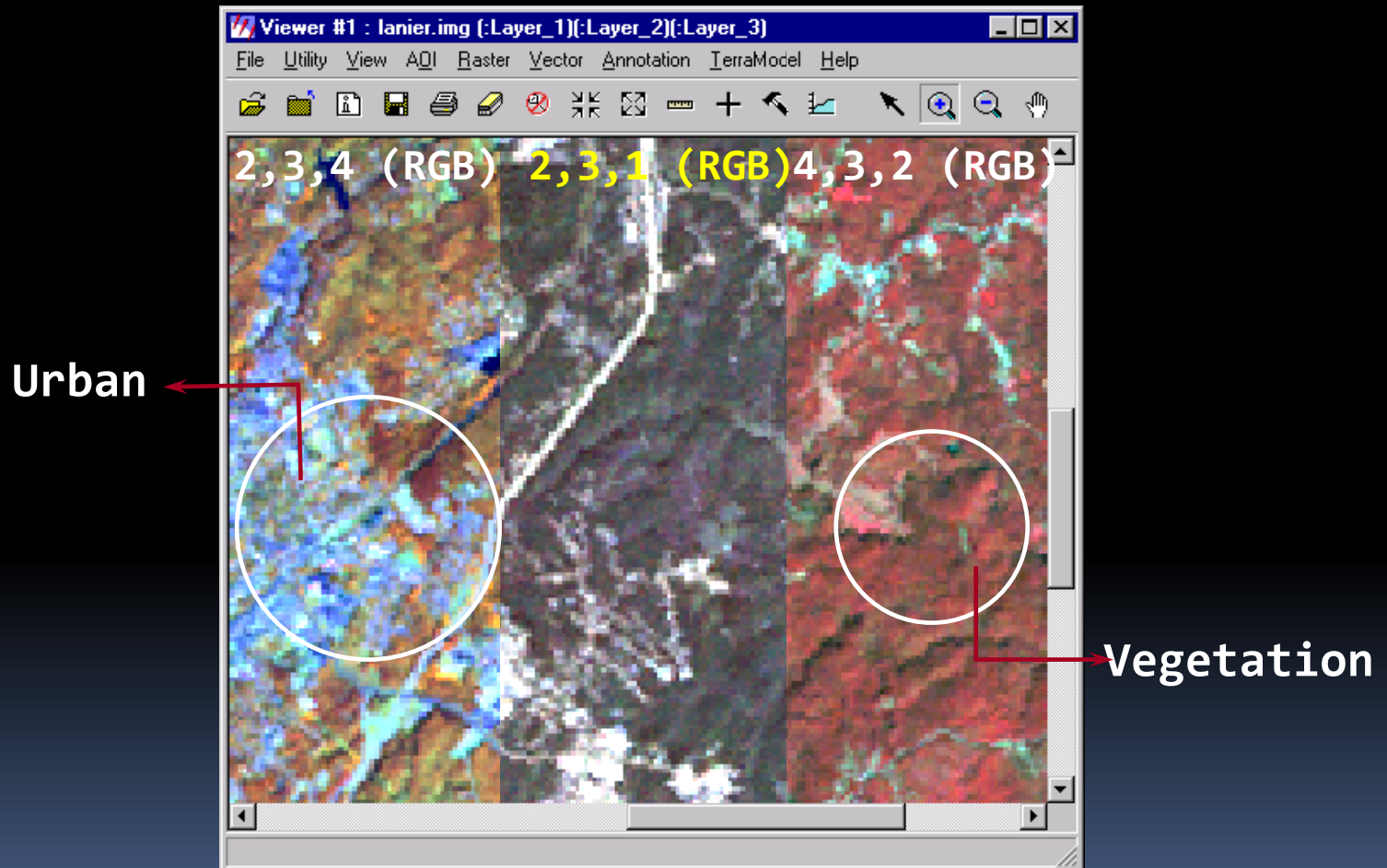


Band 5



Band Combinations

- Features can become more obvious





Thank You