

VISUAL IMAGE INTERPRETATION

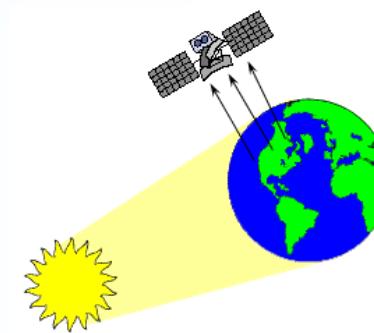


IMAGE INTERPRETATION

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- ▶ Act of examining images to identify objects and judge their significance.
- ▶ Information extraction process from the images.
- ▶ An interpreter is a specialist trained in study of photography or imagery, in addition to his own discipline.
- ▶ Aerial photographs and remote Sensing images employ electro magnetic energy as the mean of detecting and measuring target characteristics.
- ▶ Involves a considerable amount of subjective judgment
- ▶ Highly dependent on capability of mind to generalize
- ▶ Takes place at different levels of complexity

IMAGE INTERPRETATION

- ▶ Image is a pictorial representation of an object or a scene.
- ▶ Image can be analog or digital.
- ▶ Aerial photographs are generally analog, while satellite data is in digital form.
- ▶ A digital image is made up of square or rectangular areas called pixels.
- ▶ Each pixel has an associated pixel value which depends on the amount reflected energy from the ground.

Advantages of aerial photographs/Satellite Images over ground observation

- ▶ Synoptic view
- ▶ Time freezing ability
- ▶ Permanent record
- ▶ Spectral resolution
- ▶ Spatial resolution
- ▶ Cost and time effective
- ▶ Stereoscopic view
- ▶ Brings out relationship between objects

Methods of Image Interpretation

► Visual

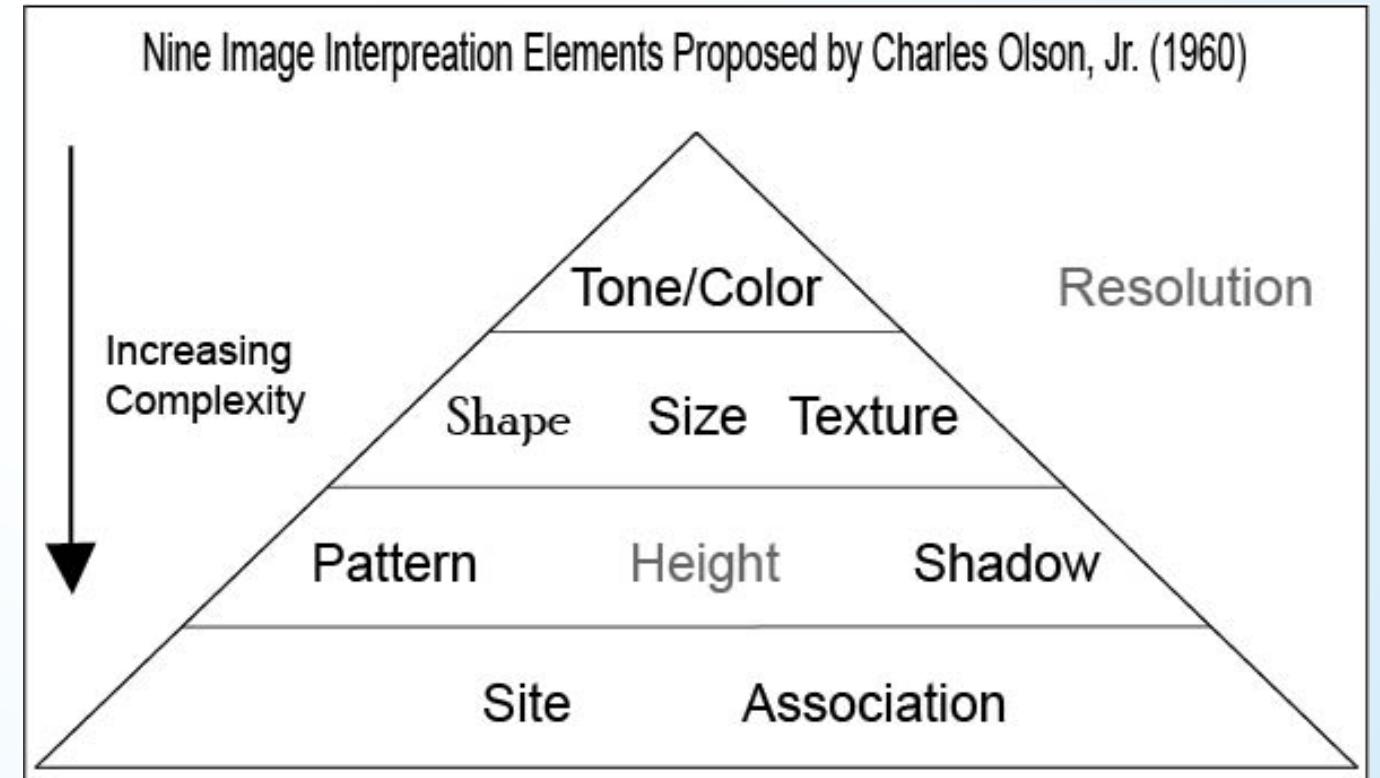
1. Visual image interpretation on a hardcopy image/photograph
2. Visual image interpretation on a digital image

► Digital image processing

Types of interpretation

► Qualitative

► Quantitative



Elements of Image Interpretation



Shape
(depends on the object outline)



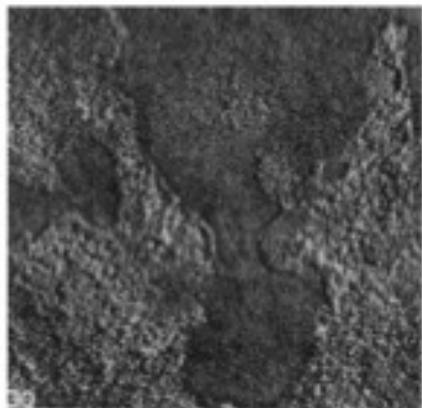
Size
(relative to one another)



Tone
(brightness-hue, color)



Site
(location helps recognition)



Texture
(smooth or coarse)



Shadow
(helps to determine height)



Association
(features that are normally found near object)

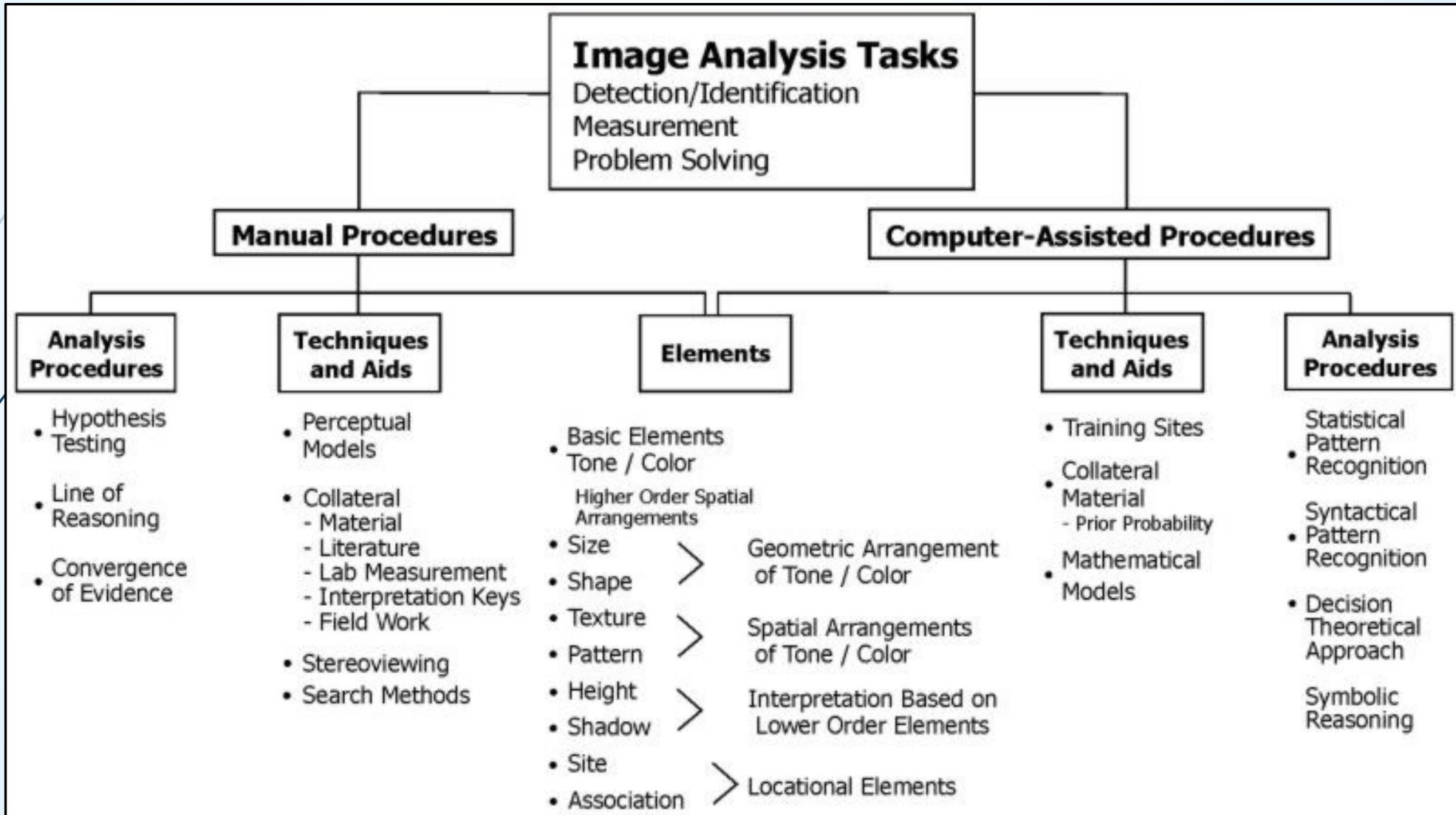


Pattern

Typical Examples of Image Interpretation



Methods of Image Interpretation



Basic Principle of Image Interpretation

- Image is a pictorial representation of pattern of landscape.
- Pattern indicates type of objects and their physical, biological, and cultural relationships
- Similar objects under similar conditions reflect similarly.
- A systematic examination of photos and supporting material.
- Interpretation is made of physical nature of the object.
- Information extracted is proportional to knowledge, skill and experience of analyst; the methods and equipment used.

Factors governing interpretability

- ▶ Training, Experience
- ▶ Nature of object or phenomenon
- ▶ Quality of photographs
- ▶ Equipment and method of interpretation
- ▶ Interpretation keys, guides, manuals and other aids
- ▶ Prior knowledge of the area.

Techniques of visual image interpretation

- ▶ The development of interpretation techniques has been mainly by the empirical method.
- ▶ The gap between the photo image on the one hand and the reference level, i.e. the level of knowledge in a specific field, in the human mind on the other hand, is bridged by the use of image-interpretation.
- ▶ The techniques adopted for one discipline may differ from those adopted for another.
- ▶ The sequence of activity and the search method may have to be modified to suit the specific requirements.

Techniques of visual image interpretation

- ▶ Image interpretation comprises at least three mental acts that may or may not be performed simultaneously:
 - ▶ i) The measurement of images of objects
 - ▶ ii) Identification of the objects imaged
 - ▶ iii) Appropriate use of this information in the solution of the problem.

Methodology depends on.....

- ▶ Kind of information to be interpreted
- ▶ Accuracy of the results to be obtained
- ▶ The reference level of the person executing the interpretation
- ▶ Kind and type of imagery or photographs available
- ▶ Instruments available
- ▶ Scale and other requirements of the final map
- ▶ External knowledge available and any other sensory surveys that have been or will be made in the near future in the same area.

ACTIVITIES OF IMAGE INTERPRETATION

- ▶ Detection
- ▶ Recognition
- ▶ Analysis
- ▶ Deduction
- ▶ Classification
- ▶ Idealization
- ▶ Convergence of evidence

METHOD OF SEARCH

- Interpreter should work methodologically
- From general information to specific object
- From known to unknown

BASIC METHODS

- **Fishing Expedition**- Examination of each and every object
- **Logical Search**- Quick scanning and selective intensive study

INTERPRETATION KEYS-TYPES OF INTERPRETATION KEYS

Scope of image interpretation

- ▶ Item key
- ▶ Subject key
- ▶ Regional key
- ▶ Analogous area key

Technical level image interpretation

- Technical
- Non-Technical

INTERPRETATION KEYS-TYPES OF INTERPRETATION KEYS

Intrinsic character of image interpretation:

- ▶ Direct key
- ▶ Association key

Manner of organization:

- ▶ Selective
 - 1. Essay key
 - 2. File key
 - 3. Photo key
 - 4. Integrated selected key

▶ Elimination

- 1. Disk key
- 2. Punch card
- 3. Dichotomous key

Methods of analysis and reference levels

- ▶ Monocular and stereo analysis
- ▶ Densitometry analysis
- ▶ Multiple images
- ▶ Multi band images
- ▶ Multi date images
- ▶ Multi stage images

Sensors in photographic Image Interpretation

- ▶ Black and white panchromatic
- ▶ Black and white infrared
- ▶ Colour
- ▶ Colour infrared/ false colour





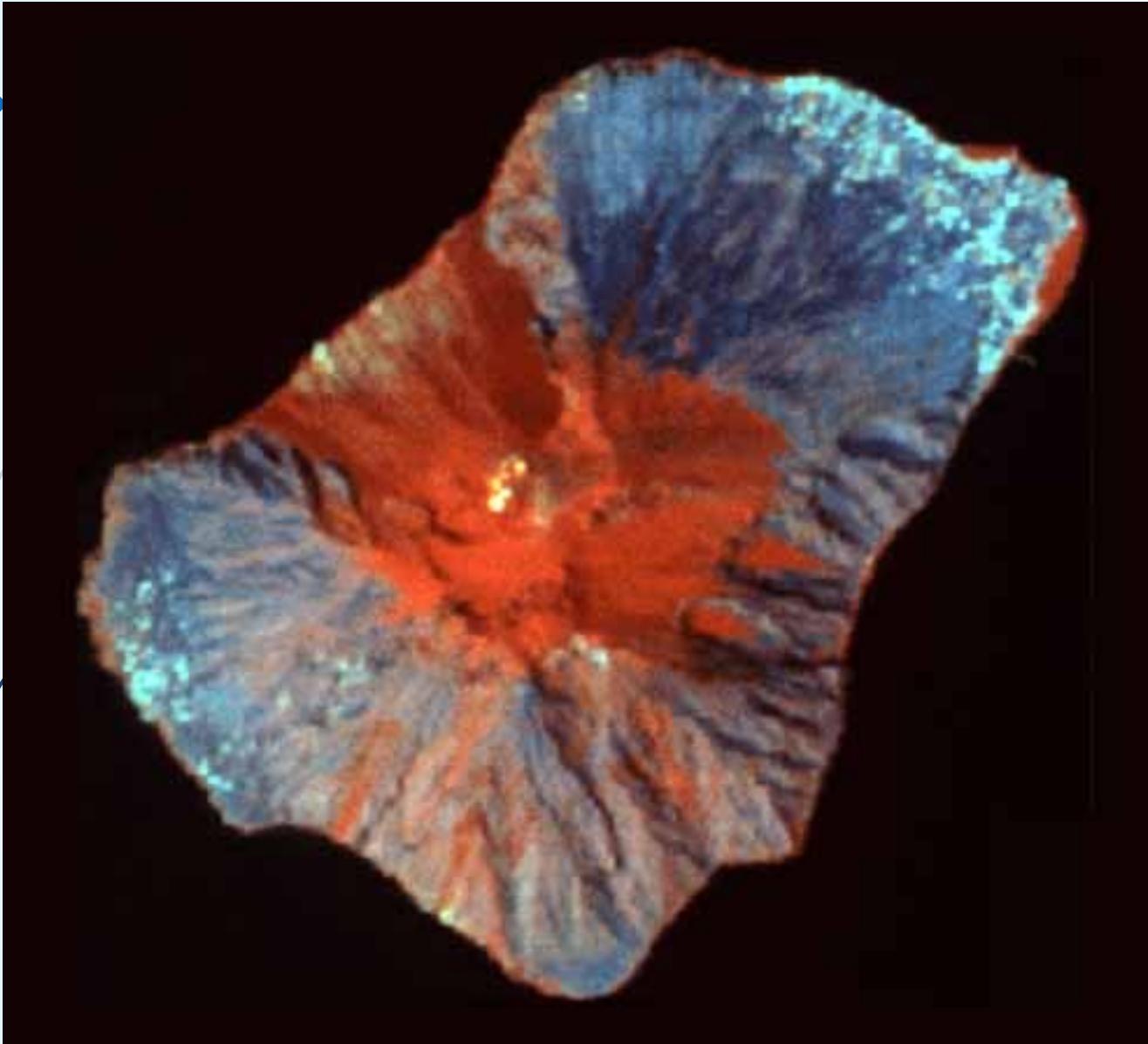
B/W Aerial Photo

The image is stored on photographic film that is, generally speaking, sensitive to electromagnetic radiation from $0.3 \text{ } \mu\text{m}$ to $0.9 \text{ } \mu\text{m}$. **Panchromatic films**, producing black and white images, is the most common type of film used for aerial photography.

In the upper right corner there is a hydrofoil ship. The other big ship is a tanker delivering fresh water to the island



Colour and false colour (or colour infrared) photography involves the use of a three layer film with each layer sensitive to different ranges of light. For a normal colour photograph, the layers are sensitive to blue, green, and red light - the same as our eyes. Accordingly, these photos appear to us the same way that our eyes see the environment. The colours resemble those which would appear to us as "normal" (i.e. trees appear green, etc.).



Mid-Infrared Image of Stromboli Island.

In **color infrared (CIR)** photography, the three emulsion layers are sensitive to green, red, and the photographic portion of near-infrared radiation (up to $0.9 \mu\text{m}$), which are processed to appear as blue, green, and red, respectively. In a false color photograph, targets with high near-infrared reflectance appear red, those with a high red reflectance appear green, and those with a high green reflectance appear blue, thus giving us a "false" presentation of the targets relative to the color we normally perceive them to be.

Image interpretation for Multispectral imagery

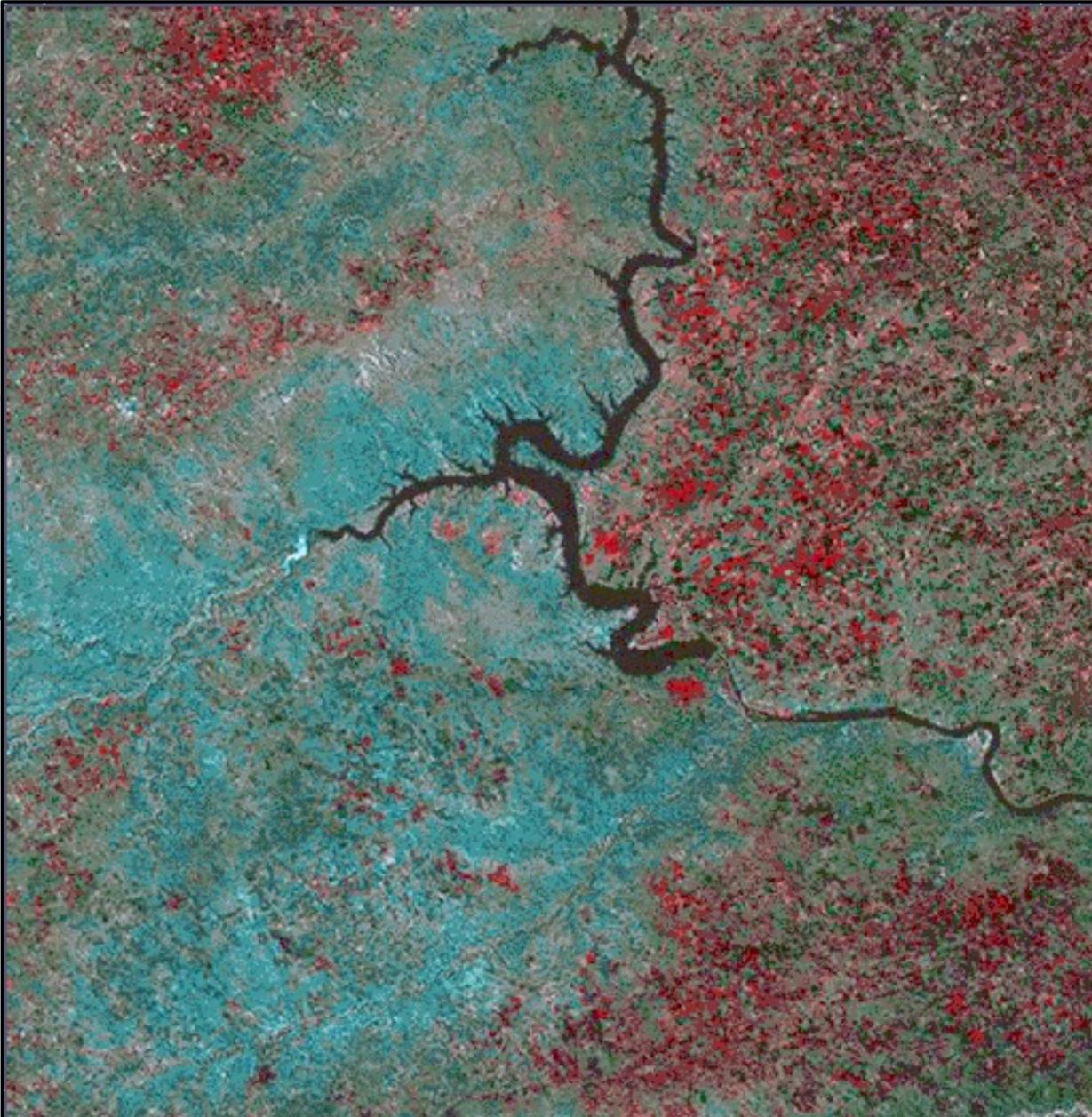
- Resolution
- Stereoscopic ability
- Individual Band Interpretation
- Temporal data

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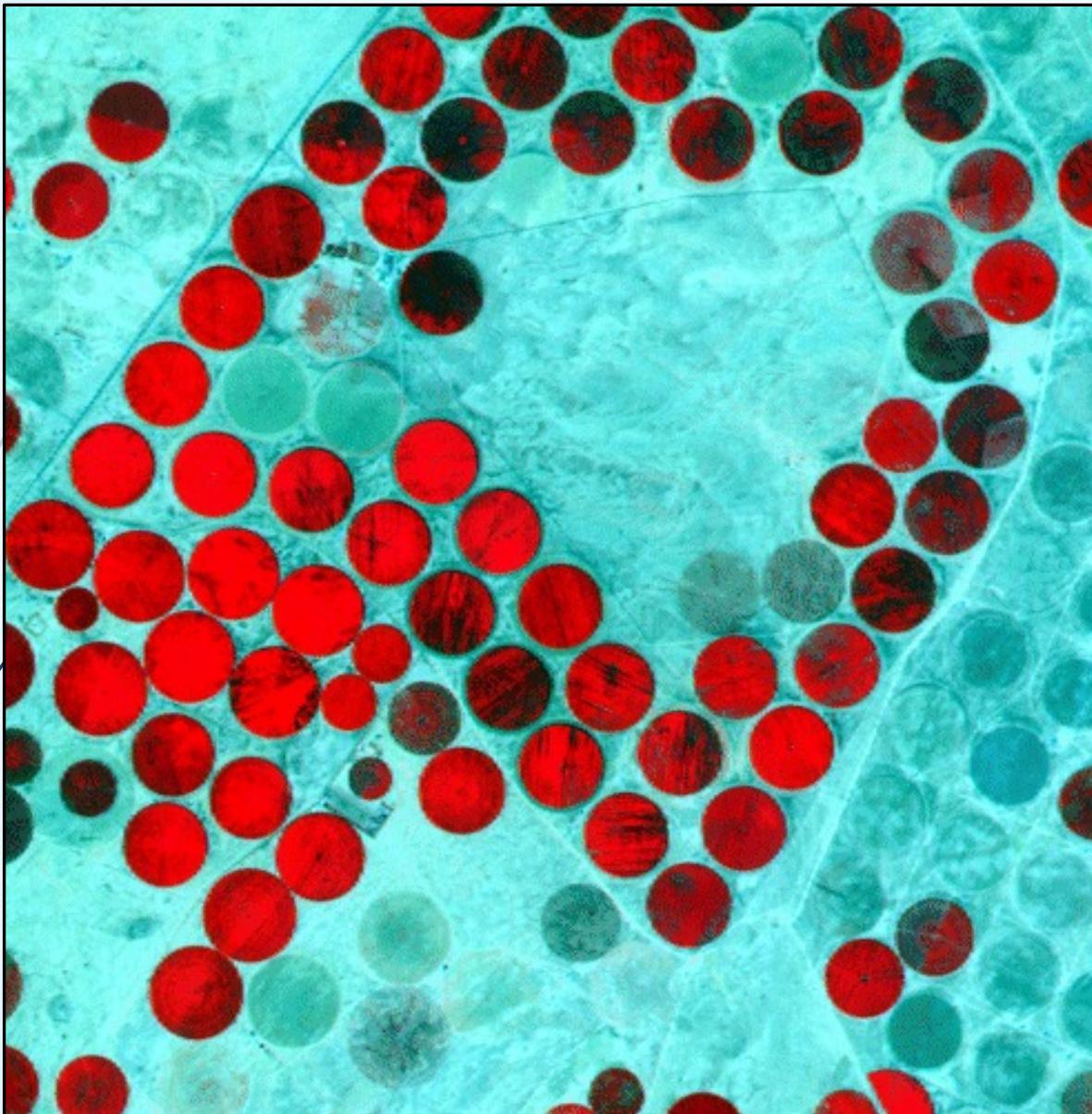


Landsat image Boston

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Landsat image



Saudi Arabia

Sensor : IRS1C LISS III

The circular features indicate
sprinkler irrigation systems.
Red color indicates crop &
dark color fallow land.



Goa city , India

Sensor : IRS1D LISS III

Goa is the smallest (area wise) of the Indian Union & is in the west coast of India situated between Karnataka & Maharashtra. The eastern sector of Goa is hilly and forms the northern edge of the Sahayadri Mountain ranges. This multispectral image shows Marmagoa & Tiswadi areas of Goa state. This image also shows the sedimentation in the River Zuari & River Mandovi & the red patches represent densely vegetated areas. The Dabolim airport near the town of Vascodagama is also visible in the lower middle part of the image.



Sunderbans , West Bengal India

Sensor : IRS1C WiFS

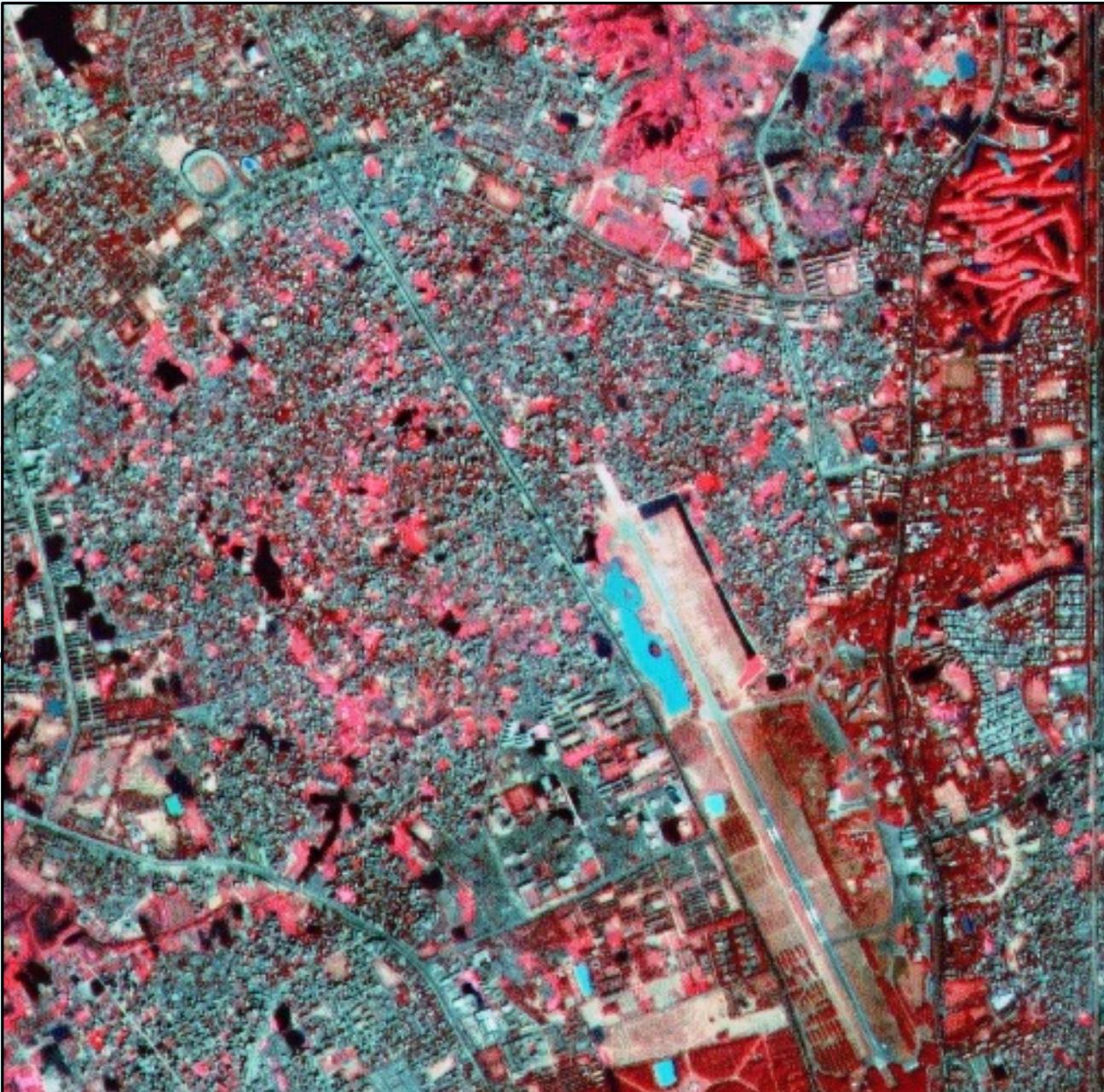
This image shows East Coast of India & sunderbans. The Bay of Bengal is dark blue whereas waters in the shallow areas near coast are seen in light blue color. The mangroves are seen in bright red color in the wet land areas. The river Hoogly dispersing sediments into the sea can be seen clearly..



Part of Oman

Sensor : IRS1D WiFS

The gulf of Oman is seen here. The mountains & rocky terrain of the area are seen through WiFS sensor .



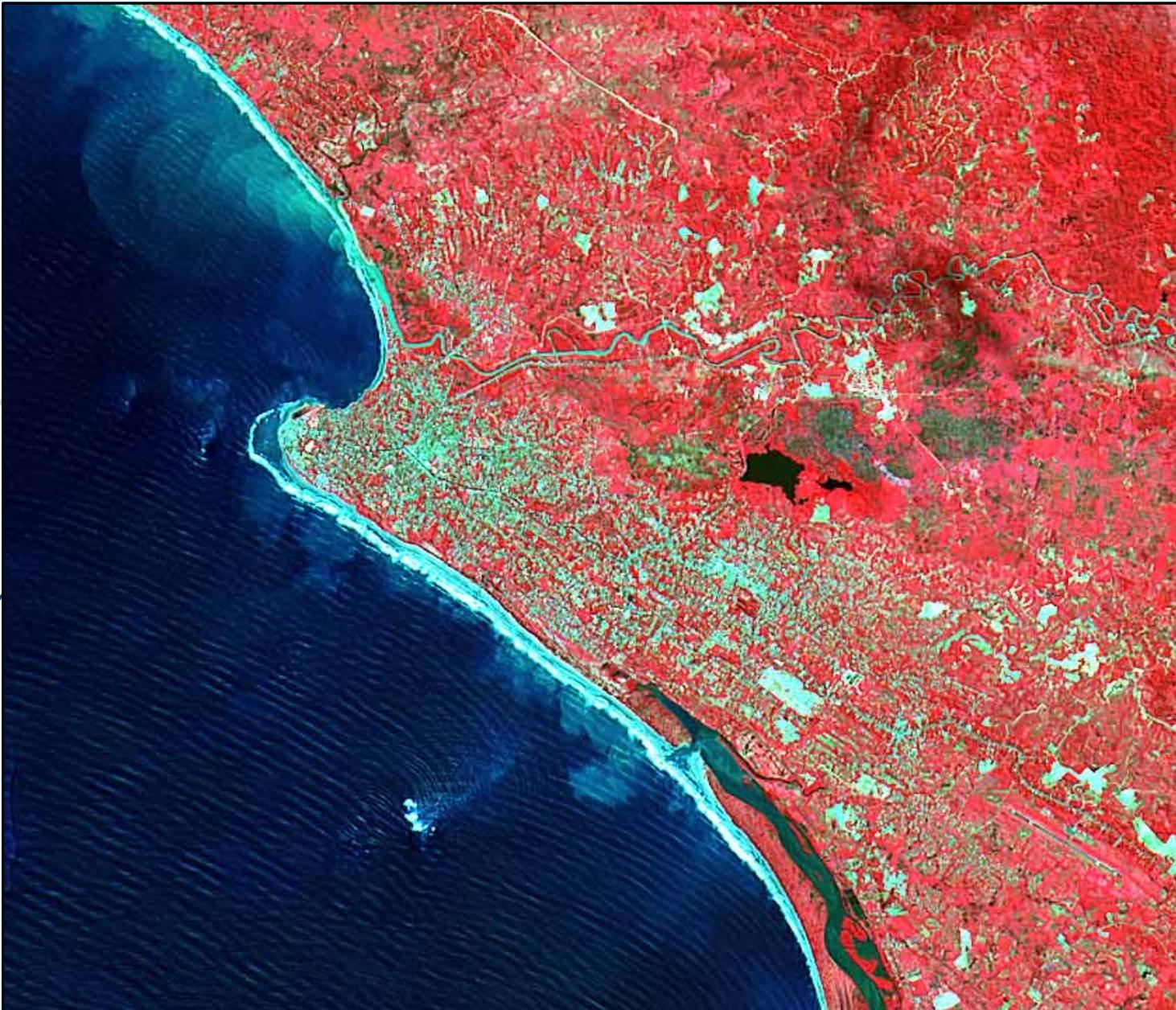
Dhaka , Bangladesh
Sensor : IRS1C LISS III+PAN

This image shows part of Dhaka city & its environments. Features like stadium & city airport are clearly seen.



Rome , Italy
Sensor : IRS1C LISS
III+PAN

This image shows part of Rome. The runways of the 'h' shaped airport can also be seen.



Spot multi-sensor image
Roads, rivers, water bodies, topography and urban areas can all be distinguished.



IIRS, Dehradun



Image interpretation
=
relating images to reality

Remote Sensing - Visual Image Interpretation

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Picture of the real world

Remote Sensing - Visual Image Interpretation

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In image interpretation use is made
of

Image characteristics

or

Interpretation elements

Remote Sensing Visual Image Interpretation

The image characteristics can be distinguished into:

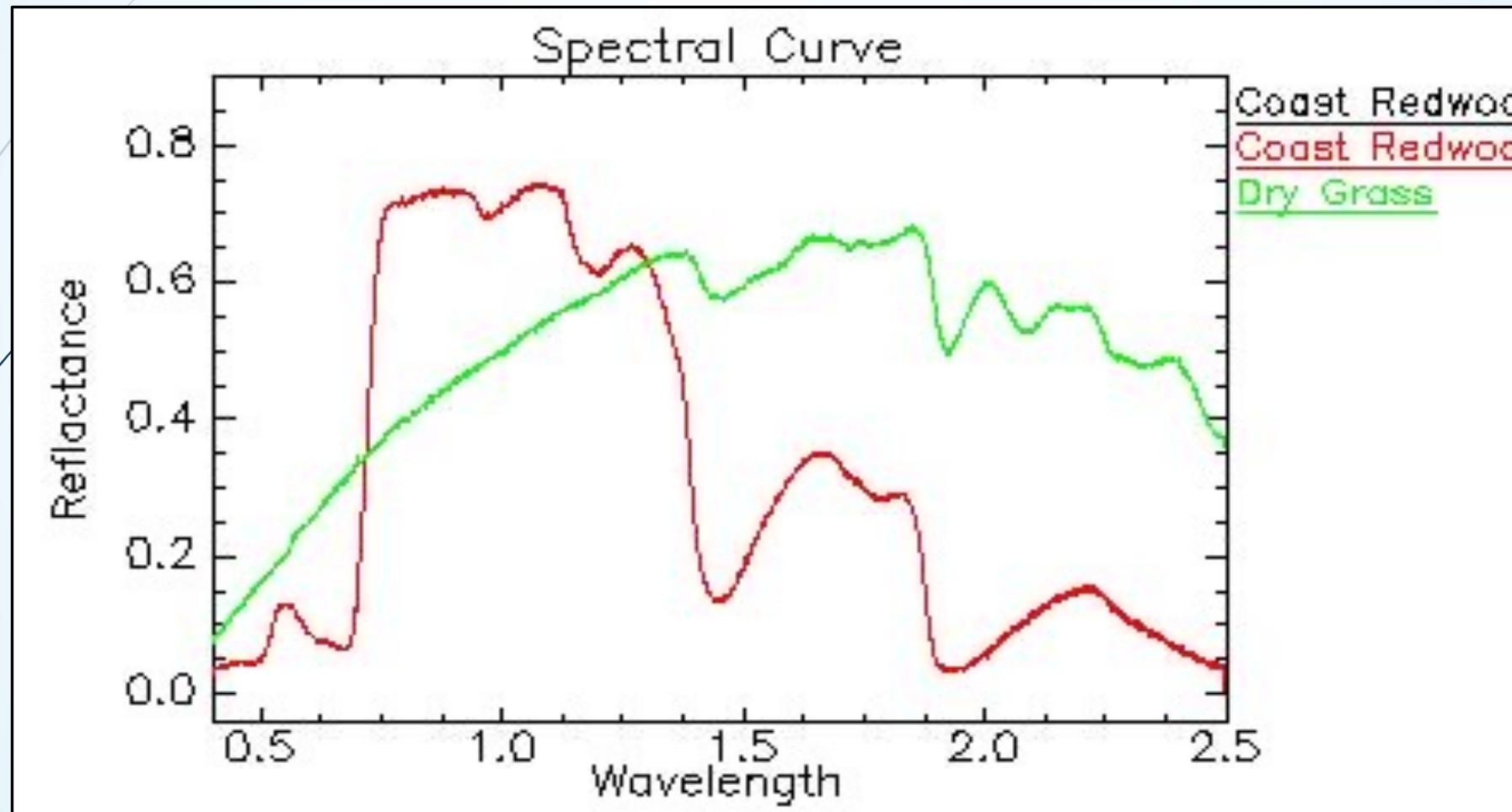
- spectral characteristics
- spatial characteristics
- stereo characteristics
- associated features

Remote Sensing Visual Image Interpretation

Spectral characteristics are:

- grey tone
- colour

Remote Sensing Visual Image Interpretation



Remote Sensing Visual Image Interpretation

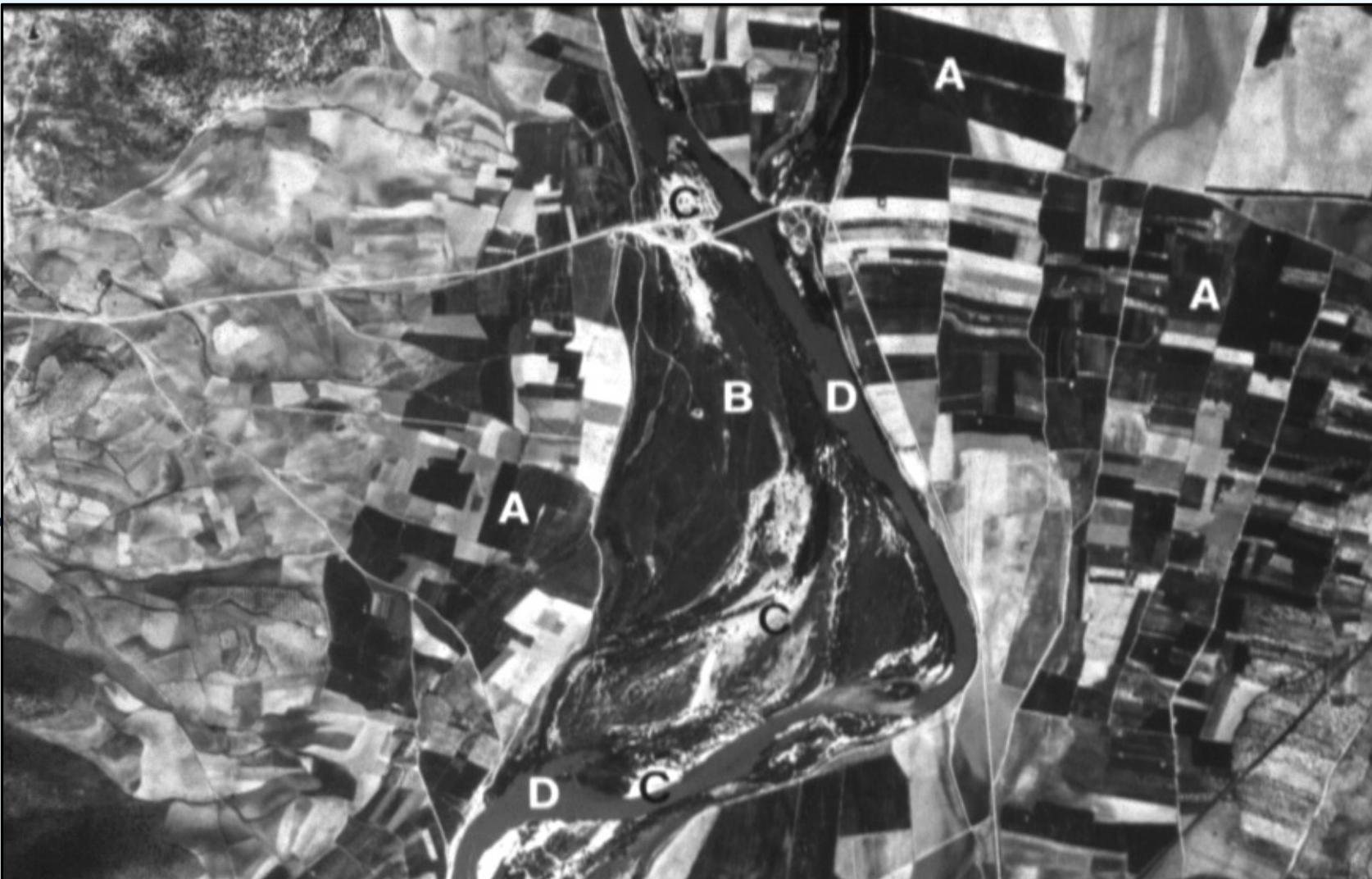
Spatial characteristics are:

- shape
- size
- shadow
- pattern
- texture

Remote Sensing Visual Image Interpretation

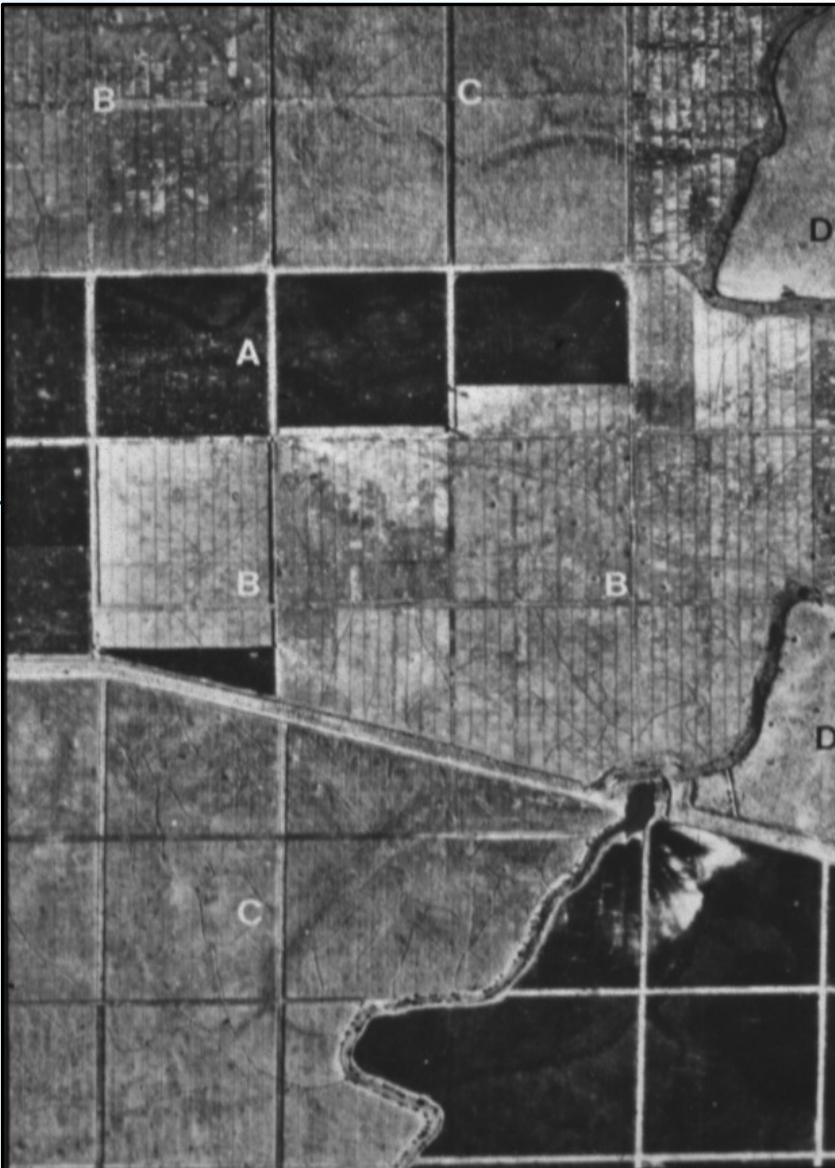
→ Different aspects of greytone

Remote Sensing Visual Image Interpretation



- A- Farm/fields
- B- River
- C-Silica/sands
- D- Water

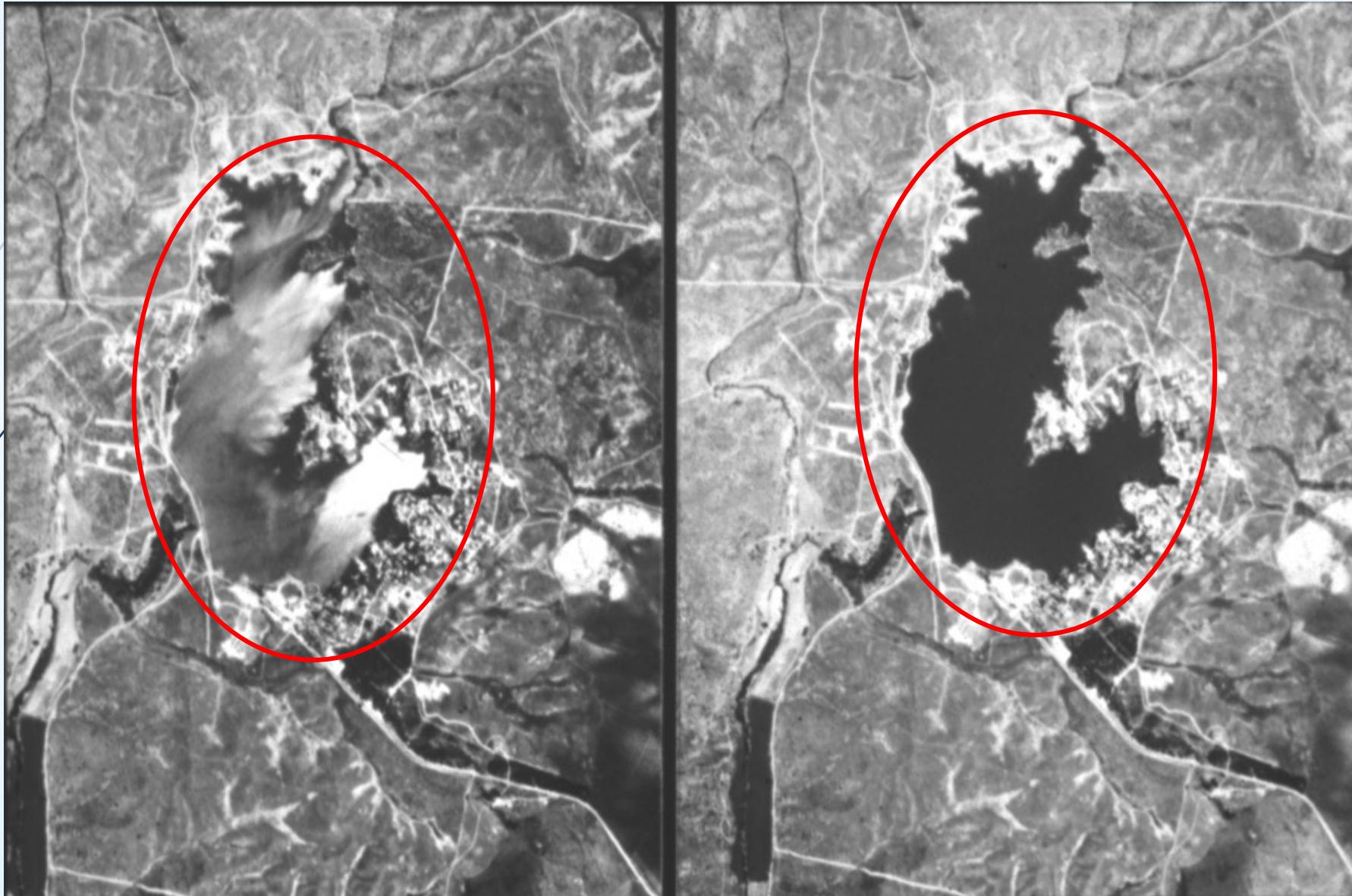
Remote Sensing Visual Image Interpretation



- A- Green/Fresh Vegetation
- B- Small Plants
- C- Old plants
- D- Bushes/grass fields

Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation



Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation



Remote Sensing Visual Image Interpretation

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Full colour



Panchromatic

Remote Sensing Visual Image Interpretation

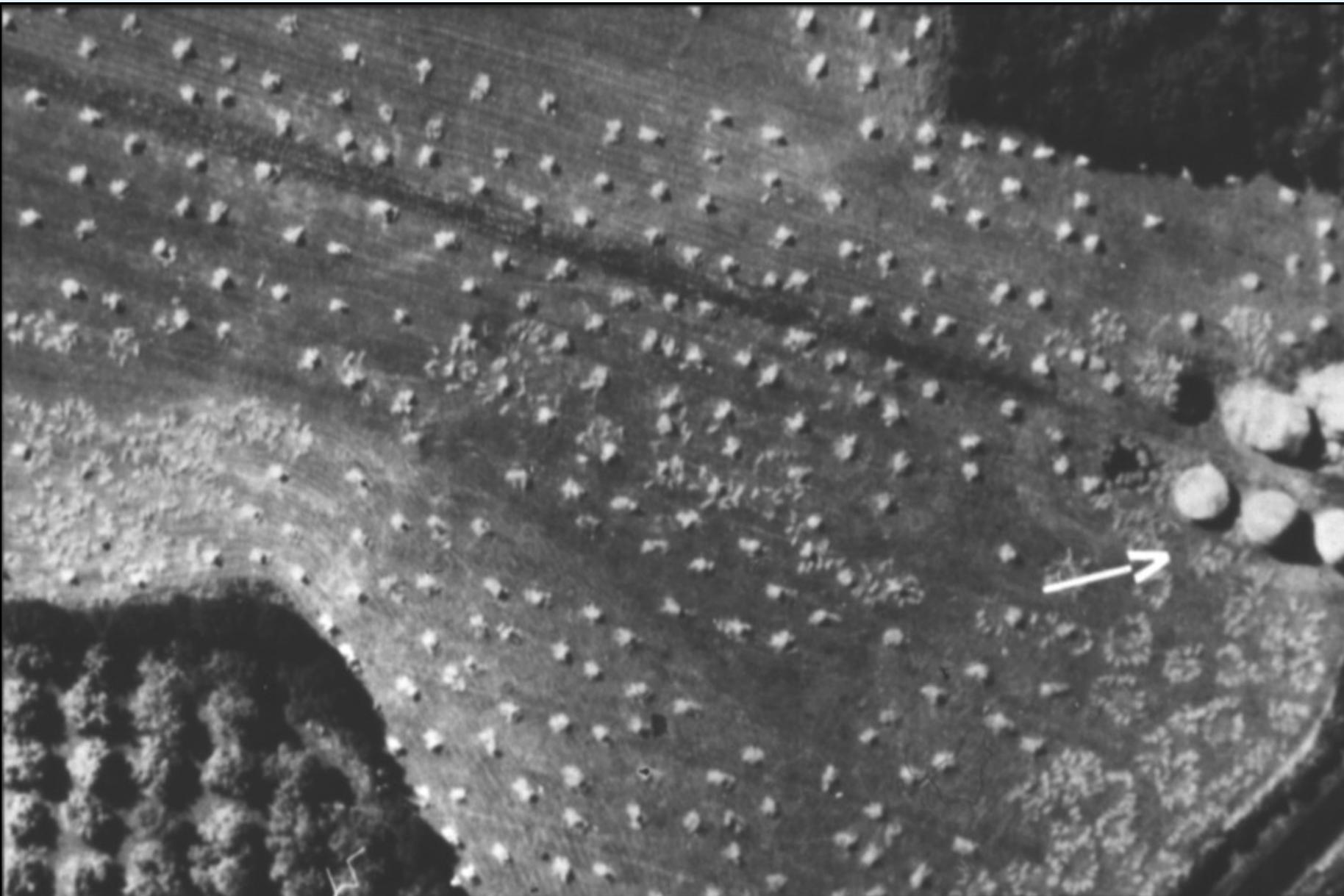
→ Shape and size

Remote Sensing Visual Image Interpretation



Remote Sensing - Visual Image Interpretation

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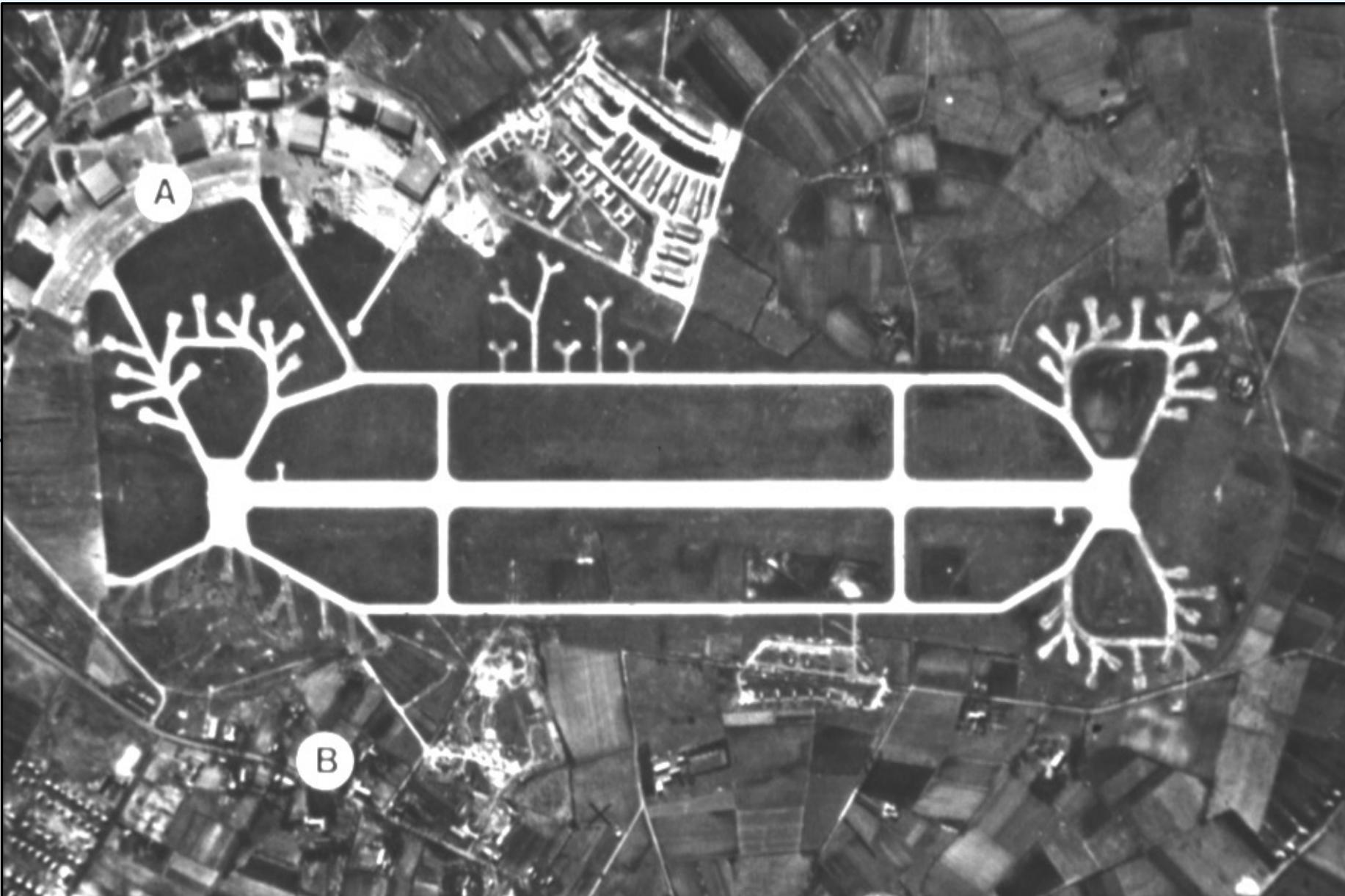
Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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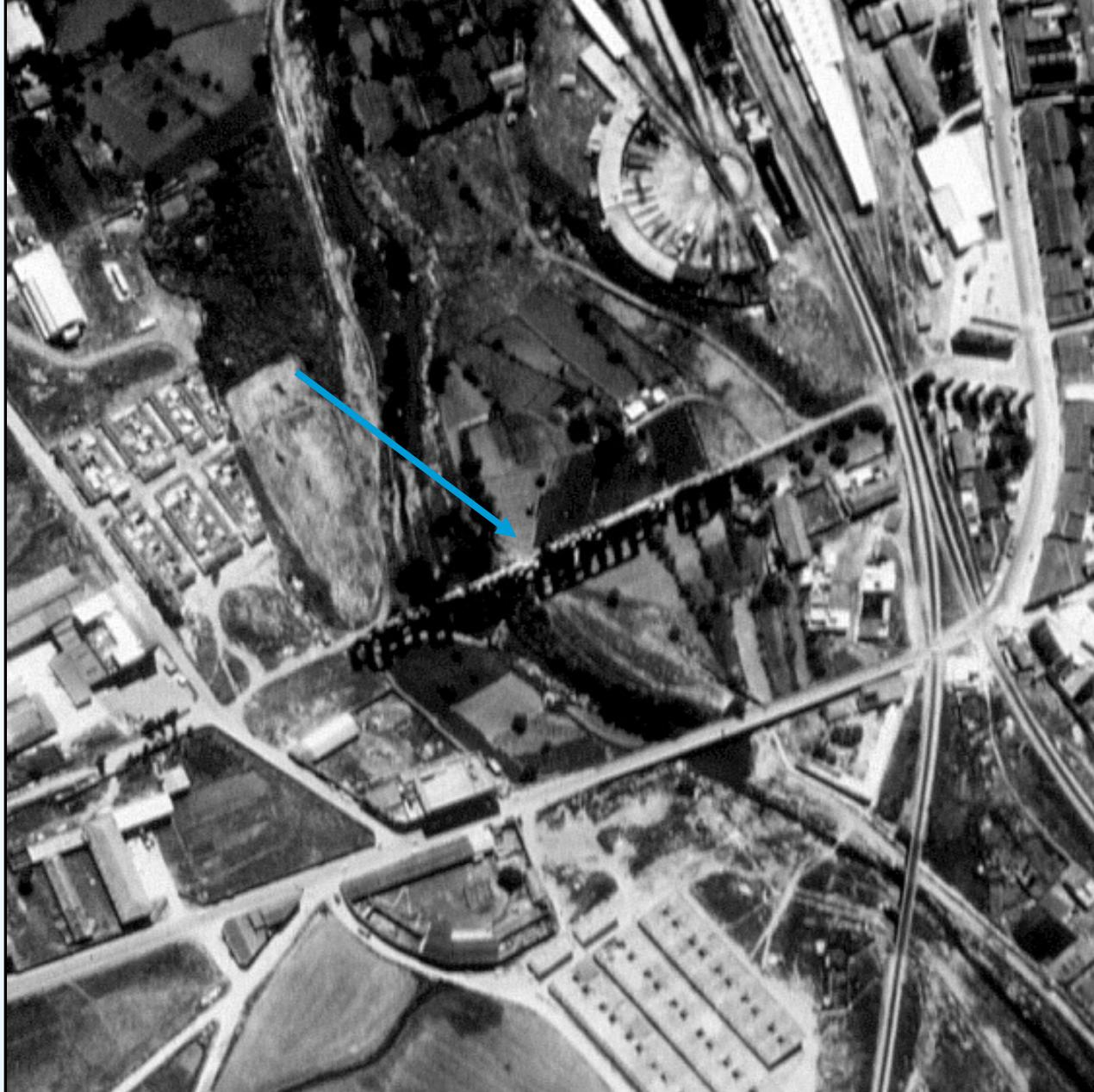


Remote Sensing Visual Image Interpretation

Shadow

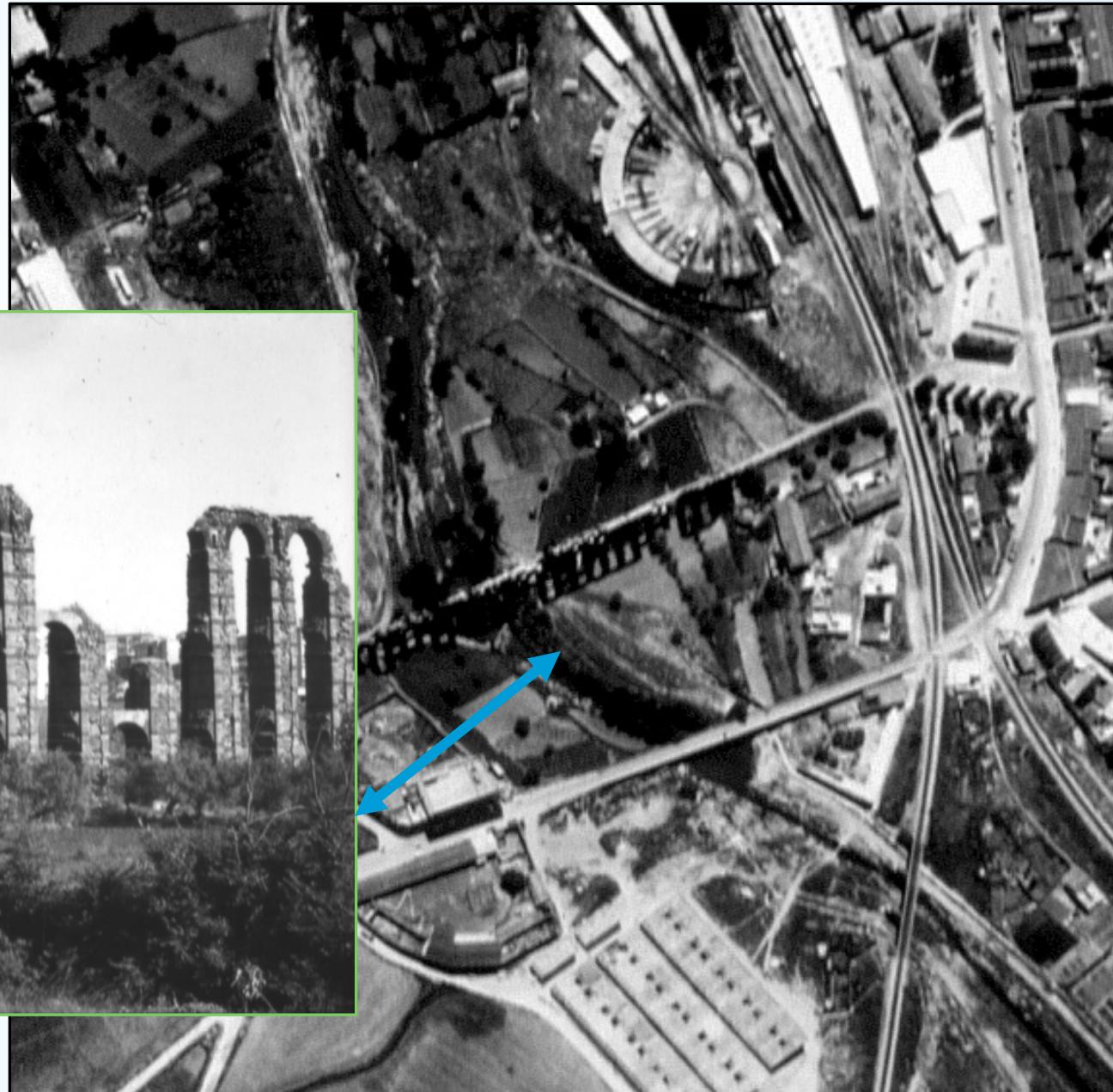
Remote Sensing Visual Image Interpretation

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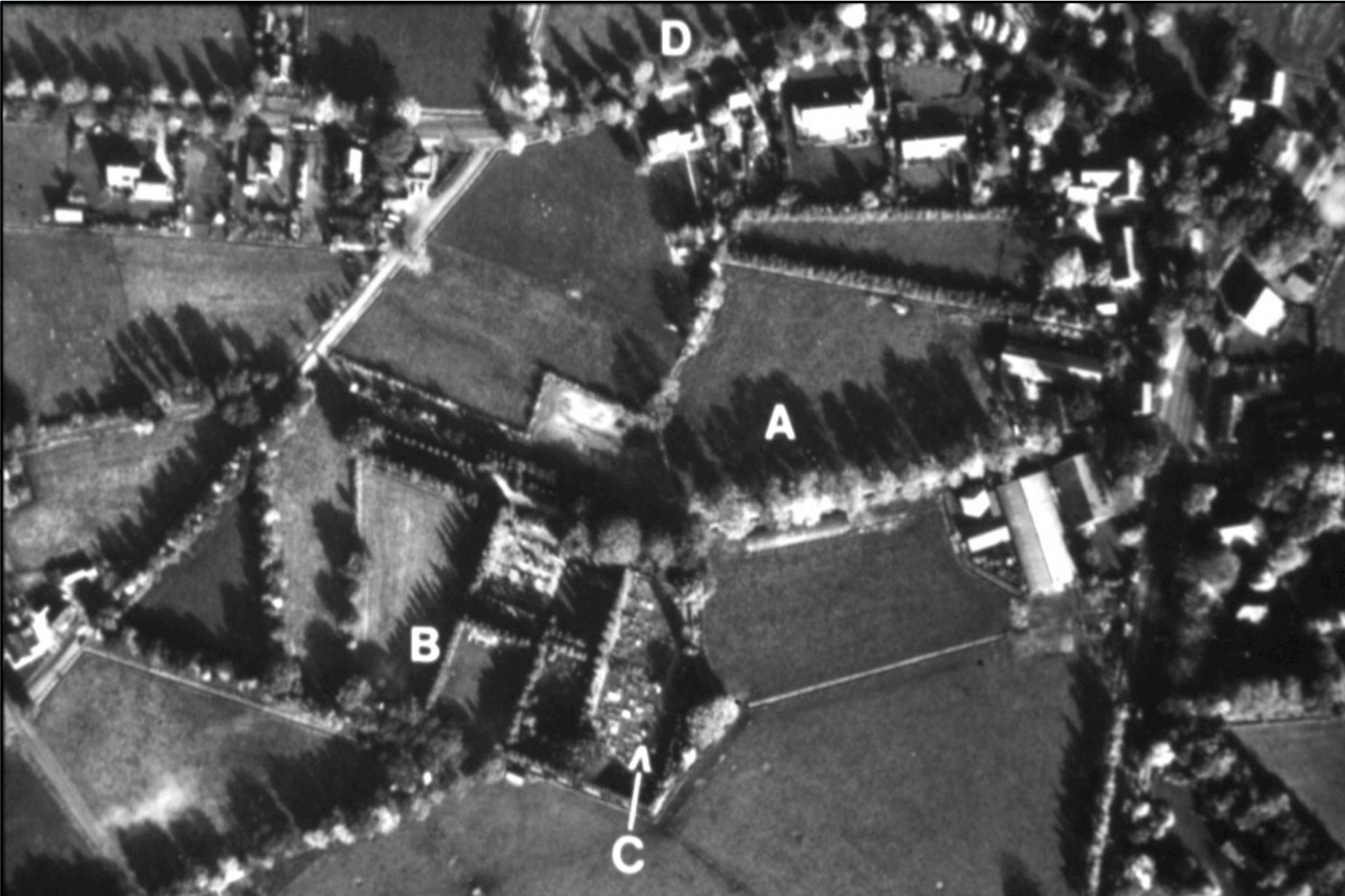
Remote Sensing - Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation



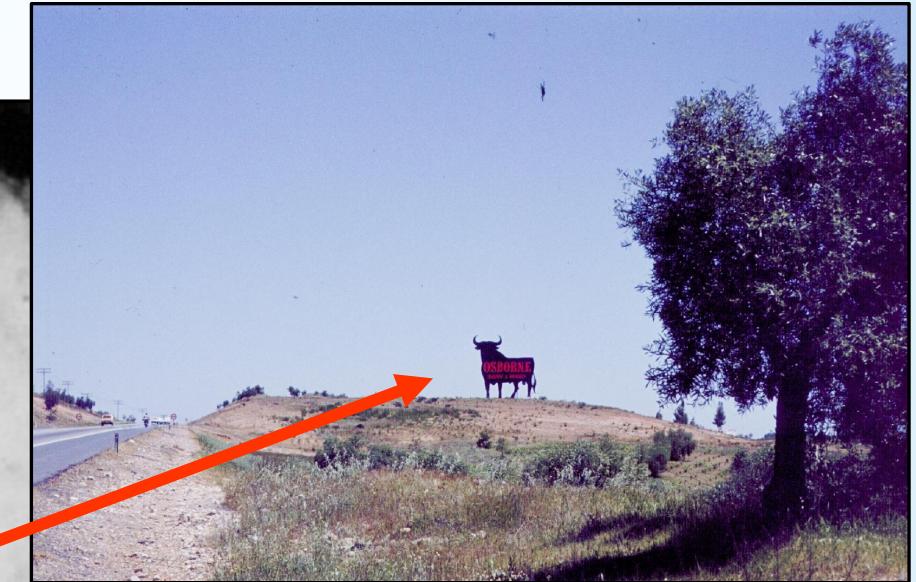
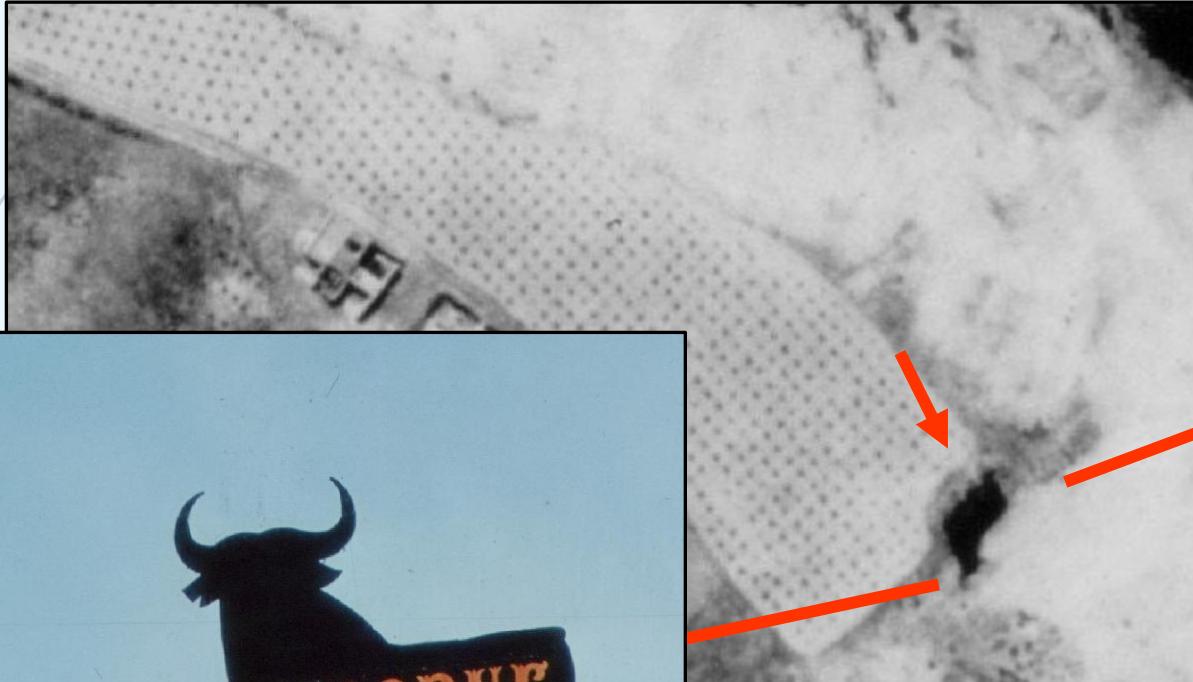
Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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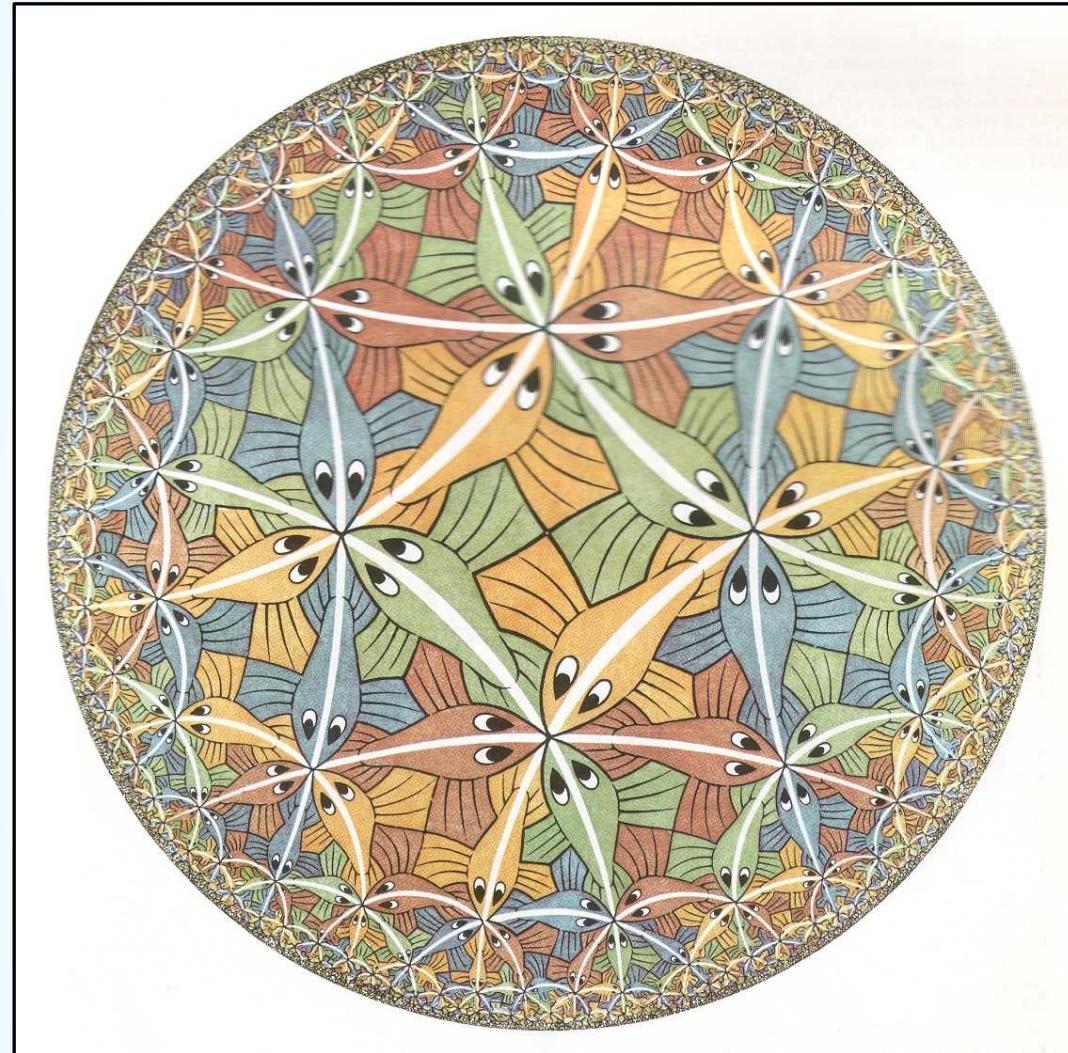


Remote Sensing Visual Image Interpretation

Pattern and Texture

Remote Sensing Visual Image Interpretation

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M.C.Esscher

Texture



Pattern



Texture

Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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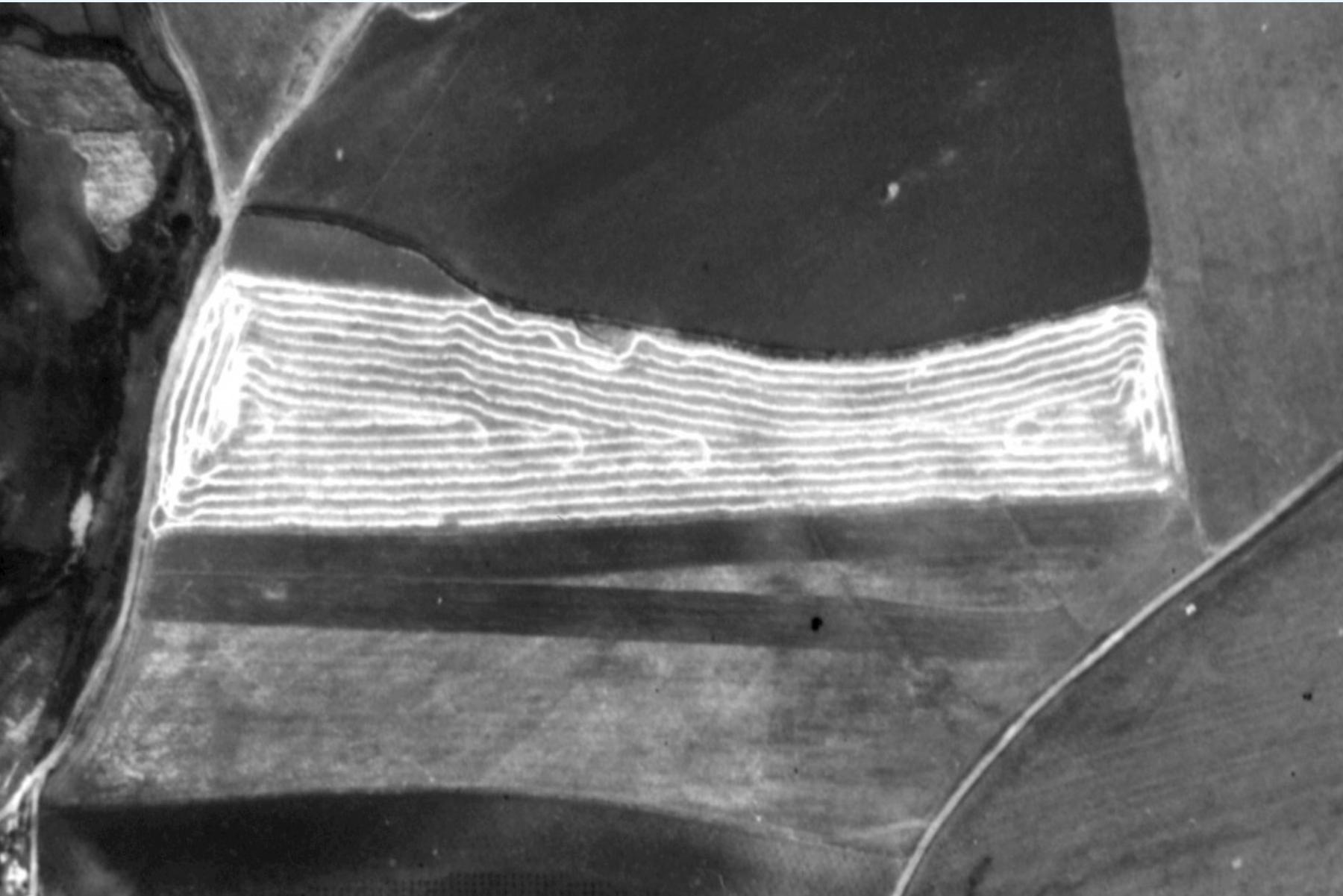
Remote Sensing Visual Image Interpretation

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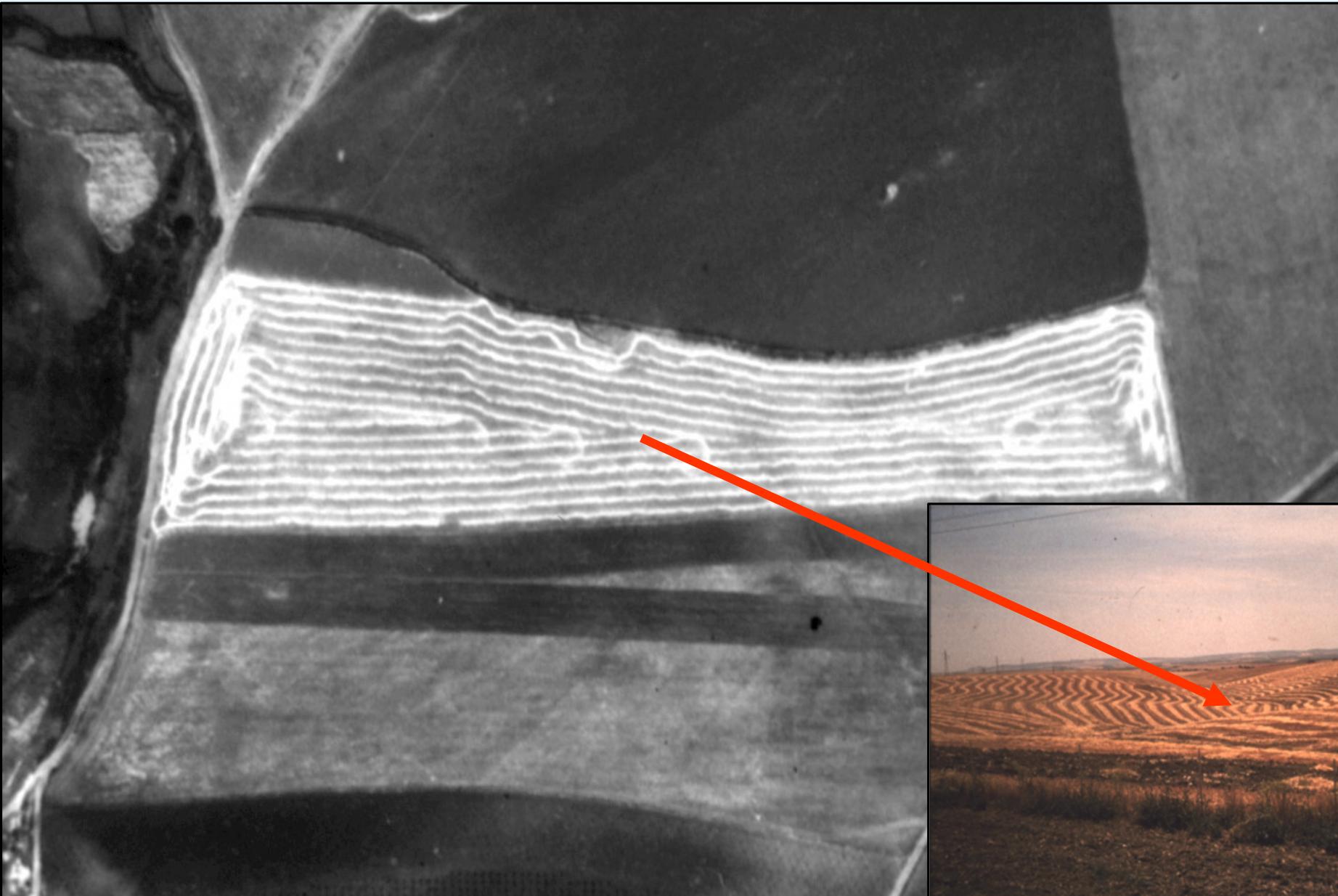
Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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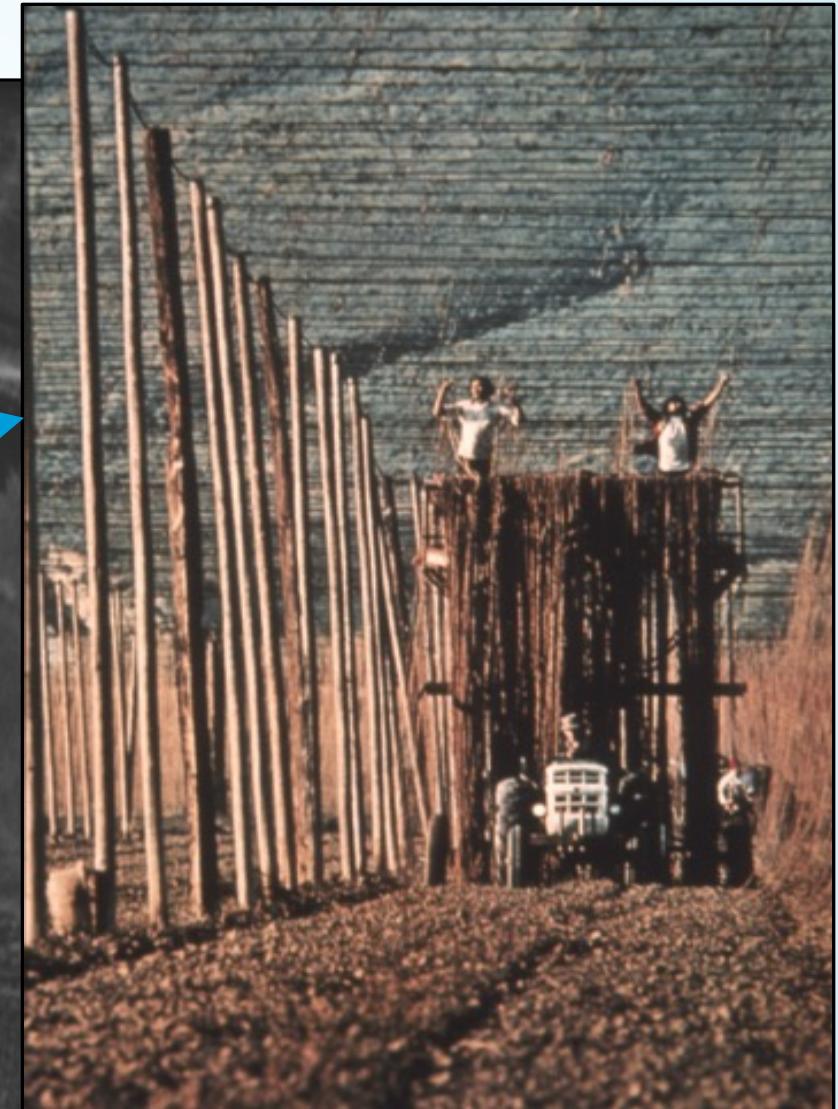
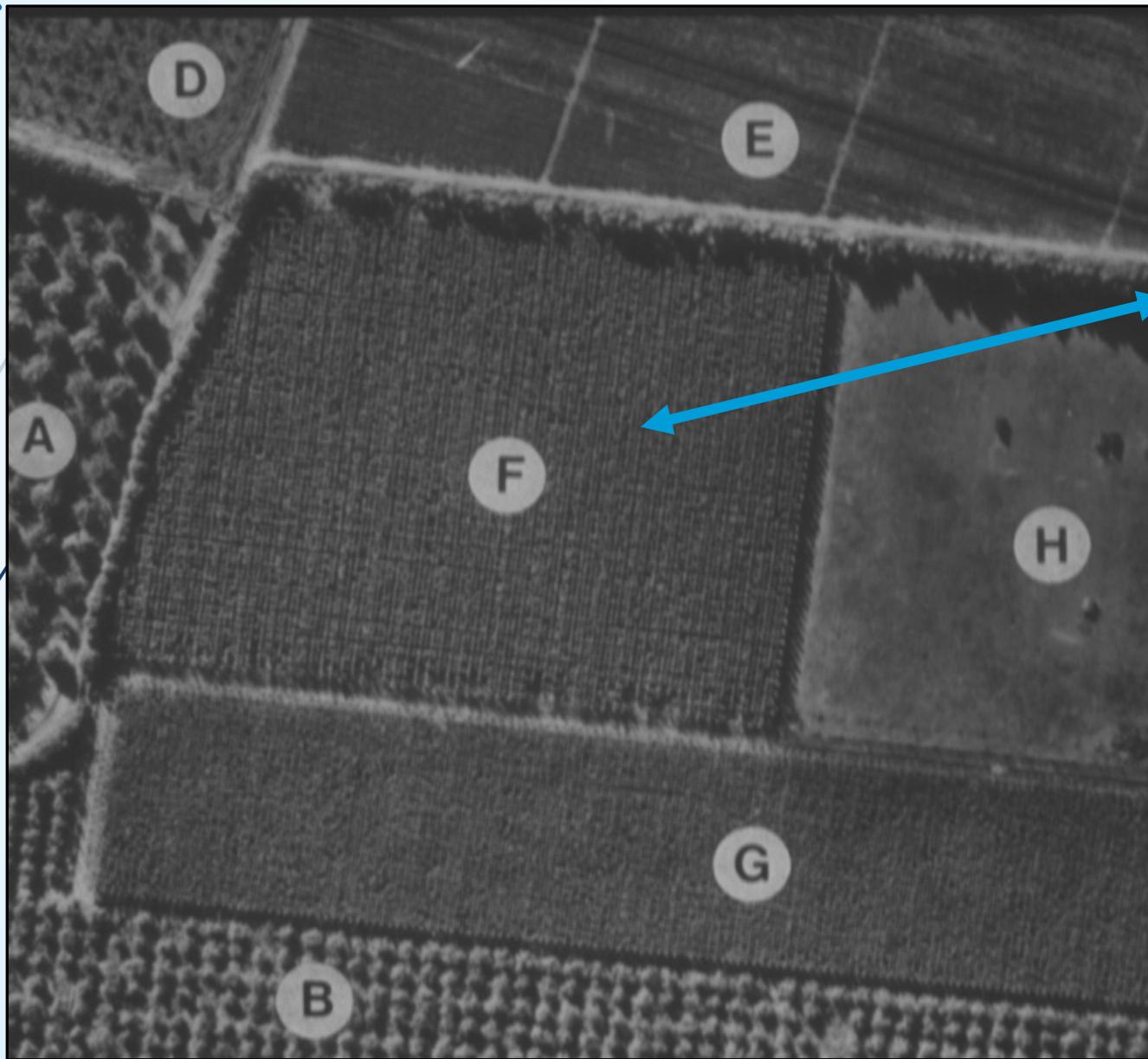
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Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

In addition to the spectral, spatial
and stereo image characteristics

Associated Features

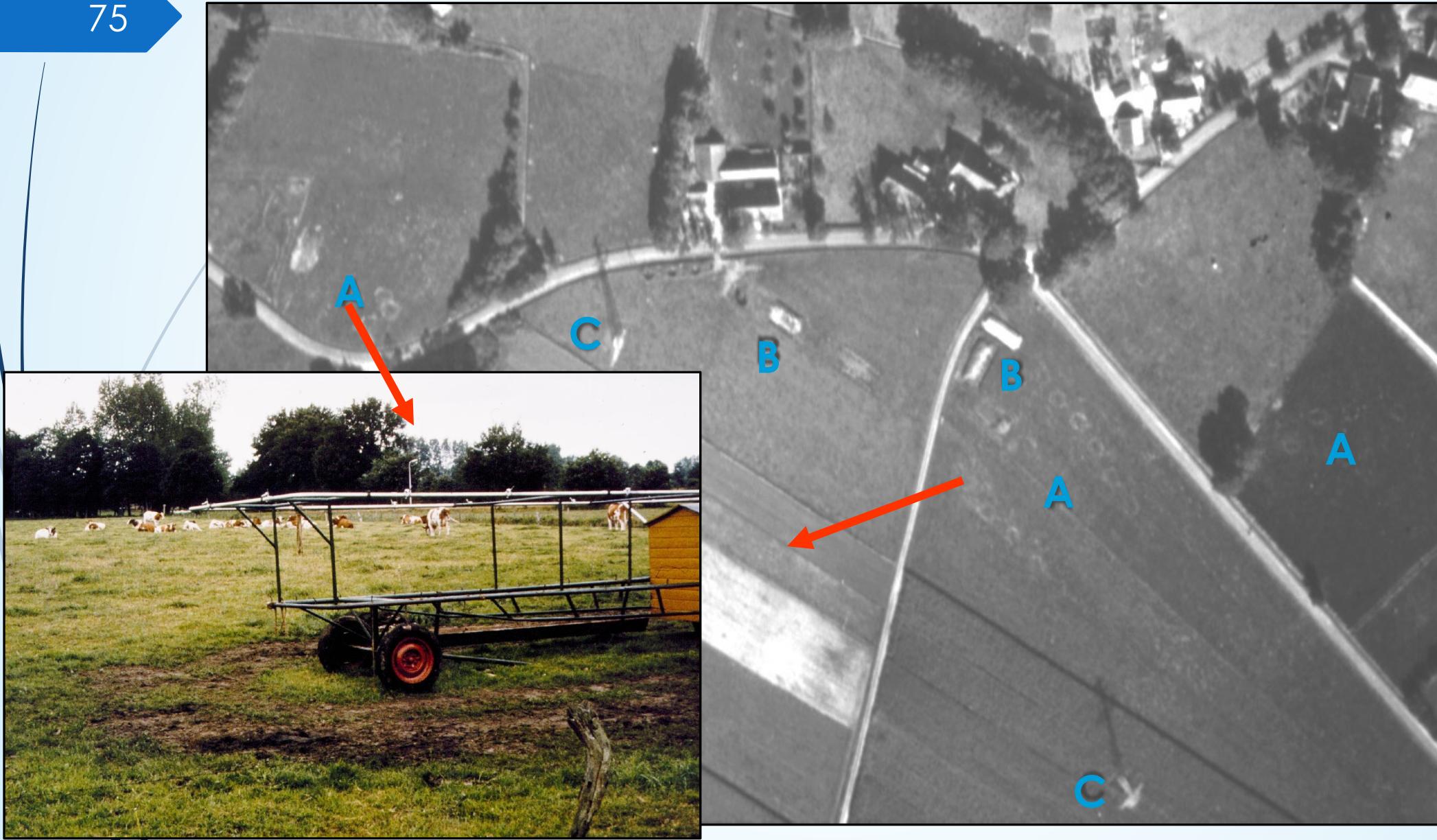
are of importance in image
interpretation

Remote Sensing Visual Image Interpretation



Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation

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IMAGE INTERPRETATION

- **Act of examining images to identify objects and judge their significance**
- **Information extraction process from the images**
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Remote Sensing Visual Image Interpretation

Image interpretation comprises at least three mental acts that may or may not be performed simultaneously:

- I) **Measurement of images of objects**
- ii) **Identification of the objects imaged**
- iii) **Appropriate use of this information in the solution of the problem**

Remote Sensing Visual Image Interpretation

ACTIVITIES OF IMAGE INTERPRETATION (SEQUENCE OF INTERPRETATION)

- 1.Detection**
- 2.Recognition and Identification**
- 3.Analysis**
- 4.Deduction**
- 5.Classification**
- 6.Idealization**
- 7.Convergence of evidence**

Remote Sensing Visual Image Interpretation

Image Representation or Interpretation

For facilitating mental process [procedures] we use some mental representations say rules for knowledge formation in particular domain.

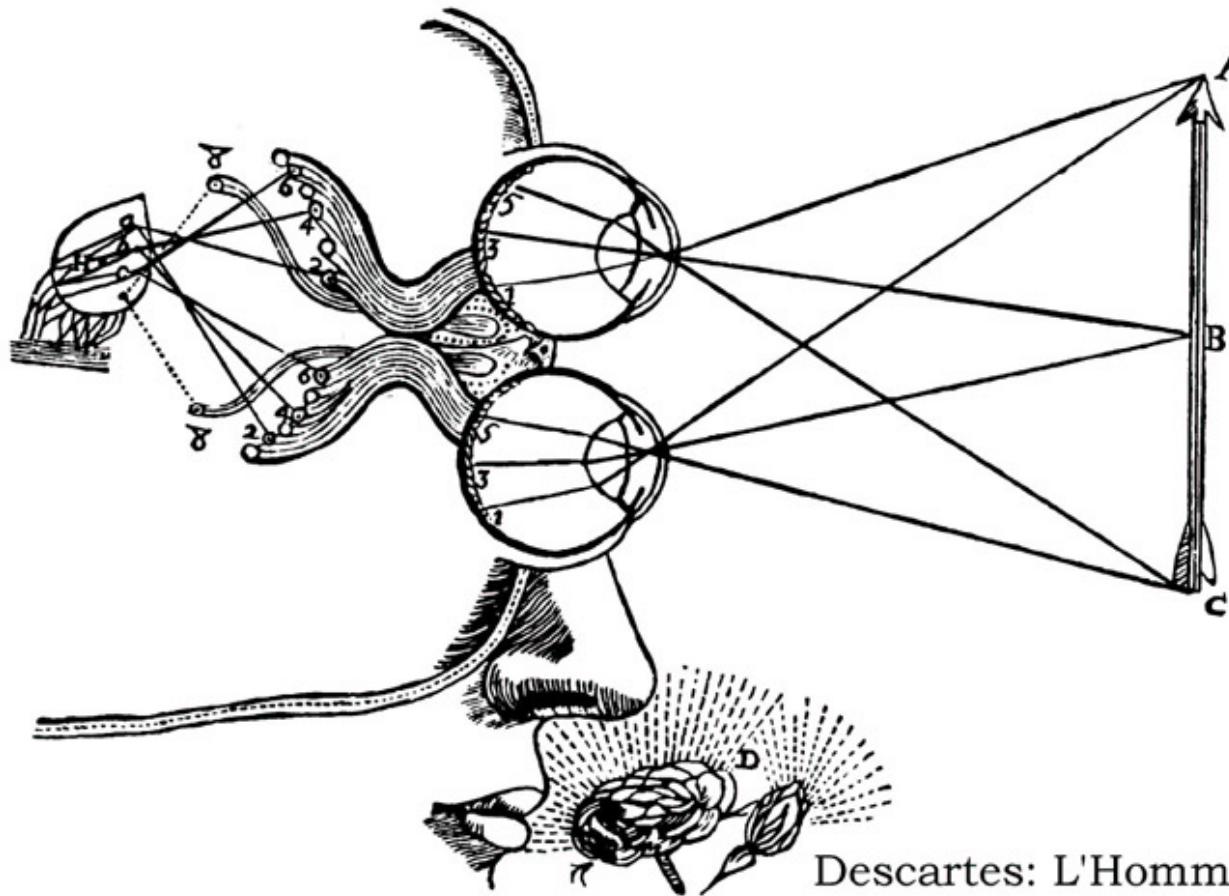
So, what can be the mental representations :

= Logical propositions, Thoughts, Percepts,
Rules, Concepts, Idea, Impressions,
Schemas

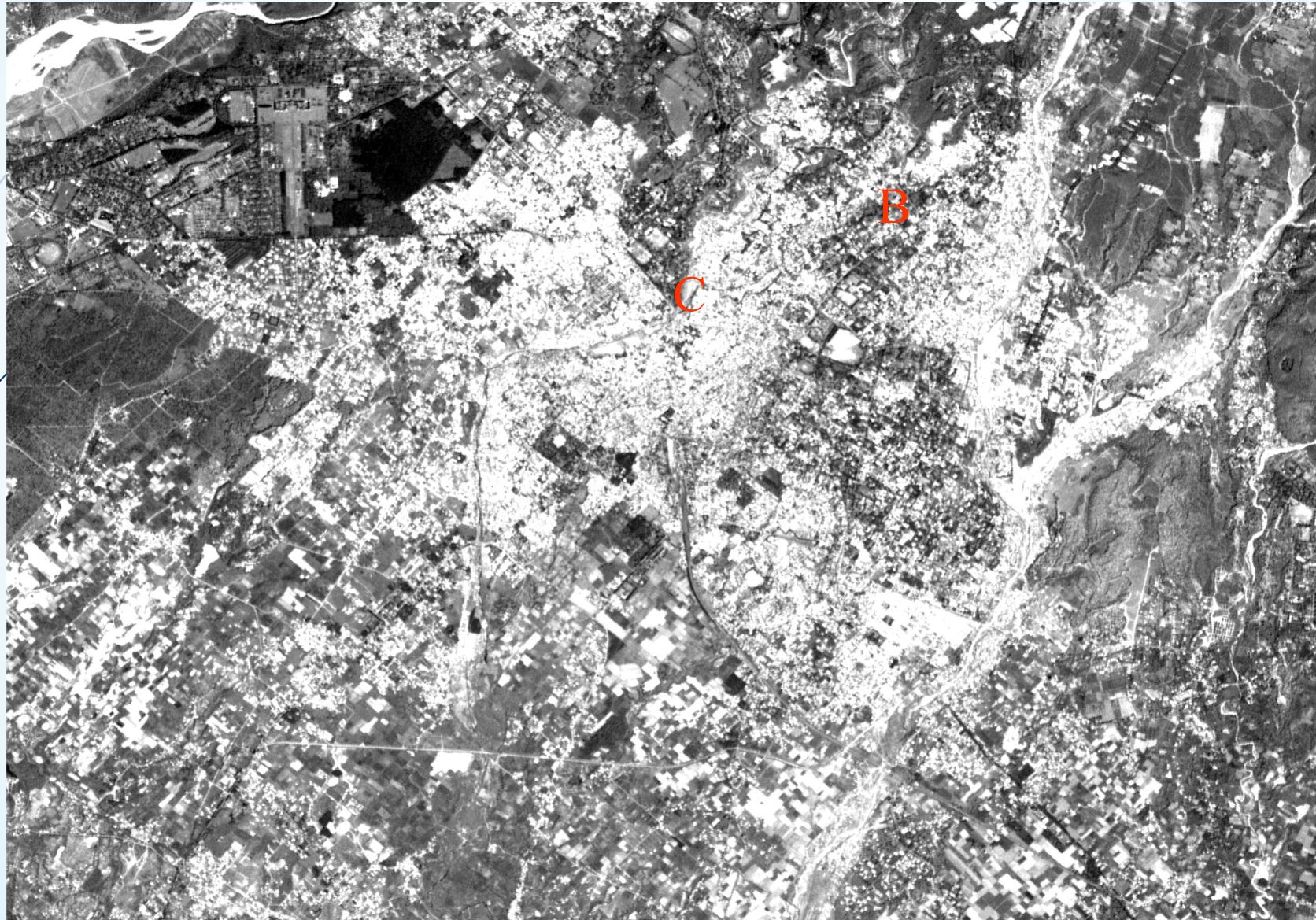
Remote Sensing Visual Image Interpretation

Basic idea

optical structure → Processing → perception

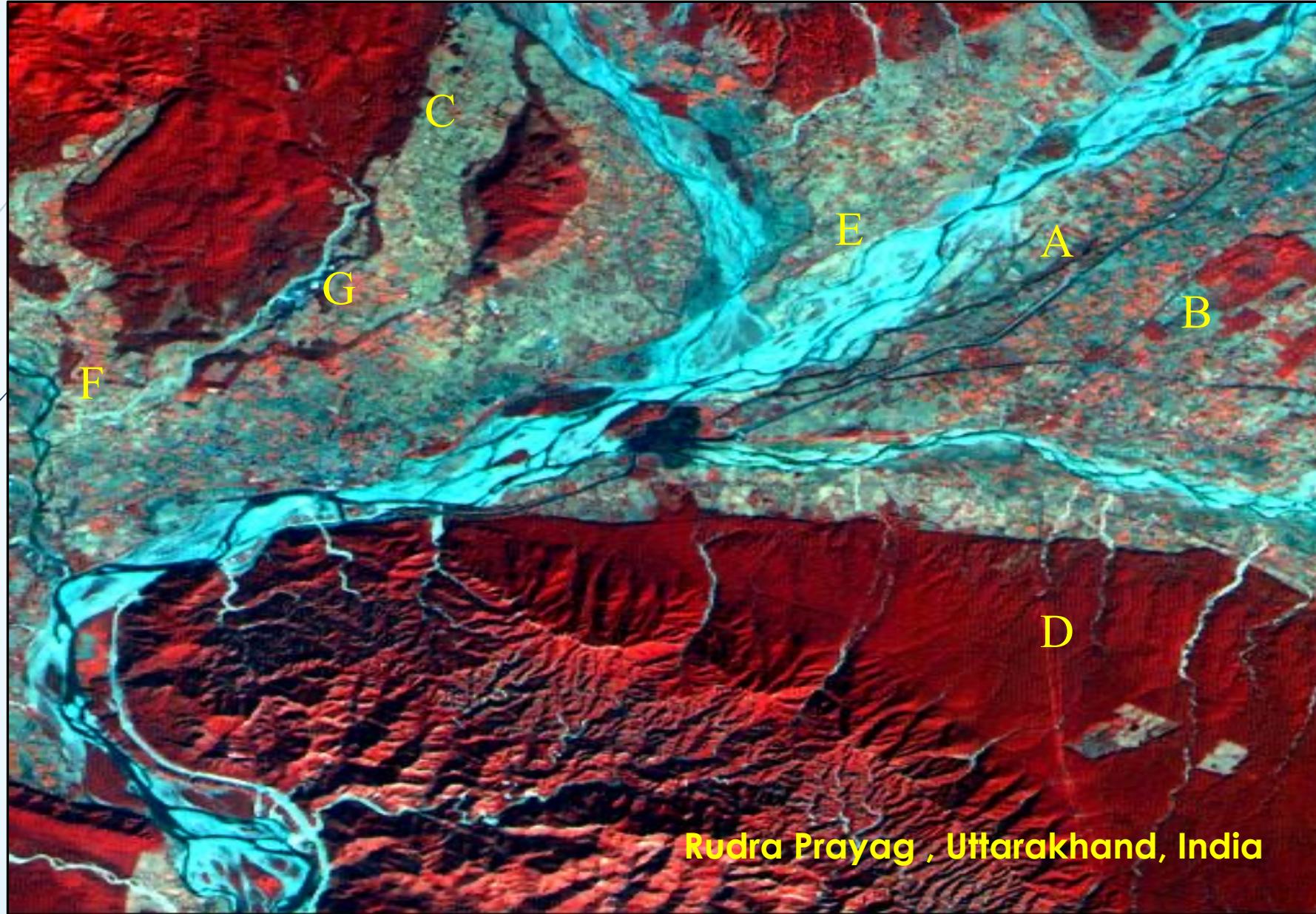


Remote Sensing Visual Image Interpretation

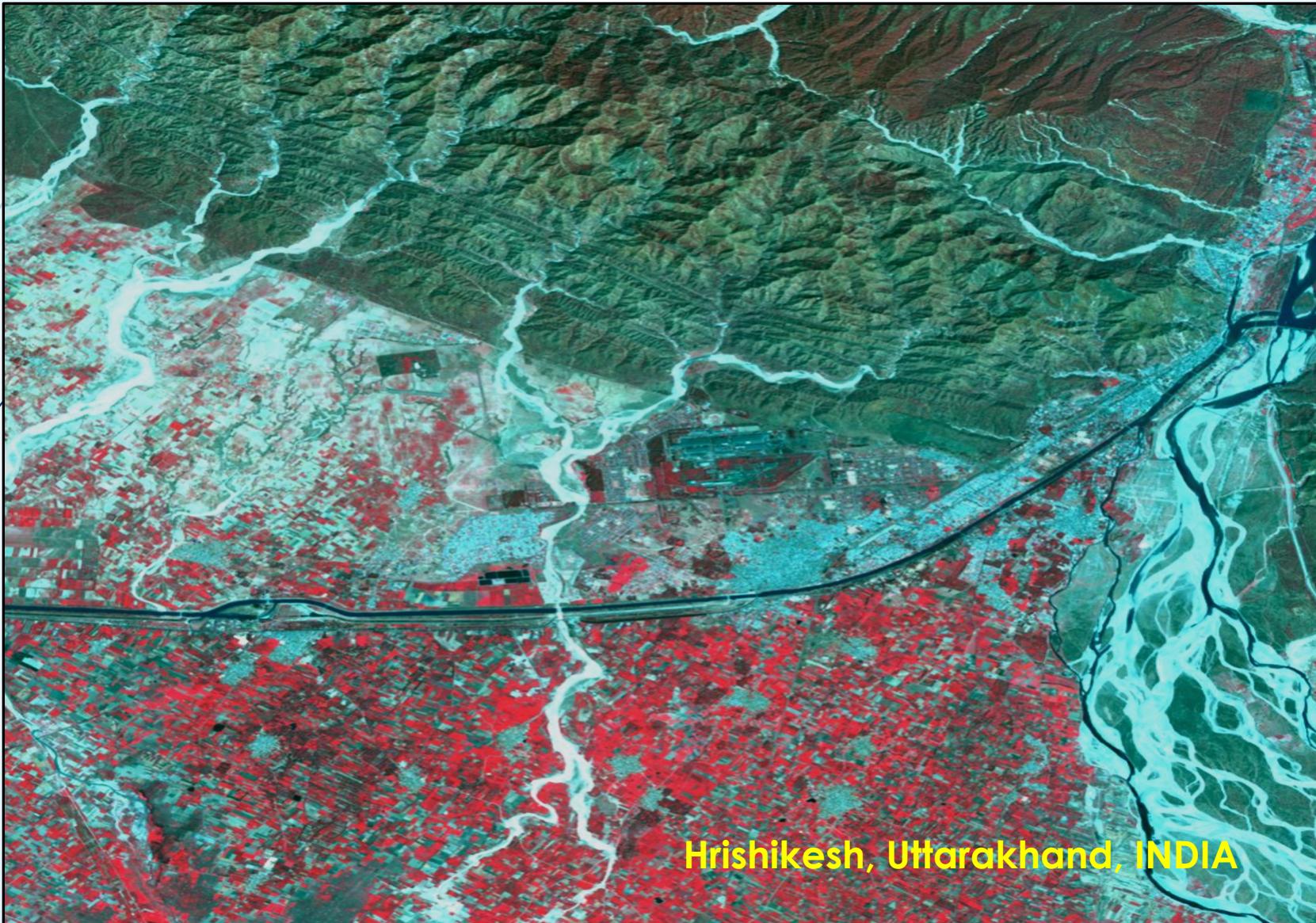


Remote Sensing Visual Image Interpretation

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Remote Sensing Visual Image Interpretation



Hrishikesh, Uttarakhand, INDIA

Remote Sensing Visual Image Interpretation

IIRS,
Dehradun



Remote Sensing Visual Image Interpretation

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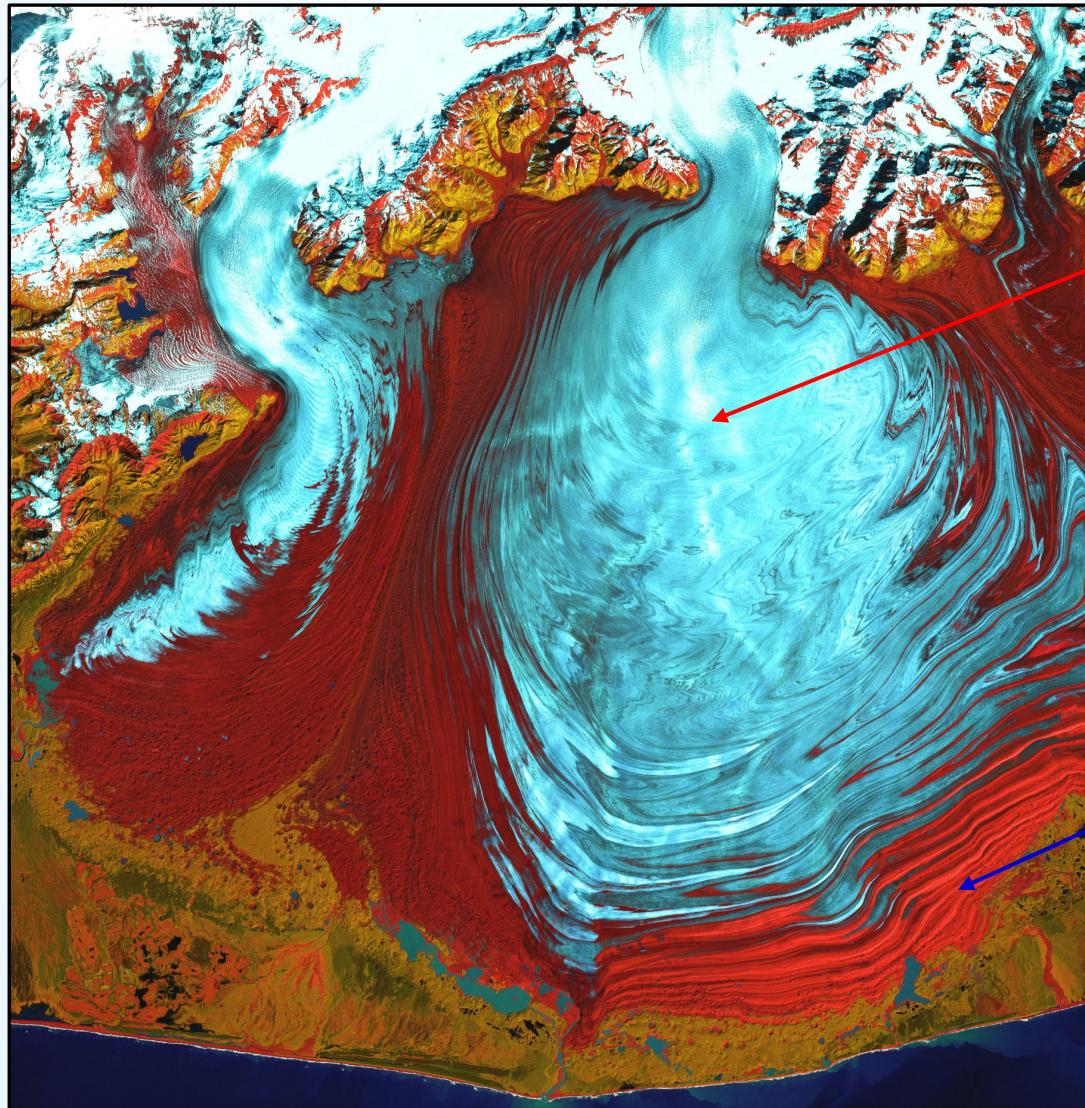
IIRS as seen by IKONOS



Clock Tower



Remote Sensing Visual Image Interpretation



Lava Flow

Molten Lava Flow



www.satimagingcorp.com

ikonos-vancouver-canada-web

Copyright © 2007 GeoEye. All Rights Reserved
IKONOS (0.8 meter resolution)
Vancouver, Canada
October 29, 2002

Any Question..?

Thank You