JOIN THE TWS EXECUTIVE!

Who? You! I know you're interested in TWS.

What? Become an executive member.

Where? Virtually for now, fingers crossed we can all gather next school year!

When? March, 2021-March 2022!

Why? It's FUN!! You'll gain valuable volunteer experience. Executives keep our club running. It looks great on your resume (wink wink)

How? Contact us at tws@unbc.ca for more information about the available executive roles and how you can become involved for the fall semester.

Aerial photography and Remote Sensing

Birds, Kites,
Balloons, Planes
with camera
(and now UAVs)

Computers have linked mapping technologies under the umbrella term :

Geomatics includes the following geospatial technologies:

For data collection, analysis and output

a. Cartography
"The art, science and technology of making maps"

b. Geographic Information Systems (GIS)
"Automated systems for management, analysis, input and output of spatial data"

c. Global Positioning Systems (GPS)
"determination of ground locations using measurements from satellites"

d. Surveying
"science of determination of accurate coordinates of terrestrial locations"

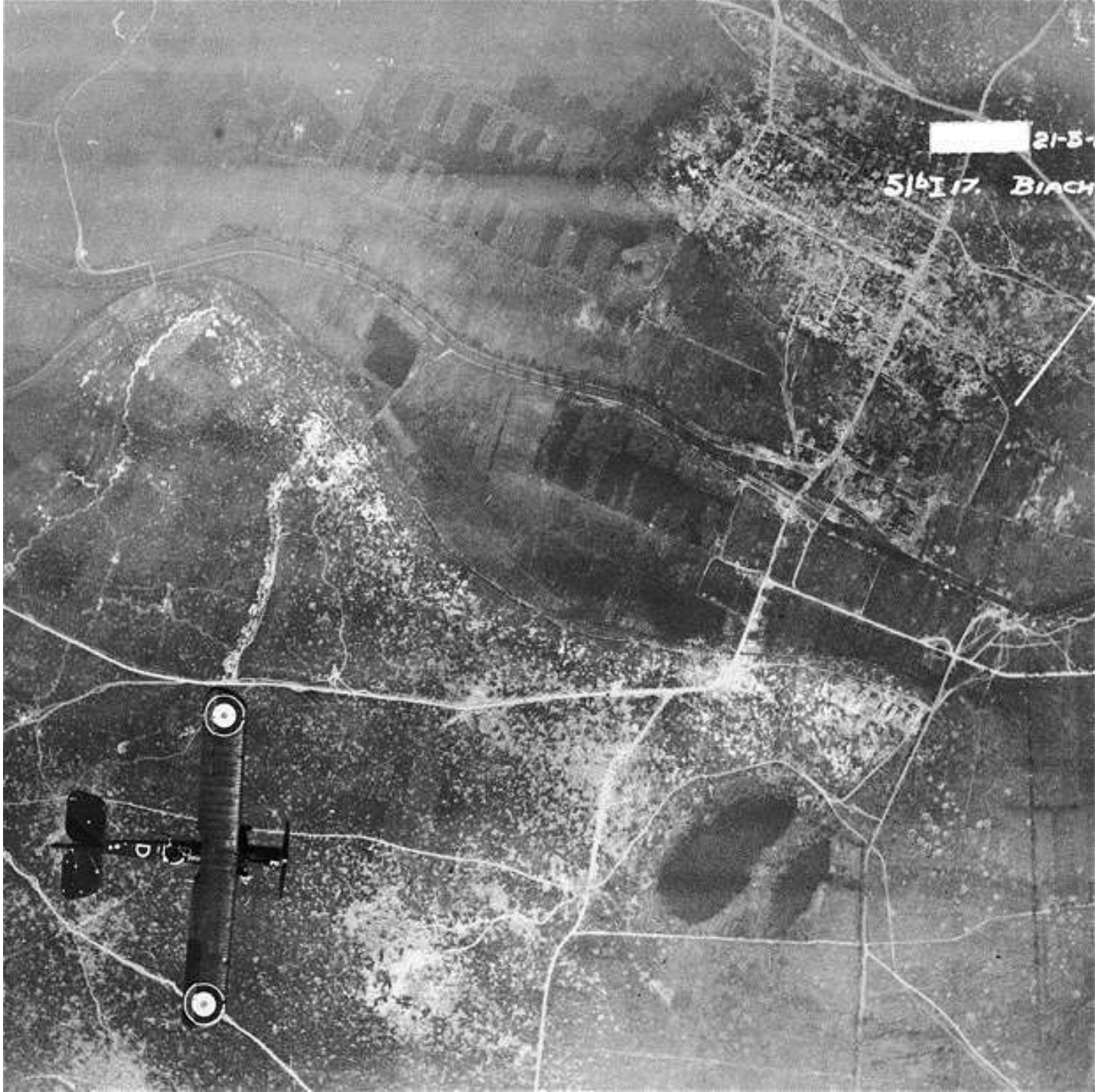
e. Photogrammetry
"derivation of 2D or 3D locations from stereo pairs of aerial photography"

f. Remote Sensing
"Acquisition of information about a planetary surface from a distance"

Air photo, World War 1 Reconnaissance and analysis

Postwar use – limited by resources and the depression

Standard for mapping after World War 2

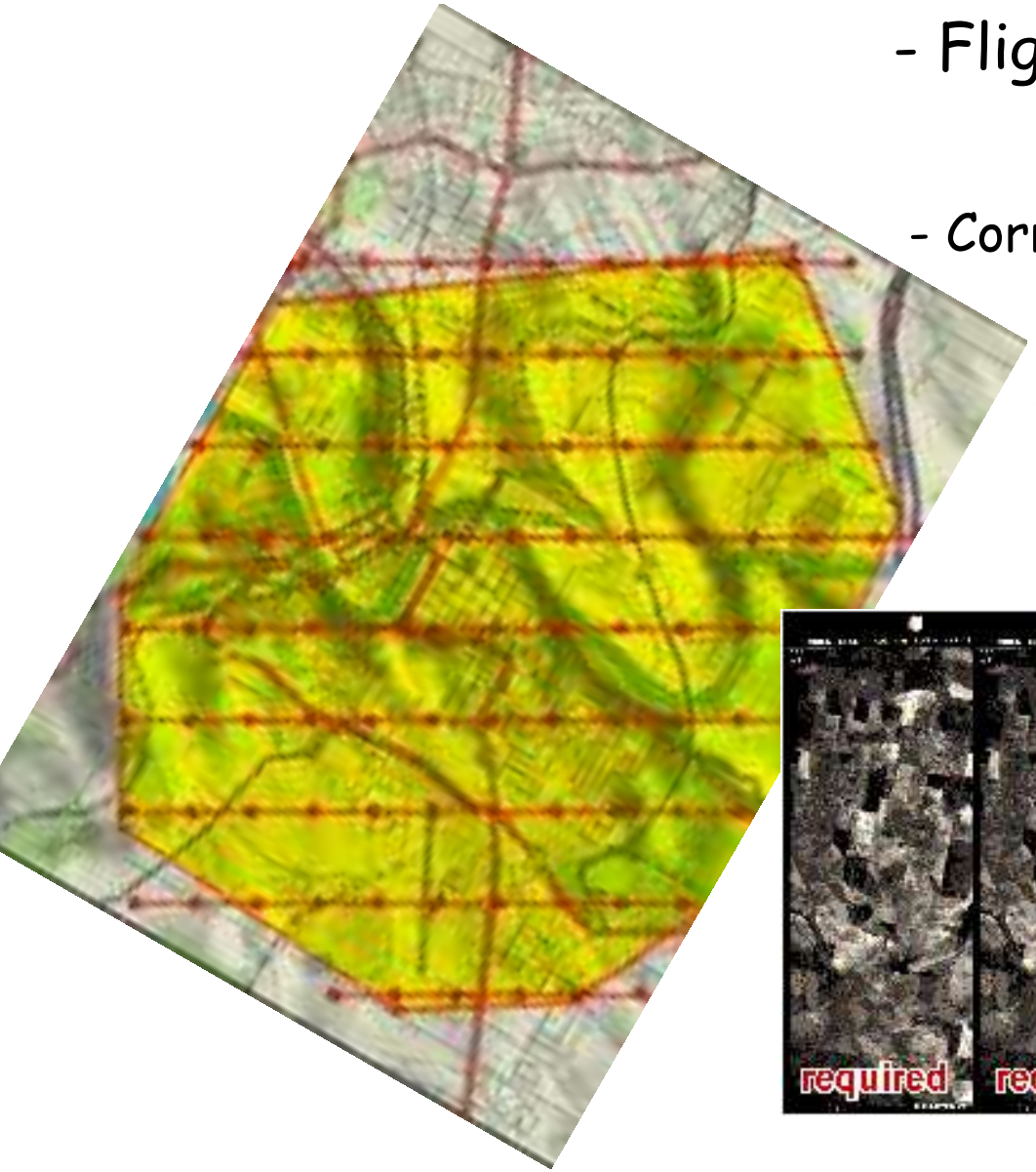


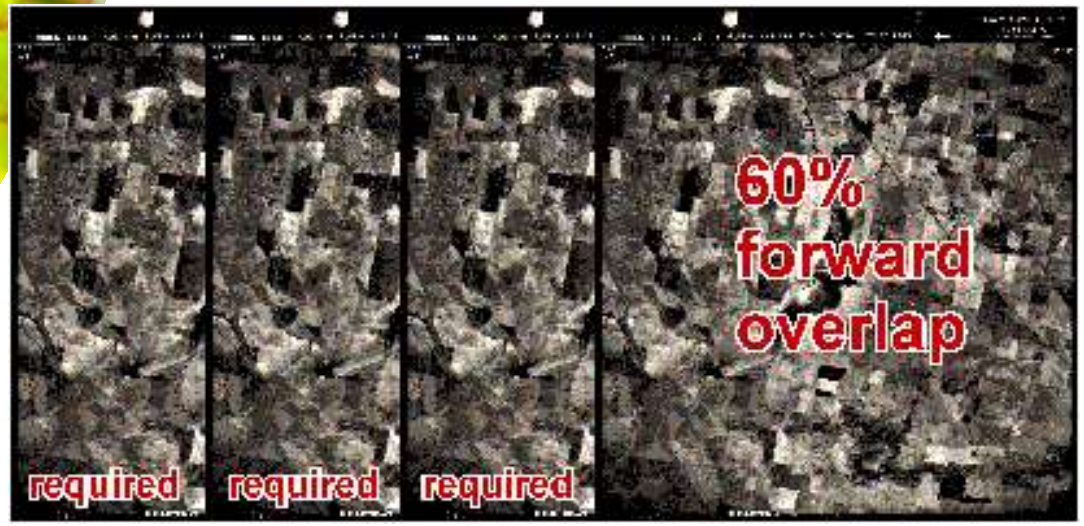
Aerial Photography

- Flightlines and overlap

- Corrected,mosaicked -> orthophotos

- Panchromatic, Colour, Infra-red





Panchromatic air photo: 15th / University Way

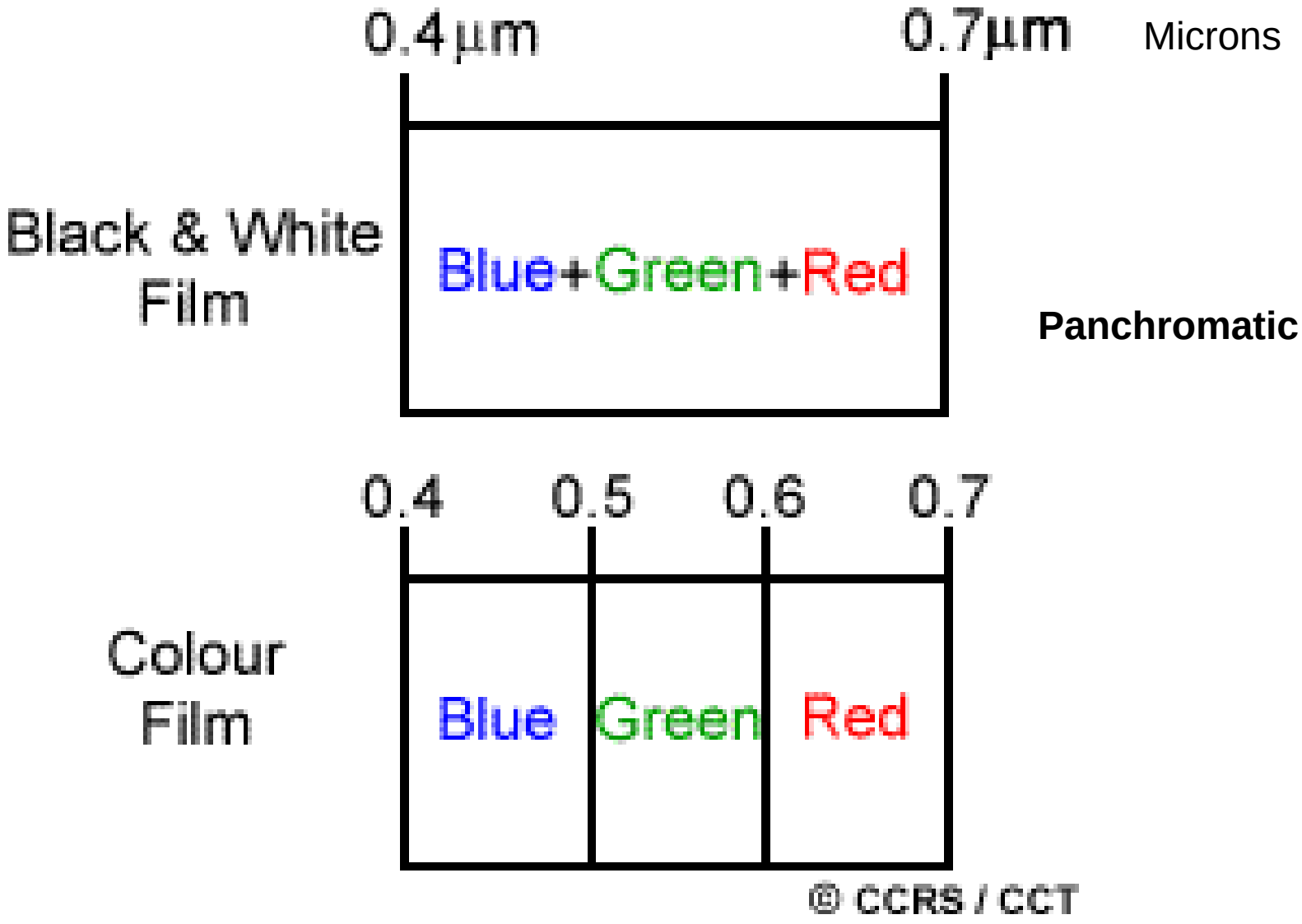
Colour air photo: 15th / University Way; hardcopy cost = 2x

2000s Digital photogrammetry

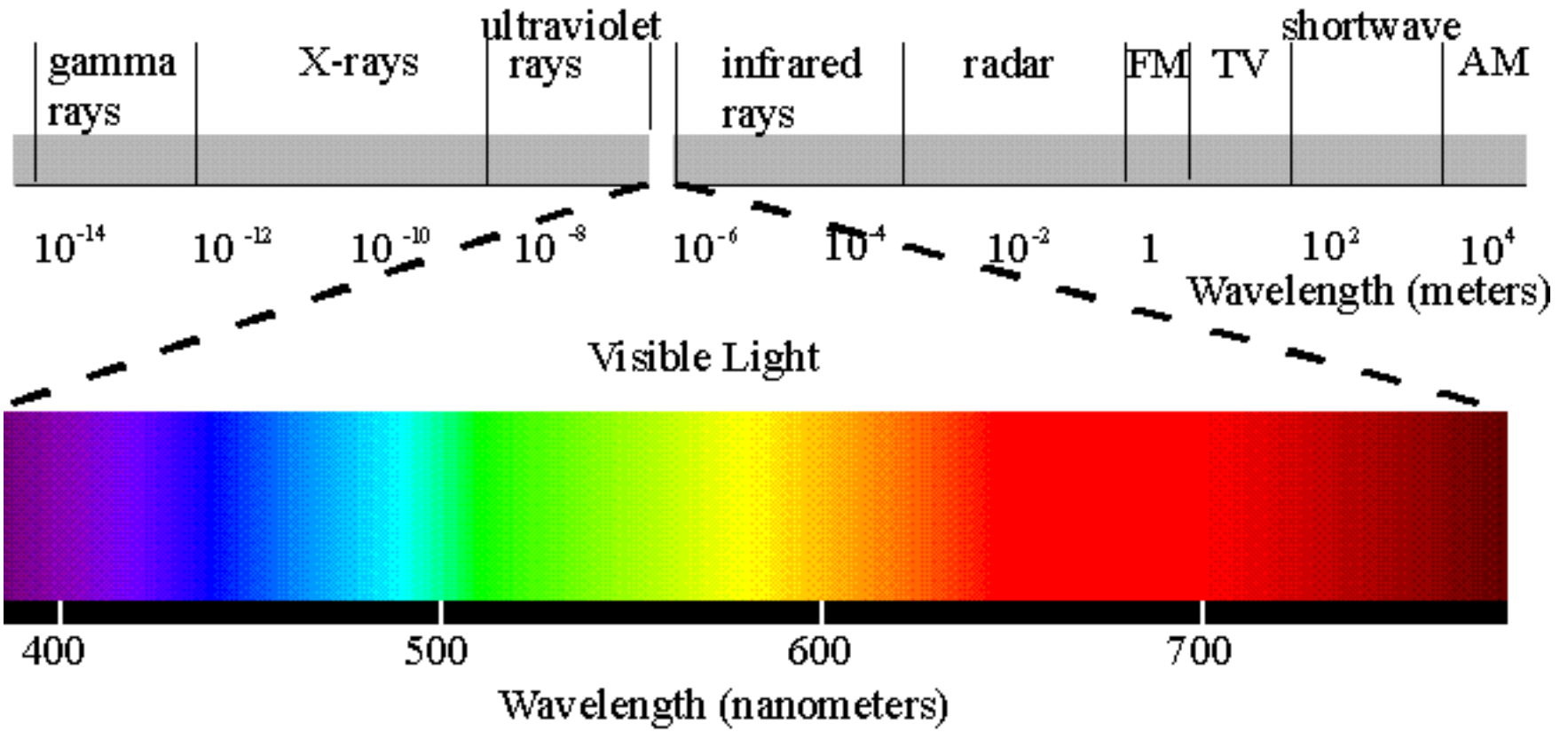
https://www.terrasaurus.ca/imagery-examples/

Most pre-digital aerial photography was panchromatic, not colour

https://pgmap.princegeorge.ca/Html5Viewer/index.html?viewer=PGMap

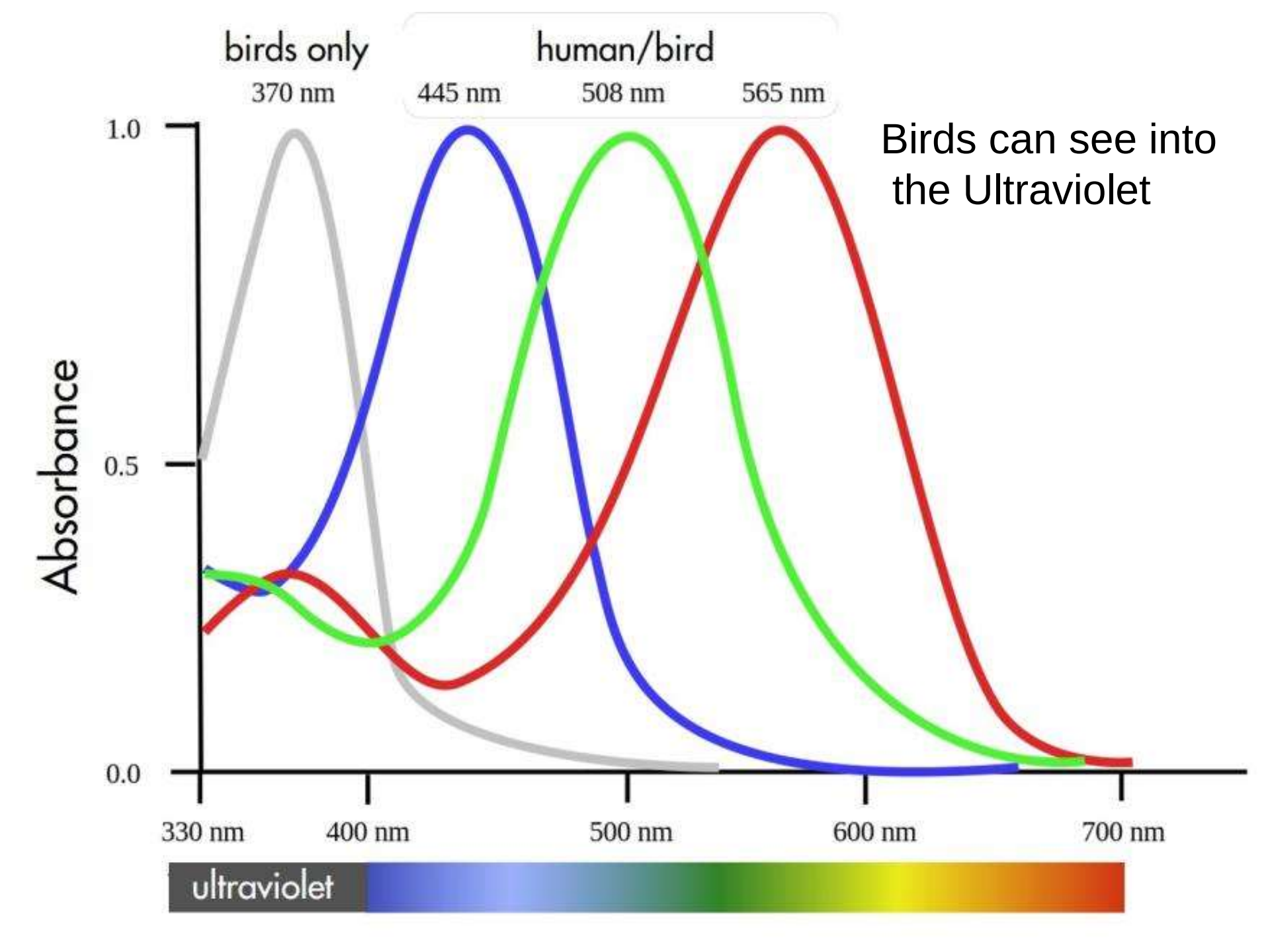

0.4 µm
0.7µm
Microns
Black & White Film
Blue+Green+Red
Panchromatic
0.4
0.5
0.6
0.7
Colour Film
Blue
Green
Red
© CCRS / CCT

Remote sensing and the electromagnetic spectrum



Blue	**0.4 - 0.5 µm**	**(microns)**	**= 400 to 500 nm nanometres**
Green	**0.5 - 0.6 µm**		**= 500 to 600 nm**
Red	**0.6 - 0.7 µm**		**= 600 to 700 nm**

micrometres: 'microns' : millionths of a metre
nanometers: billionths of a metre



Birds can see into the Ultraviolet


Human vision
Bird vision

1960s: Remote Sensing

a. wider use of the electromagnetic spectrum
b. development of satellites (space race)

What is Remote Sensing?

"Obtaining information from a distance"

= The acquisition and processing of aerial and satellite imagery..

The term first appeared ~1965 with the first **satellite images along with use of the Infra-red**

- Evelyn Pruitt

(IR) vegetation appears bright (almost as if snow-covered). There is less haze and higher land-water contrast.

Table 2 : Characteristics of normal colour and false colour film

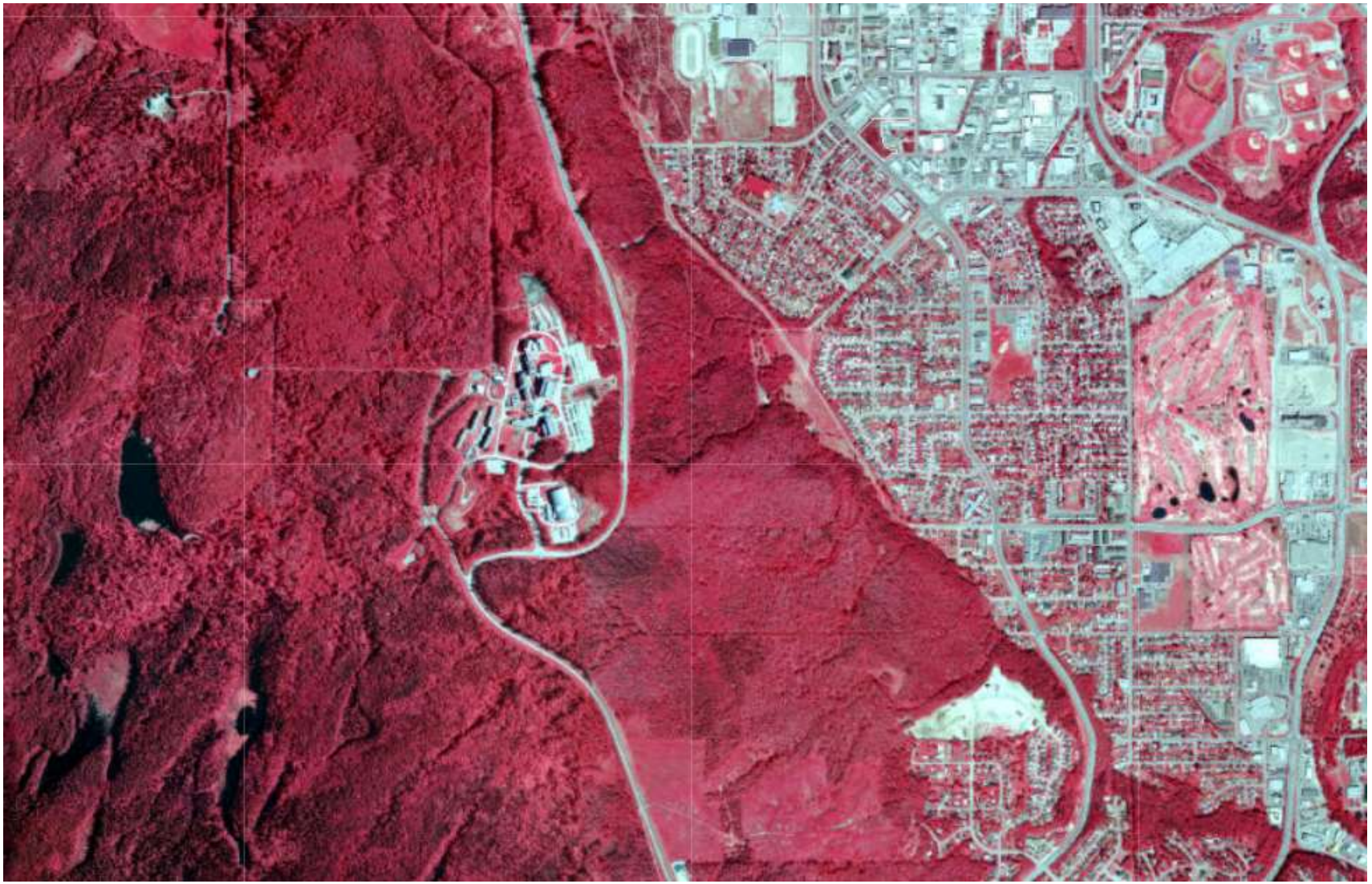
Normal colour film (Energy captured by film)	IR film (Energy captured by film)	Colour that results on film
B	G	Blue
G	R	Green
R	IR	Red

Film has three layers (RGB), a yellow filter removes blue wavelengths, the film is sensitive to infra-red, reflected by healthy vegetation, in the red (film) layer.

PGmap spring 2014 natural colour

Advantages of using Infra-Red wavelengths for mapping/GIS:

PGmap spring 2014 IR image:
https://pgmap.princegeorge.ca/Html5Viewer/index.html?viewer=PGMap



- Land-water distinctions are enhanced (but not urban features)
- Vegetation differences are enhanced, coniferous v deciduous etc..

Digital Scanning: all wavelengths

A scanner creates digital images with pixels (picture elements) – e.g. 8 bit = 256 values (0=dark to 255=bright)

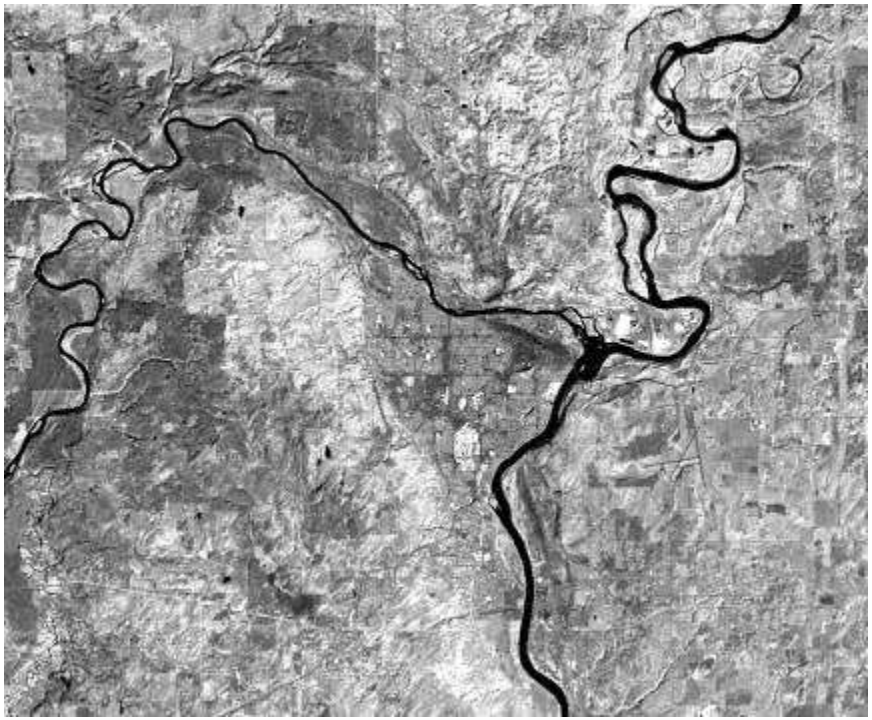
Close-up of pixels in a digital (scanned) image

<- Prince George – scanned IMAGE

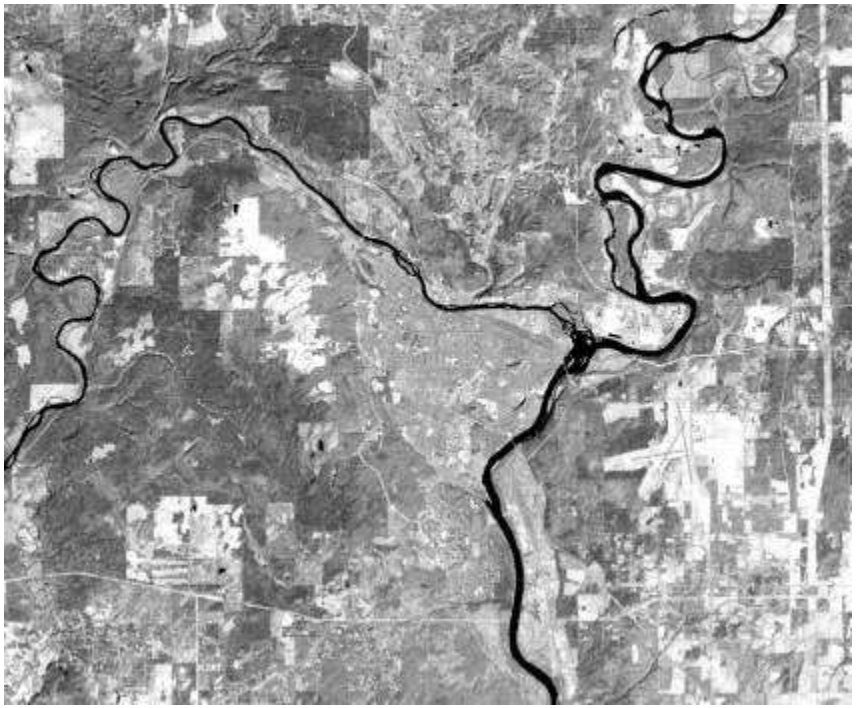
The **near IR** (0.7-1.3 microns) records energy related to **vegetation vigour** (health), while the **mid- IR** (1.3-3.0 microns) is dryness.

Neither have much to do with temperature

Near-IR



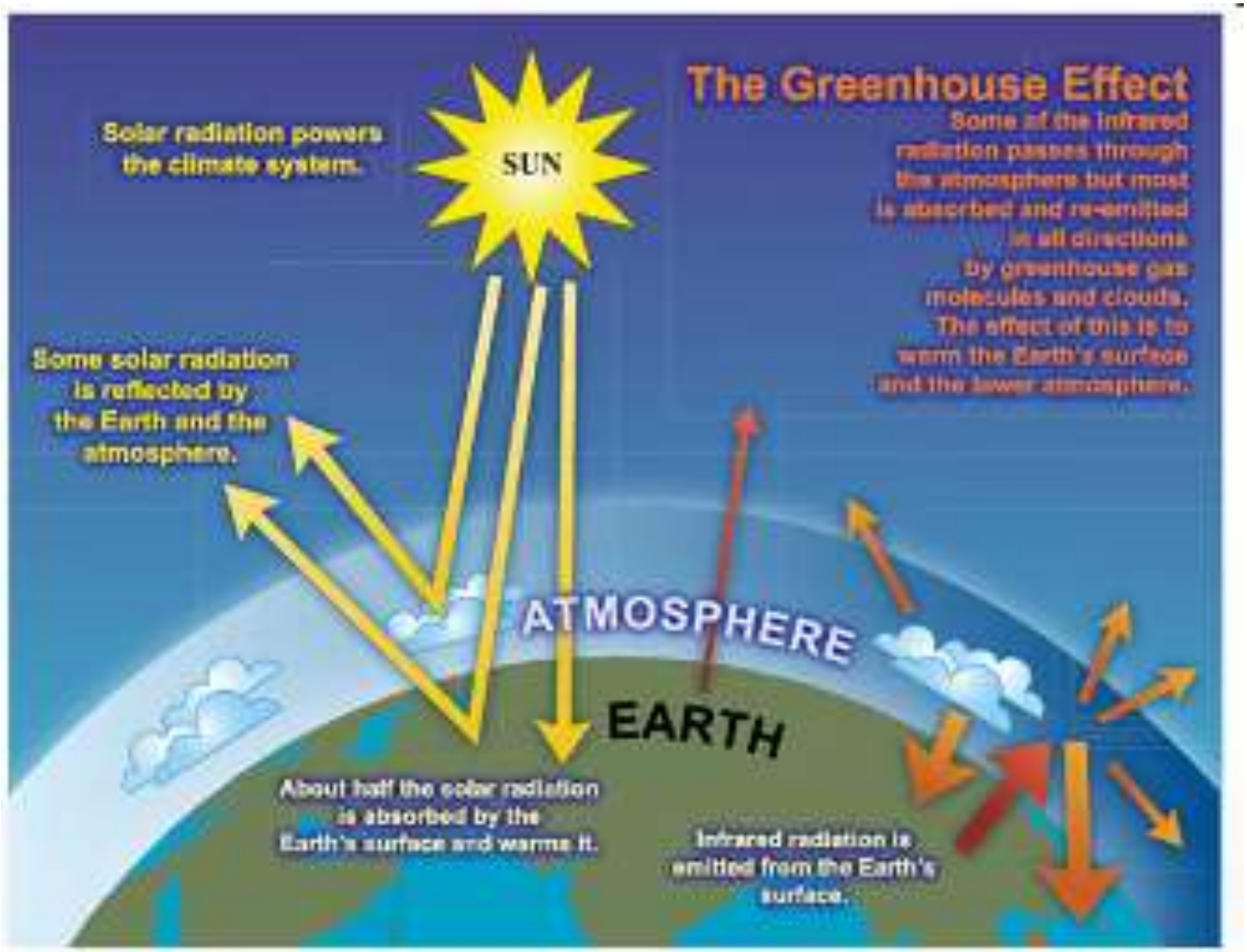
Mid-IR



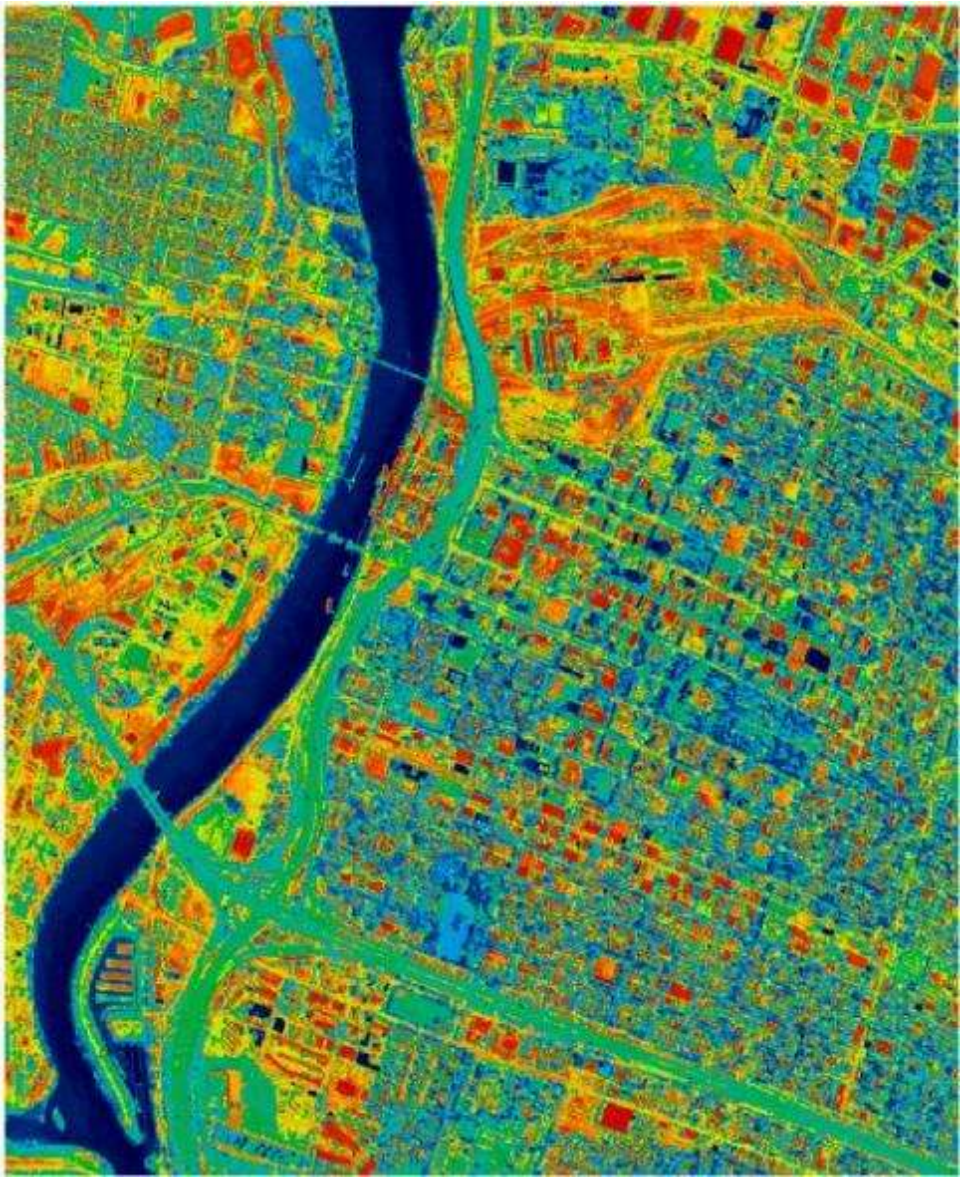
The mid-IR is mostly associated with satellite imagery

Thermal Infrared (3-14 microns)

This records longer wavelengths and temperature as energy is **emitted** NOT reflected IR

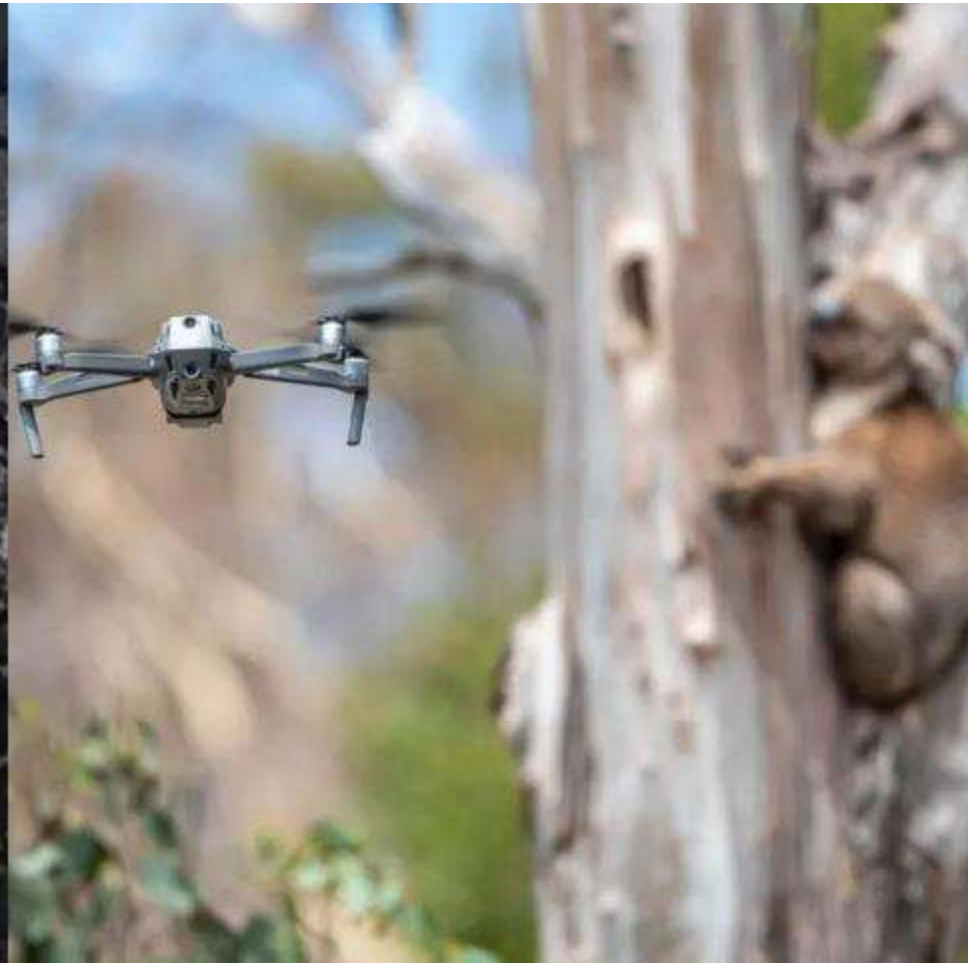


Daytime **Day and night**



Normal colour and thermal images of Sacramento, CA

Drones with thermal cameras used to locate Koalas in Australian bush fires



Microwave: (passive) 1mm – 1 metre

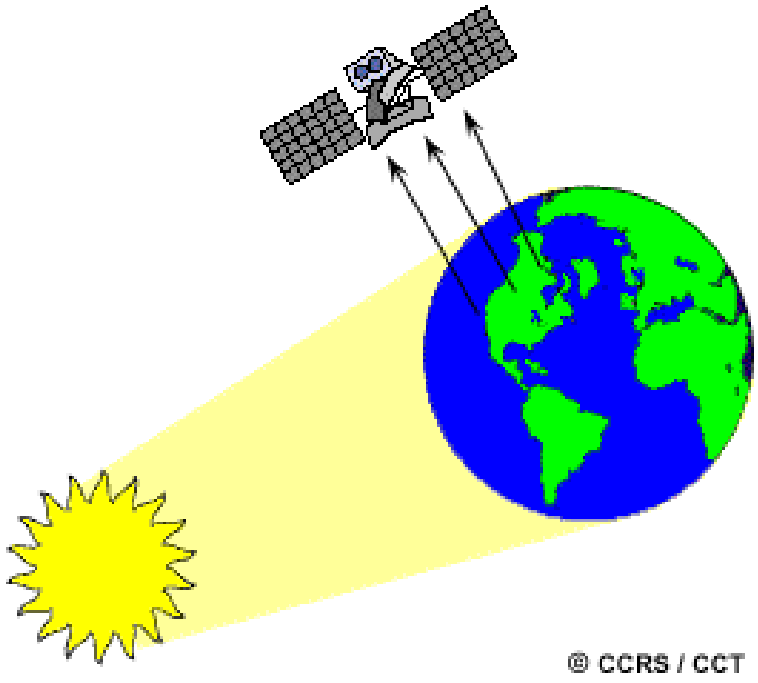
These wavelengths beyond the infra-red can 'see through' clouds, light rain, and snow, but there is a low amount of it
… this is why we use these wavelengths for communications.

Microwave: - RAdio Detection And Ranging (RADAR)

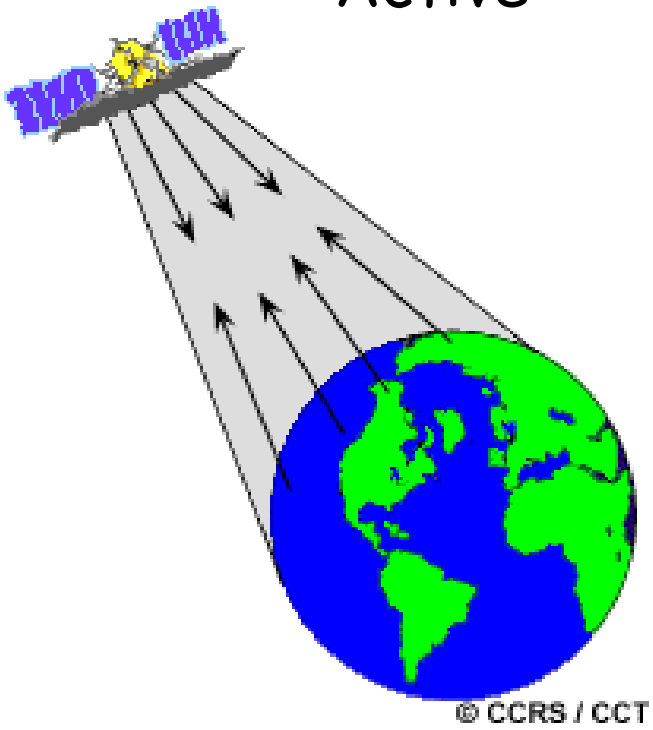
is '**active**' remote sensing at wavelengths of 1-30 cm

(whereas most other remote sensing is 'passive': recording solar and terrestrial radiation).

Passive



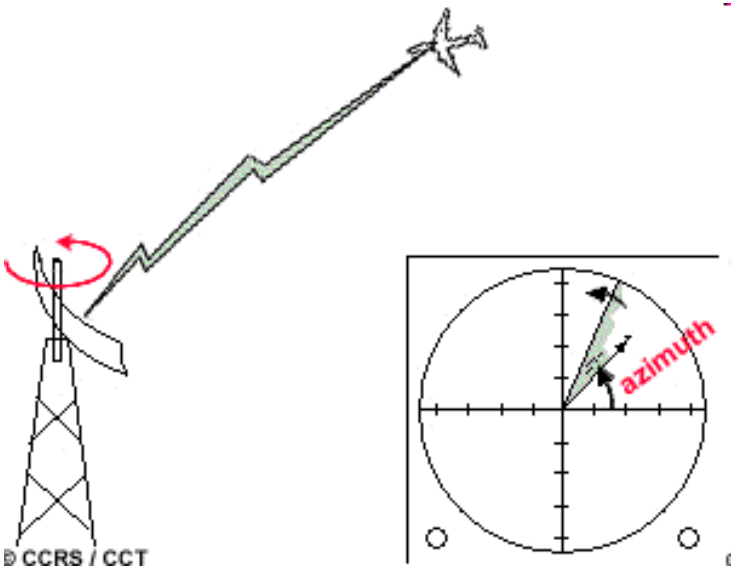
Active



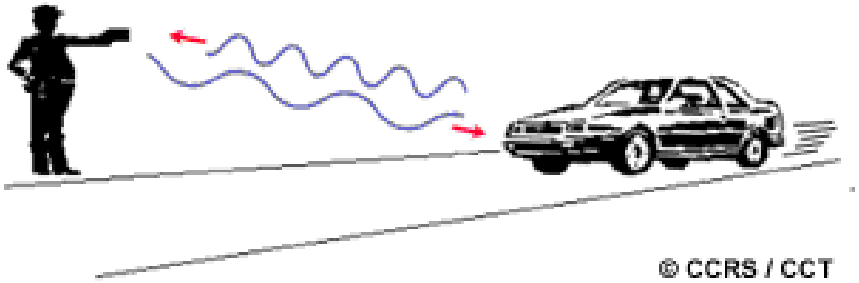
Microwave: - RAdio Detection And Ranging (RADAR)

Imaging radar systems have been in use since the 1950s. The original technology was developed during WWII :

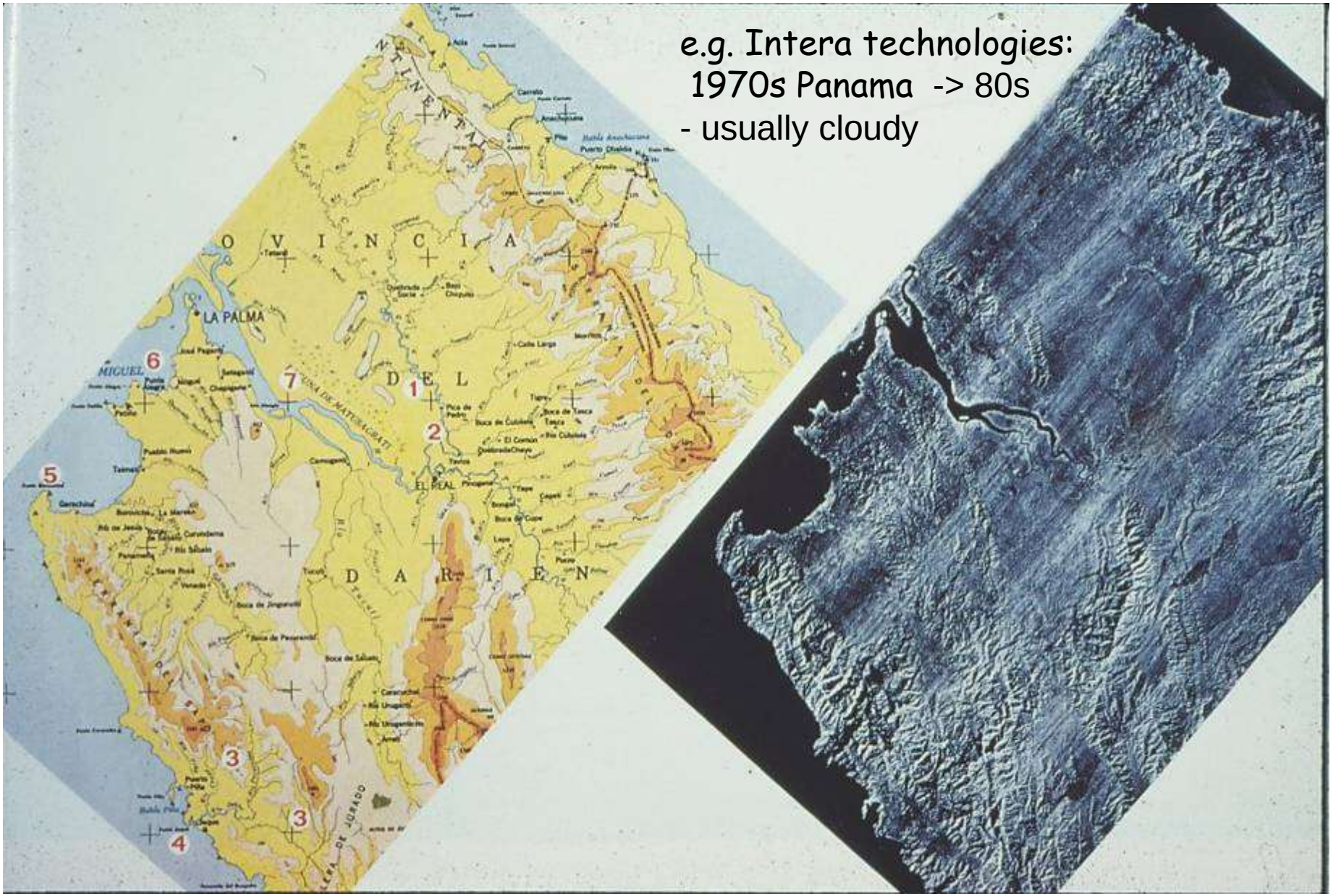
to detect enemy ships and planes



Non-imaging radar



RADAR .. was first developed before/during World War II for aircraft detection - early imaging RADAR for mapping was airborne.



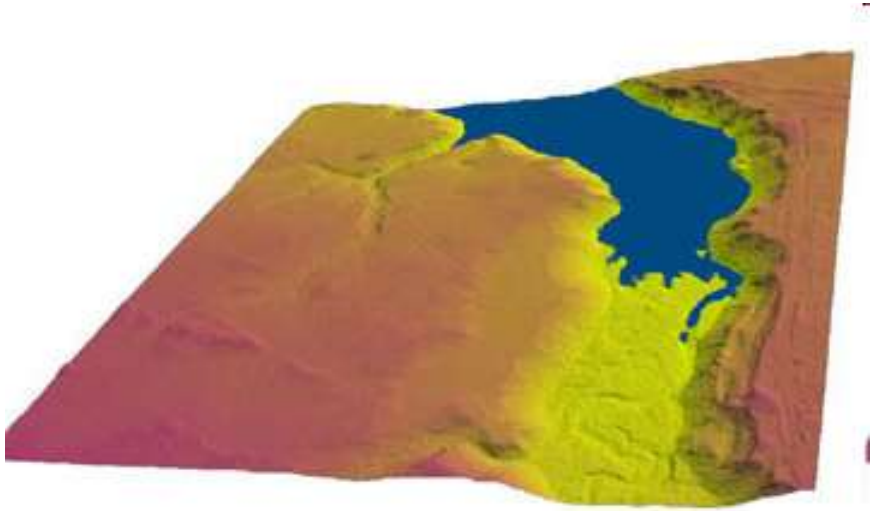
2000 -> LiDAR = Light Detection And Ranging

.. is the other common form of active remote sensing

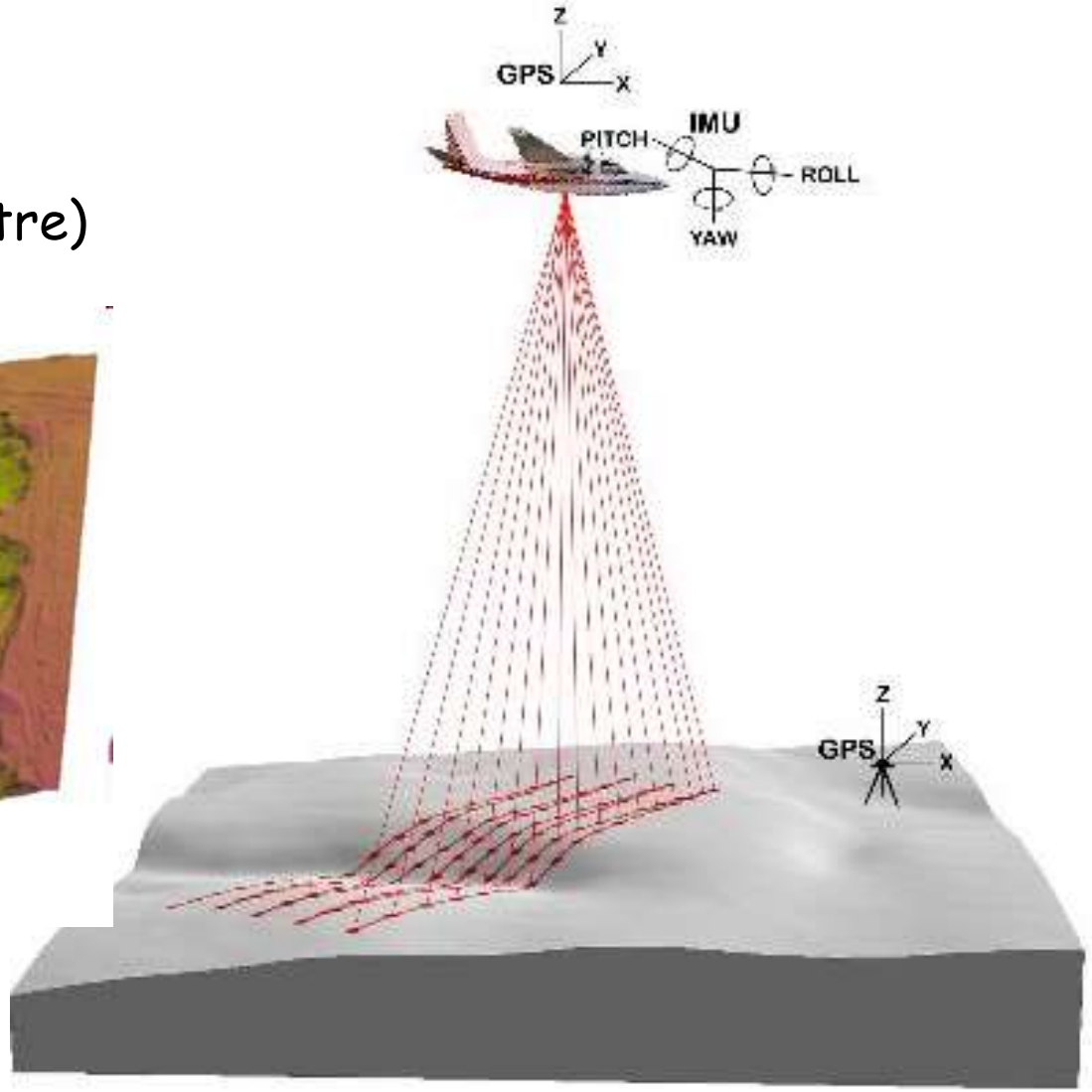
visible/NIR wavelengths

It is often used to create

high resolution DEMs (< 1 metre)



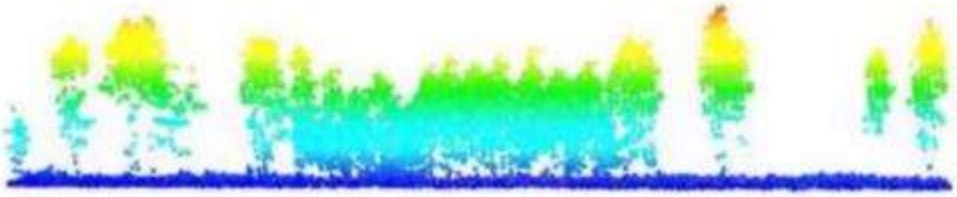
Near-IR wavelengths



Point elevation

Surface elevation

Point height above surface



LiDAR visualizations produced with FUSION/LDA software – USDA Forest Service

2000s -> Mapping from drones - UAVs

Unmanned Aerial Vehicles – easily and quickly launched