Introduction to Remote Sensing

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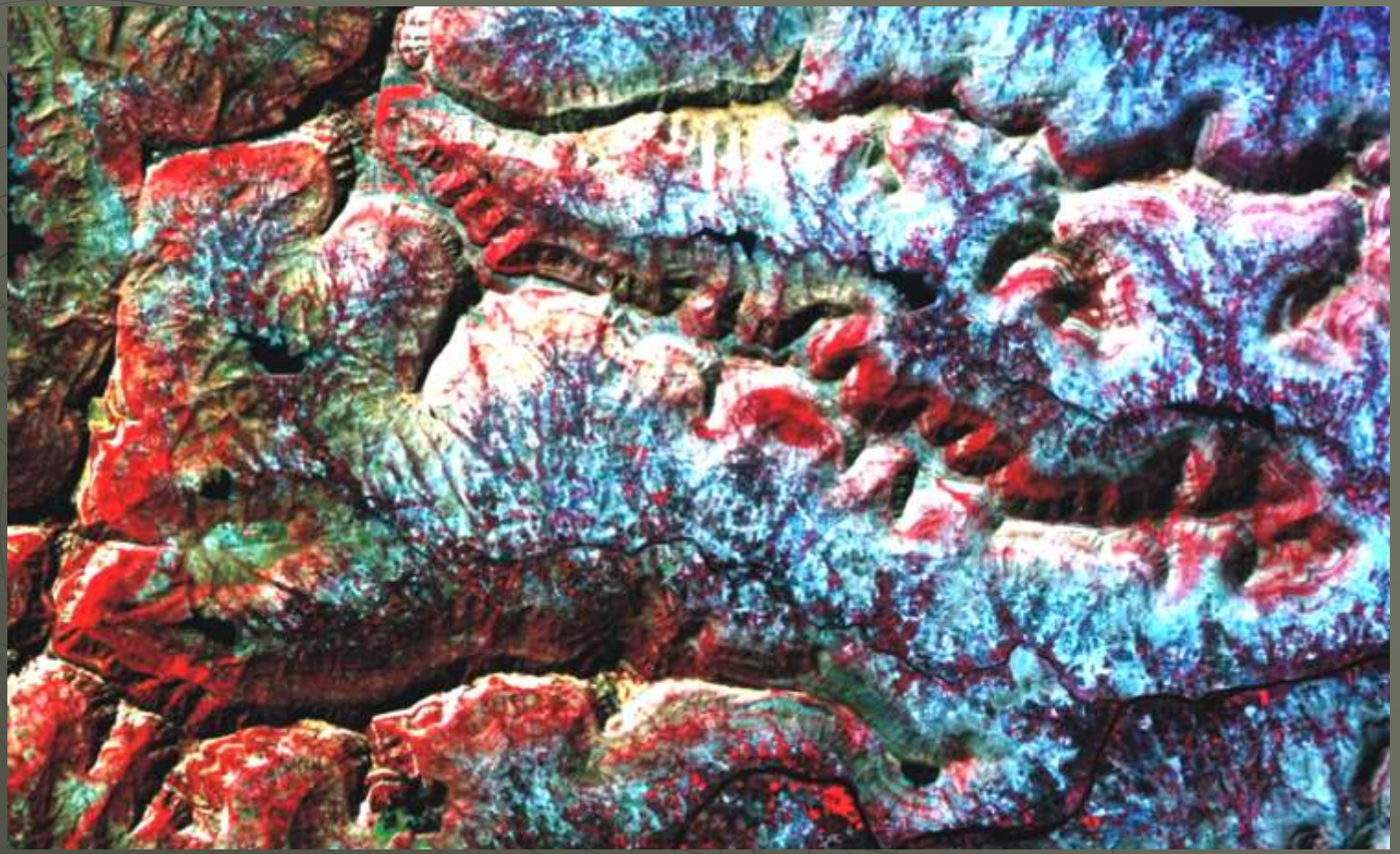
Definition of Remote sensing

It is a technique by virtue of which:

- information about an object, area or phenomenon is obtained with the help of
- a sensor on board
- a platform from
- some distance

without coming in contact with object, area or phenomenon.

Objects and areas



- Forest ; Soil ; Water resources
- Agriculture
- Rocks and mineral deposits
- Urban and rural areas etc.

Phenomena

- Dynamic:
  - Forest fires
  - Volcanoes
  - Landslides
  - Earthquakes
  - Water pollution
  - Weather patterns
  - Floods etc.

Sensors

- Following sensors are used:
  - Camera
  - Scanner
  - C.C.D Radiometers
  - Thermal scanners etc

Platforms

- Aeroplane
- Satellite
- Balloons

Distance between platform and object varies with purpose of Remote sensing.
Example: Weather satellites: 36000km
Aeroplane: 5-10 km.

Platform	Flying height	Coverage	Resolution
INSAT	36,000 km	Continental	>100 km
LANDSAT	700-900 km	185 km * 185 km	20-70 m
IRS	900 km	141 km * 141 km	5-6 m
Aeroplane	5-10 km	10 km * 10 km	2-5 m

Resolution

- What is resolution?
- Why is it different for different sensors?

Energy for remote sensing

Electromagnetic Energy (EMR)

It is the only form of energy which does not require any medium (such as air or water or metal) for transmission

Two types of EMR energy sources:

- **Natural**
- **Artificial**

Energy required for Remote sensing

Natural sources

- Sun
- Hot objects
  - Volcanoes
  - Forest fires
  - Gulf streams
  - Heat from earth
  - Hot springs
- Passive microwave

Artificial sources

- Active microwave by SLAR, SIR, SAR
- Laser

Atmospheric windows

When Suns energy passes through the atmosphere; gases, water vapour, dust particles etc. absorb and scatter a part of the radiation.

Those wavelengths which can pass through the atmosphere are called *Atmospheric Windows.*

Atmospheric windows are those portions of EMR for which the atmosphere is *transparent*.

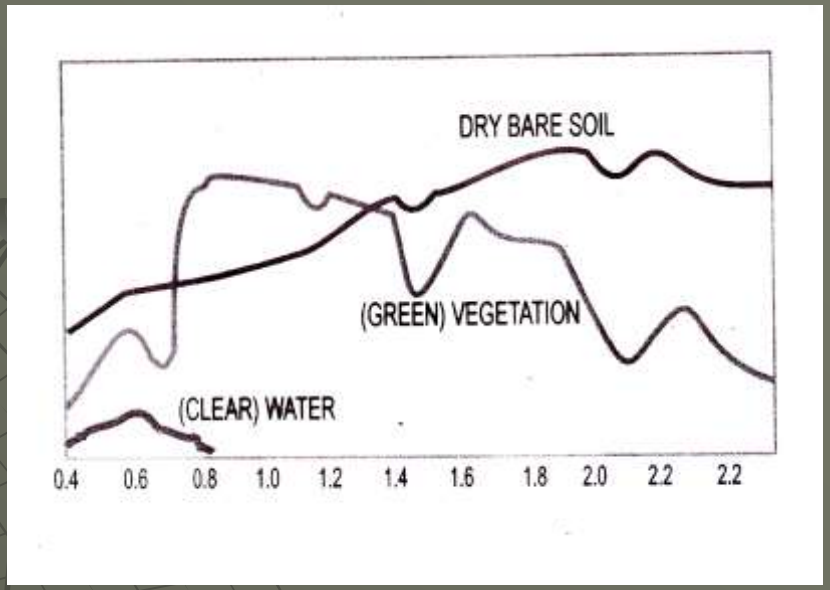
Atmospheric windows

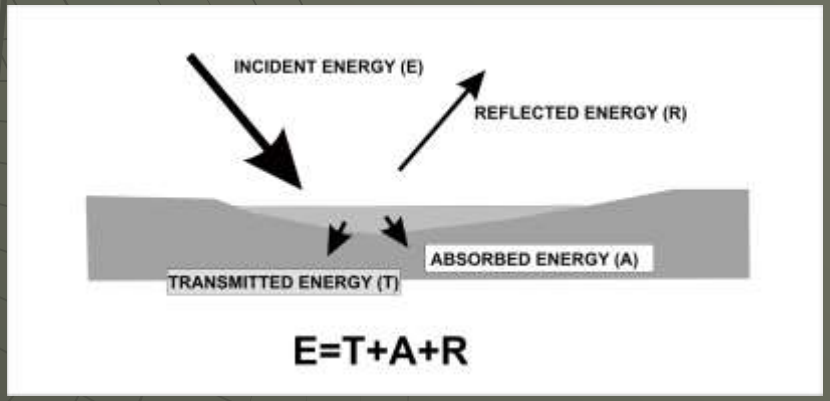
Band widths of EMR which can penetrate through the atmosphere

Gamma rays	0.03 micrometer	Absorbed
U.V	0.03-0.3	Ozone absorption
U.V	0.3-0.4	Detected by spl. film
Visible	0.4– 0.7 microns	Aerial photography, scanner etc.
Near I.R.	0.7-0.9 microns	Photographic (sp.film) N.I.R. scanner etc.
Near I.R.	0.9-1.5 microns	Non photographic N.I.R. scanner
Middle I.R.	3-5.5 microns	Thermal scanner
Far I.R.	8-16 microns	Thermal scanner
Microwave	0.75 cm to 1.3 m.	Radar, SLAR, SIR, Radiometer

Interaction of EMR with earth

- Visible, N.I.R.- Reflected
- Thermal I.R.- Emitted
- Microwave (active) - Scattered
- Microwave (passive)- Emitted





Aerial photo interpretation

- *Stereopairs* of vertical aerophotos viewed under stereoscope.
- Photo recognition elements like
  - Tone
  - Texture
  - Pattern
  - Form
  - Shape
  - Size
  - shadow etc

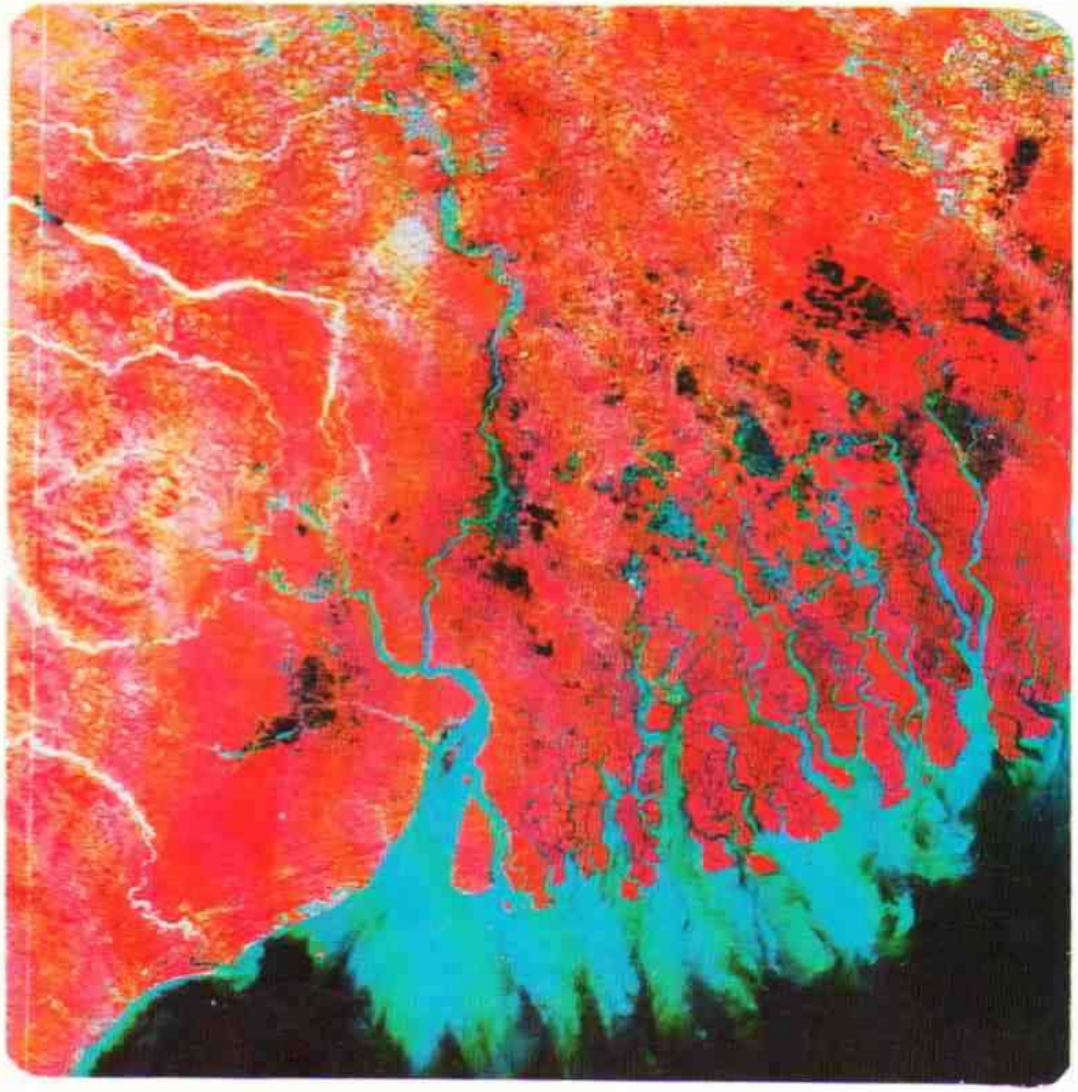
used to interprete different features.

L4/MSS 135-041 19-Jan-85 (280 Pixels X 200 Lines / 22.12 X 15.80 Kms) SCALE 1:91,670 (1 cm = 917 mts.)

L5/TM 135-041 Q4 20-Jan-88 (738 Pixels 526 Lines / 22.14 X 15.78 Kms) SCALE 1:91,753 (1 cm = 918 mts.)

Different types

- Panchromatic black and white:
  - Tones depend on colour, moisture, shadows etc.
  - Vegetation dark colour
- Panchromatic coloured: colours true to original
- NIR Black and white
- False Colour Near Infrared
  - Vegetation : Red
- Multiband (Multispectral) :same features show different reflectance in different bands.



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Applications of Remote sensing

- Geology
- Geography
- Urban and rural planning
- Surface and underground water
- Military
- Agriculture
- Natural calamities
- Oceanography
- Landuse
- Pedology
- Forestry

Thank you !