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2<sup>nd</sup> Stage

Remote Sensing

Lecture 1: Remote Sensing – General View



# REMOTE SENSING

**Remote sensing** : it's a science and art to get information and data from the bodies or regions reached to the R.S. instruments then analysis it ,with out any physical touch between them

#Human eyes are one of the most accurate R.S. Tools because they received spectral reflected from the bodies and sent it to mind to interpret and get information from that bodies .

**Types of R.S.:** There are three types of R.S. which different by their physical properties and applications for each :

1. Acoustic : based on sound , we can hear the voices of around place and get information about them with out seeing the sources of voices . Just depend on Ears .

- 2 . Potential : based on earths physical powers ( Gravity – magnetic – electric – Seismic – Radiation – thermal ...) , measuring theses field powers on Earth surface can give us many information about the sub-surface features .
- 3 . Spectral : based on Electromagnetic Energy . its our course studies

Energy Source or Illumination (A) **Sun**

Radiation and the Atmosphere (B)

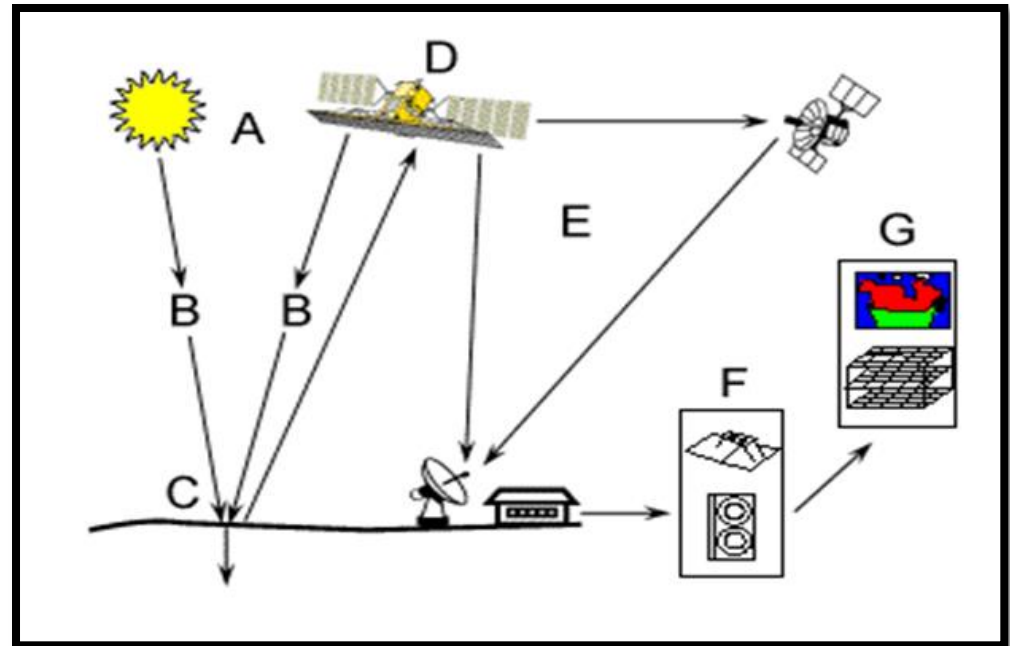
Interaction with the Target (C) **Earth**

Recording of Energy by the Sensor (D) **Satellite**

**Ground Stations** Transmission, Reception, and Processing (E)

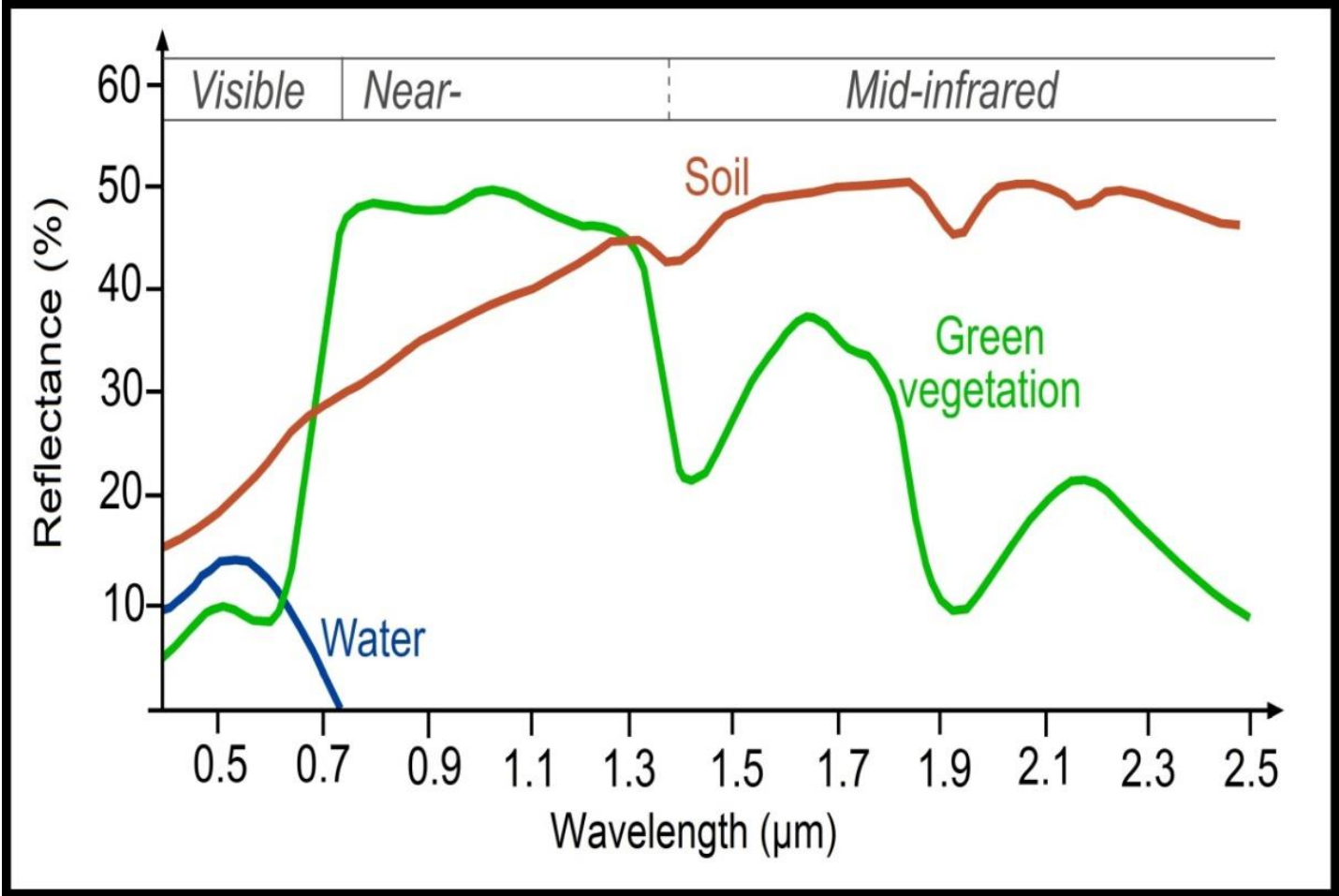
**Main frame computers** Interpretation and Analysis (F)

**Users** Application (G)

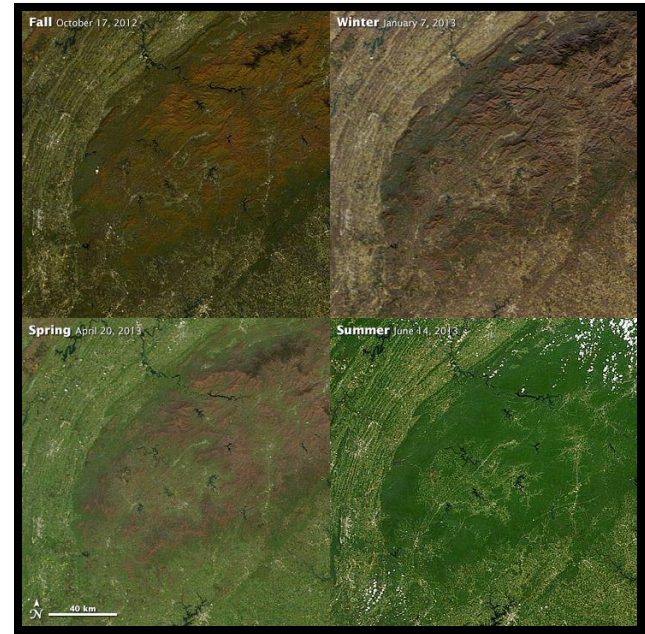


# R.S. effect by these natural changes :

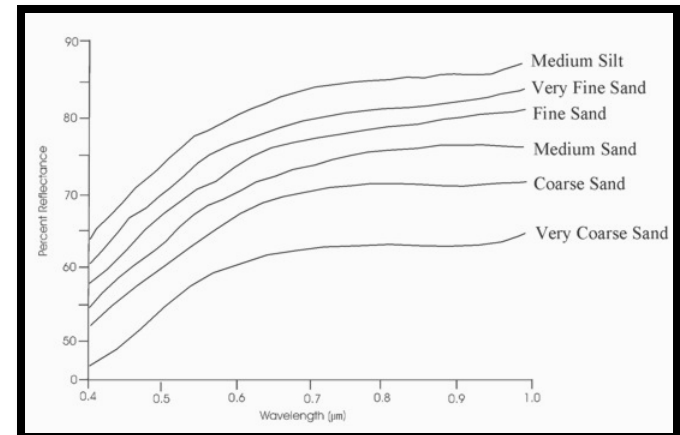
1 - Spectral : changed by spectral Electromagnetic Energy for each material or body on earth that give different values in different wavelength .



2 - Temporal : changed by time , any body can give different reflectance with the change of time , day time also season change . By effect of sun light and physical properties .



3 - Spatial : Changed by place , same body can give us different reflectance in different places by effect of Environment around the body and change in body physical .



## **Advantage of R.S.**

- 1 – The total coverage of wide areas
- 2 – Imaging difficult areas ( topography , far , dangerous ... )
- 3 - Repeated the recording can detect the changes happened
- 4 – The ability to receive and process the digital data by computers
- 5 – Can get satellite images with different scales for the same region
- 6 – Can record the region with different band width ( each band has special Characteristics)

## **Disadvantages of R.S.**

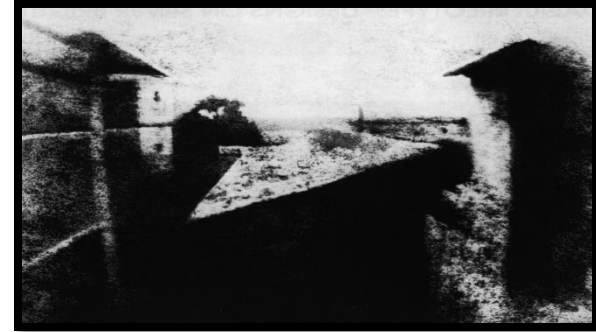
- 1 – High cost of all operations .
- 2 – High complex Technology instruments and need very specials crew to del with received data .
- 3 – Some geometric or navigation errors may happen to the satellite and in aerial images.
- 4 – The possibility of interface between the different frequencies .
- 5 – The effects of clouds and smoke or rain at some records .
- 6 – Can not record at nights .

# Historical view

# From old stone age the human use R.S. as out feeling act in his life

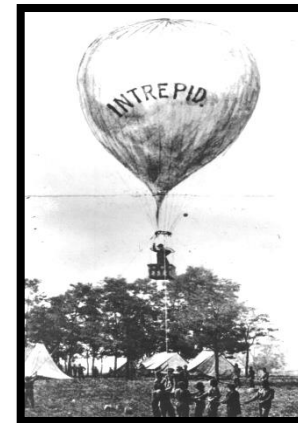
# real progress began after 1800

# 1839 First ever photographs by Daguerre and Nepce, in France



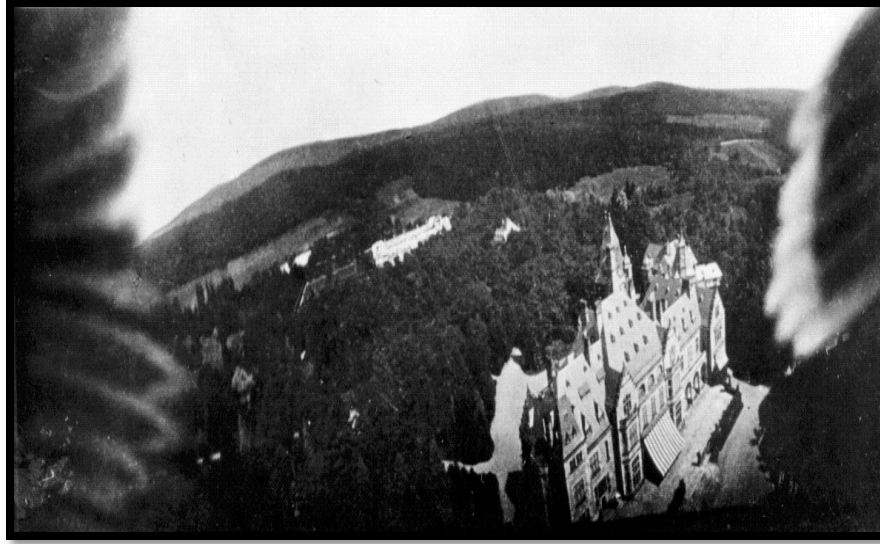
# 1840 French used photos in making topographic maps

# 1858 Pictures of Paris from cameras mounted in free Balloons.



# 1880's Camera airborne on kites in England, France, Russia.

# 1903 Cameras attached to carrier pigeons , that weighed only 70 grams.

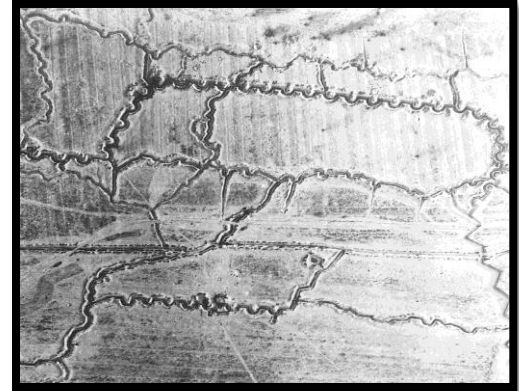


# 1909 Wilbur Wright took first photos (movies) from an airplane.





# 1915 Aerial photos used by British R.A.F. for reconnaissance, changing tactics of work in W.W.I.



# 1920 Aerial photos used by petroleum geologists for exploration.

# 1924 Multilayered color film developed.

# 1930's Extensive use of aerial photos in Earth sciences and agriculture.

# 1952 Color aerial photos used in geological mapping.

# At fifties the thermal and radar imaging begin at different applications .

# At seventies first satellite for natural resources launched named Landsat then French satellite Spot .



# References

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# Earth Science Satellite Remote Sensing Vol. 1: Science and Instruments , Qu J. J., Gao W. , Kafatos M. , Murphy R. E, Salomonson V. V., Tsinghua University Press, Beijing and Springer-Verlag GmbH Berlin Heidelberg . 2006

# Internet Remote Sensing Lectures sites