

# Remote Sensing Systems Characteristics

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## Resolutions

- Spatial Resolution
- Spectral Resolution
- Radiometric Resolution
- Temporal Resolution

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## Spatial Resolution

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## Spatial Resolution

Coarse Spatial Resolution

Fine Spatial Resolution

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Data in a wide range of Pixel Resolutions (or scales), Radiometry, Bandwidths, and time-scales

False color composite image (red = 850 nm, green = 650 nm, blue = 555 nm) of MODIS, ETM+ and IKONOS imagery (Left image Courtesy: Morissette et al., 2002).

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## Spectral Resolution

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## Spectral Resolution (Contd.)

TM Band 1  
0.45–0.52  $\mu\text{m}$   
(blue)

TM Band 2  
0.52–0.60  $\mu\text{m}$   
(green)

TM Band 3  
0.63–0.69  $\mu\text{m}$   
(red)

TM Band 4  
0.75–0.90  $\mu\text{m}$   
(near-infrared)

TM Band 5  
1.25–1.75  $\mu\text{m}$   
(mid-infrared)

TM Band 6  
10.4–12.5  $\mu\text{m}$   
(thermal-infrared)

TM Band 7  
2.08–2.35  $\mu\text{m}$   
(mid-infrared)

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## Radiometric Resolution

- Radiometric resolution of a sensor is a measure of how many grey levels are measured between pure black (no reflectance) to pure white.
- Is measured in bits
  - 1 bit ( $2^1$ ) – 2 levels
  - 7 bits ( $2^7$ ) – 128 levels
  - 8 bits ( $2^8$ ) – 256 levels
  - 11 bits ( $2^{11}$ ) – 2048 levels
- In a 8 bit system, black is measured as 0 and white is measured as 255.
- For comparison across bands, all the bands should have same radiometric resolution.

**Examples**

- IRS 1A & 1B
- Landsat TM
- NOAA - AVHRR

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## Radiometric Resolution

1 bit: 0 to 1

2 bit: 0 to 3

8 bit: 0 to 255

10 bit: 0 to 1023

Black    Dark grey    Mid-grey    Pale grey    White

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## Radiometric Resolution

2 Bit Data (Coarse)

8 Bit Data (Fine)

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## Temporal Resolution

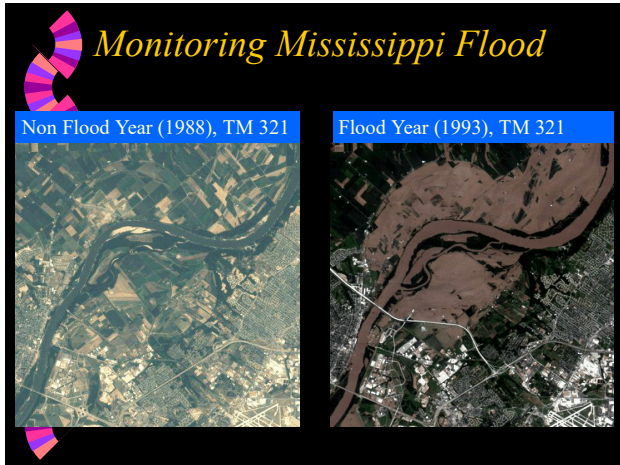
- Temporal resolution of a RS system is a measure of how often data are obtained for the same area
  - Applicable to satellite RS only
- Temporal resolution varies from less than one hour to approximately 30 days.

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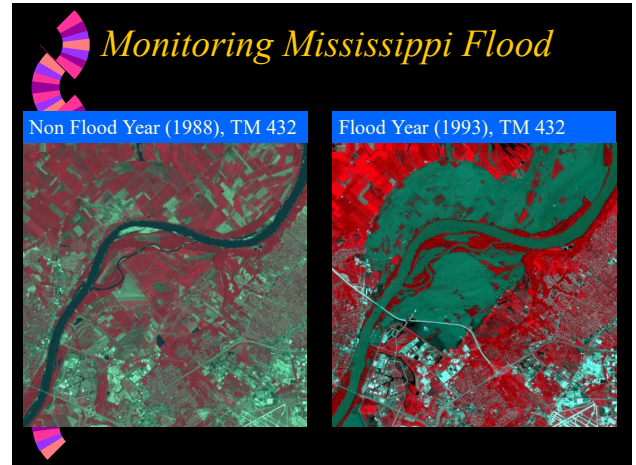
## Importance of Temporal Resolution

- Change in Land Use/ Land Cover
- Temporal Variation
- Monitoring of a Dynamic Event
  - Cyclone
  - Flood
  - Volcano
  - Earthquake

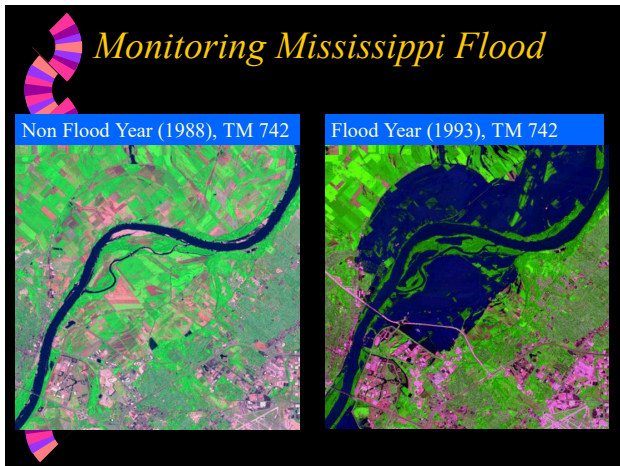
12



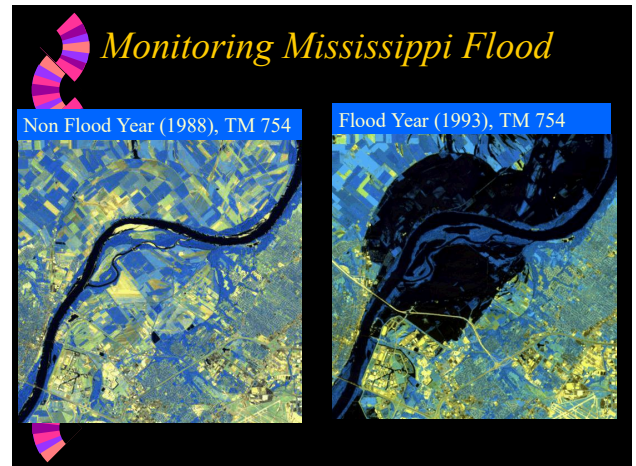
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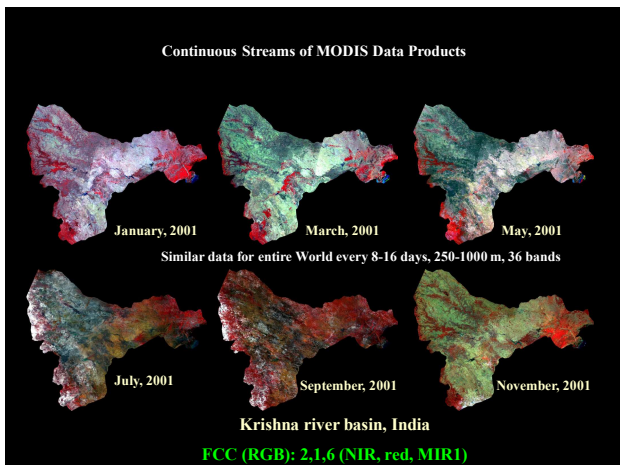
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