

DISPLAYING RASTER DATA

TOPICS

- How the computer displays images
 - Color guns
 - Resolution
- Display of multiple bands

HOW YOUR COMPUTER DISPLAYS IMAGES

RASTER IMAGES

- Each image is made up of
 - Grid of cells (or pixels)
 - Each with x,y co-ordinates
 - Each with a z value
- Visible and Infrared satellite images
 - Z value is typically between 0 and 255
 - Amount of measured energy
 - In a particular spectral band
 - Usually several bands (i.e. several images)

DISPLAYING RASTER IMAGES

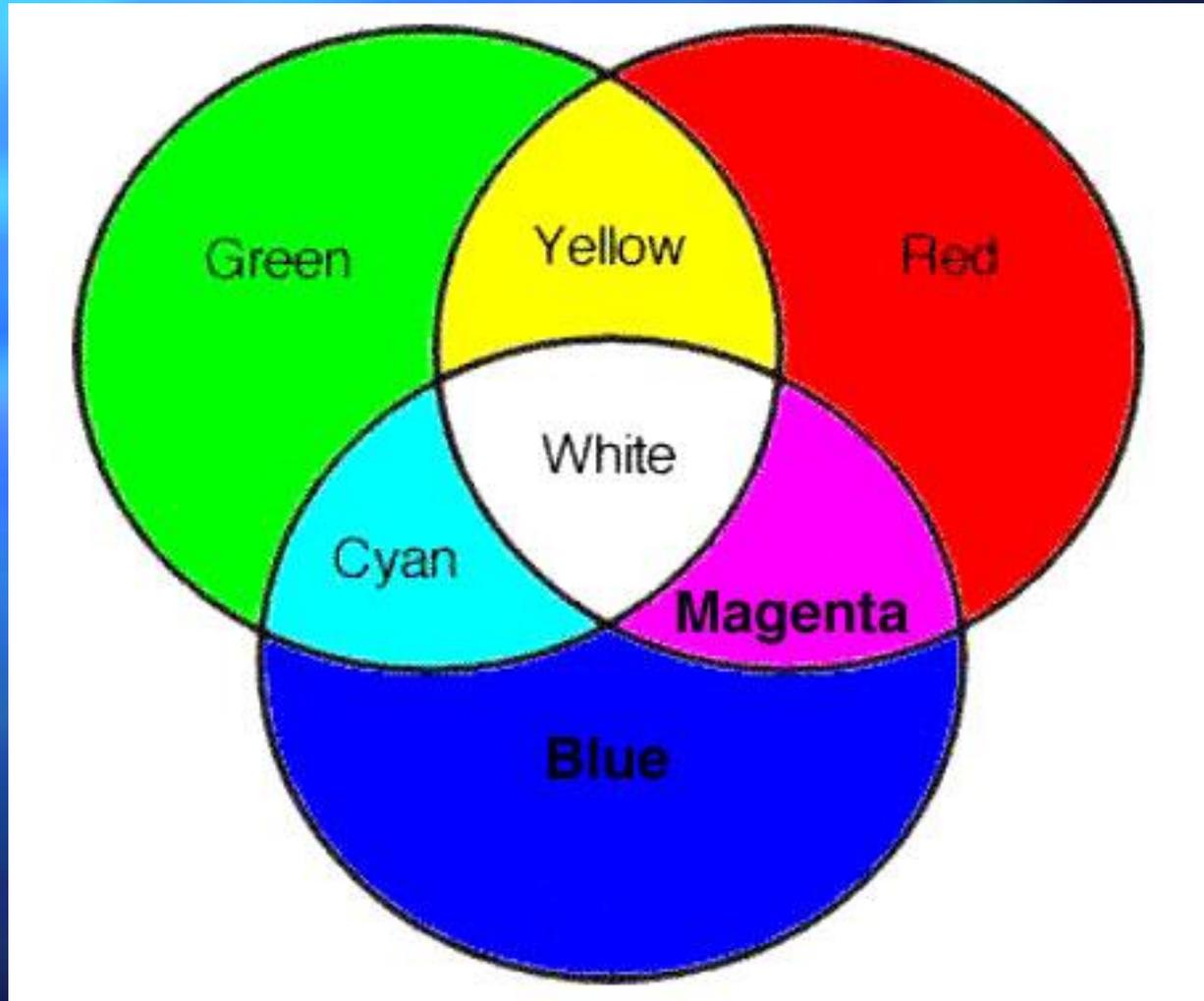
- Grayscale image
 - Single band
 - Panchromatic, magnetic, radar
 - Can also color these
 - “Pseudocolor”
- Colour image
 - Multispectral VIS/IR
 - Gamma-ray
- Also thematic raster datasets
 - Soil chemistry
 - Soil moisture etc

COLOR GUNS

- Human eye perceives colour based on relative amounts of red, blue & green light
 - Primary colors
 - Combinations produce an infinite range of colors
- Computer displays color by means of three “color guns”
- Color selector

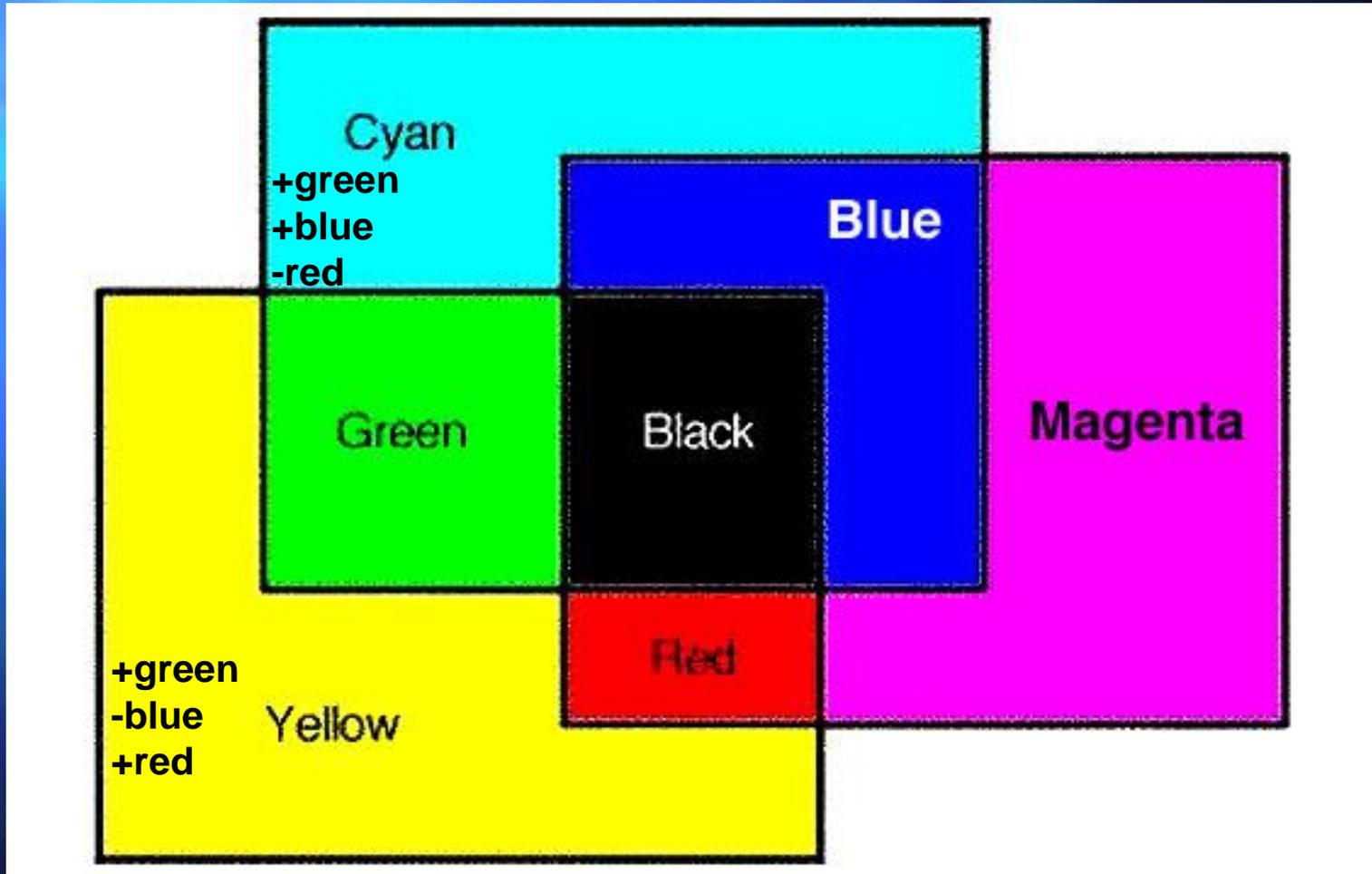
Physics of light

Additive colour mixing – light



Physics of light

Subtractive colour mixing – pigments



COLOR GUNS

- Produce electron beams
 - Fall on red, blue & green phosphors
 - On screen of monitor
 - Phosphors glow at certain frequencies producing different colors
 - Appear as tiny dots on display screen
 - Pixels have same number of RGB phosphors
- Such monitors are called RGB monitors
 - RGB = primary colors

COLOR GUNS

- Computer specifies colour of each pixel:
 - Using three brightness values
 - One for each gun
- In more recent PC's:
- Each gun assigned an 8 bit value
 - Possible values for each gun = $2^8 = 256$
 - 0 – 255
 - Total colors is $256^3 = 16.8$ million
- This is 24 bit resolution

DISPLAY RESOLUTION

- Display resolution is:
 - Measure of ability of computer screen to display images
- For PC resolution varies from 640 x 480 to 1280 x 1024
 - Number of pixels that can be viewed on the monitor screen
- PIXEL depth is number of bits for each pixel
 - In more recent PCs this is 24 bit

DISPLAYING SATELLITE DATA

- Satellite data range from 0 – 255
- Must be related to screen color
- RGB with brightness values between 0 and 255
- Done by means of a “look-up table” or “colormap”
- Image enhancement

INPUT

OUTPUT

SATELLITE
DATA

1 - 7 bands
Values 0 - 255

IMAGE
ENHANCEMENT

RED

GREEN

BLUE

3 Color Guns
Values 0 - 255

Monochrome image

0	0	0	0	1	1
1	0	0	1	1	0
1	0	1	1	0	0
0	0	0	1	1	0
1	1	0	0	0	1
0	1	1	1	0	0

0	1
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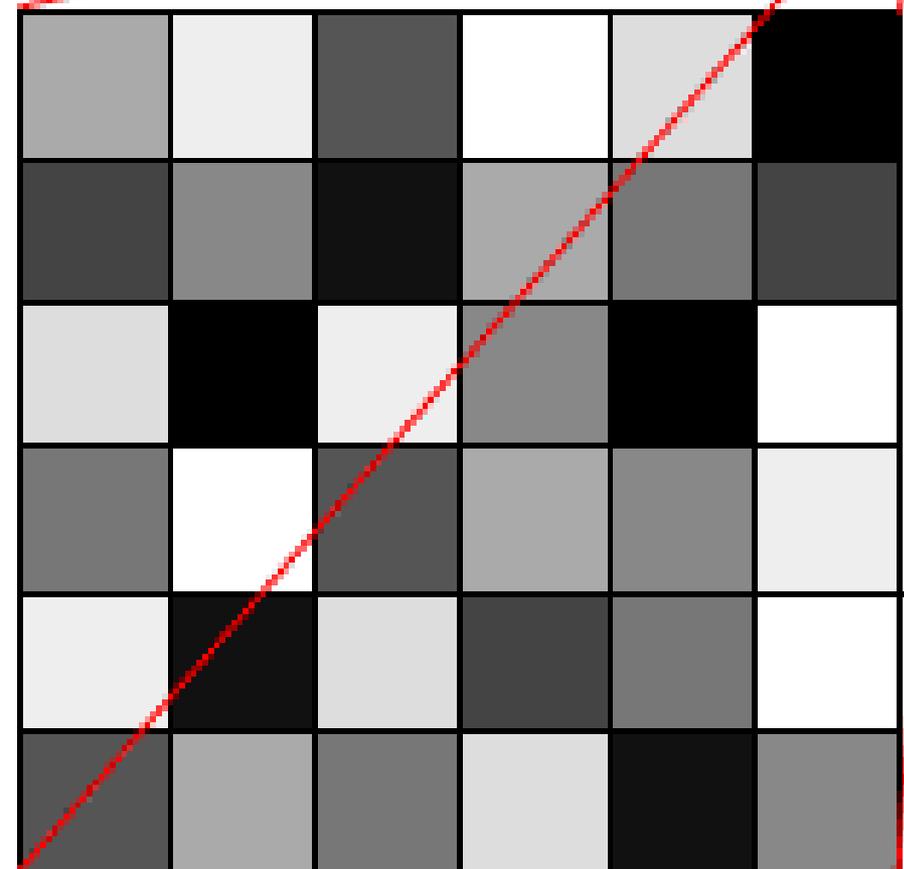
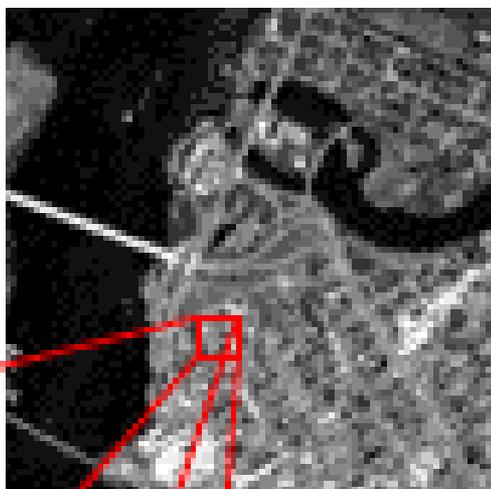
In a monochrome image, each cell has a value of 0 or 1. They are often used for scanning maps with simple linework, such as parcel maps.

Grayscale image

68	124	0	170	86	0
234	187	68	251	10	230
76	124	218	132	201	66
124	16	118	183	32	255
128	191	198	251	141	56
41	255	243	162	212	162

0	255
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In a grayscale image, each cell has a value from 0 to 255. They are often used for black-and-white aerial photographs.



170	238	85	255	221	0
68	136	17	170	119	68
221	0	238	136	0	255
119	255	85	170	136	238
238	17	221	68	119	255
85	170	119	221	17	136

Display colormap
image

1	5	3	2	2	4
5	2	4	2	5	1
5	5	5	5	3	3
2	1	2	4	1	3
4	4	4	1	1	3
2	4	2	1	3	3

Colormap

	red	green	blue
1	255	255	0
2	64	0	128
3	255	32	32
4	128	255	128
5	0	0	255

One way to represent colors on an image is with a colormap. A set of values is arbitrarily coded to match a defined set of red-green-blue values.

DISPLAYING MULTIPLE BANDS

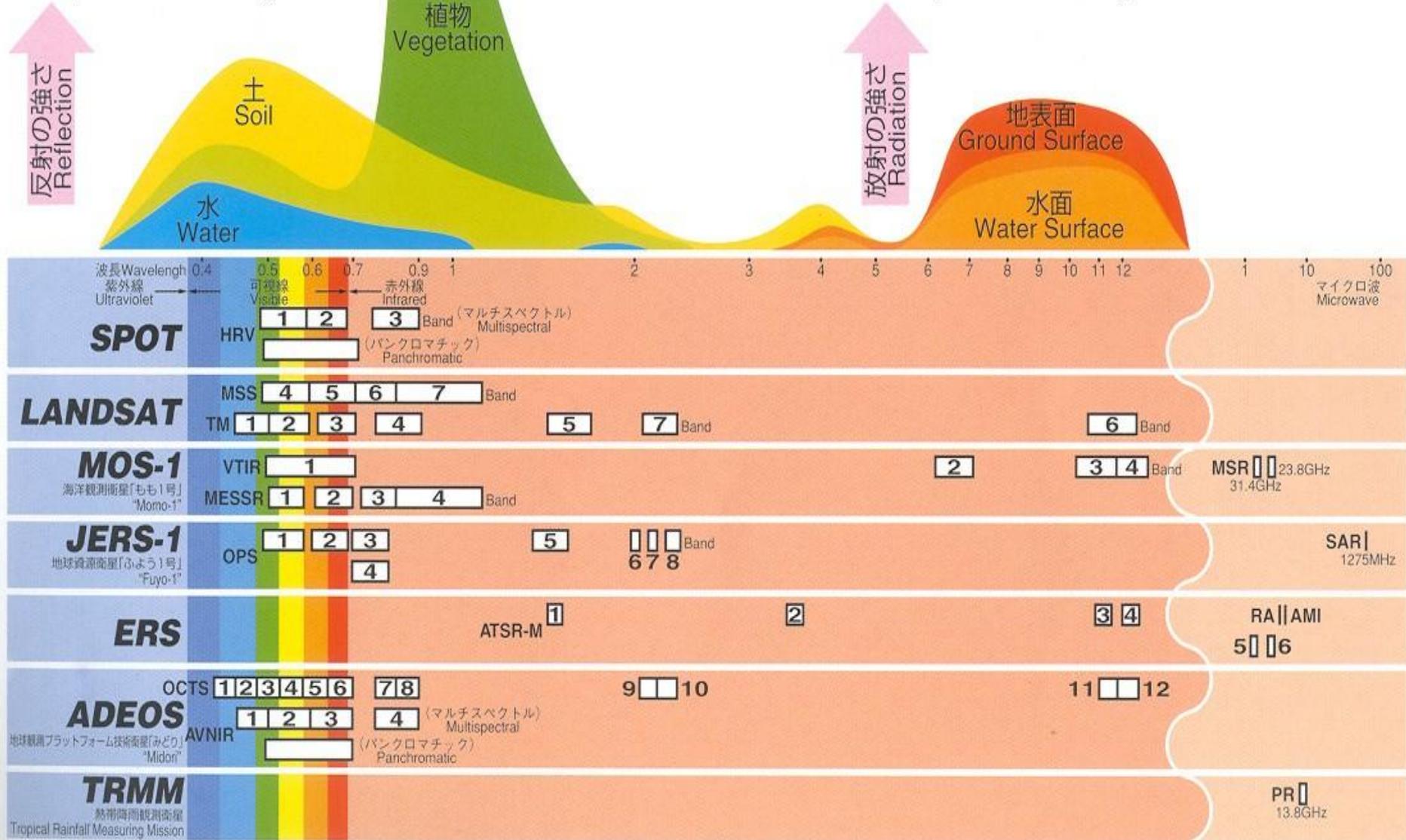
MULTIPLE BANDS

- Examples: Landsat, SPOT, IRS
- Computer can only display 3 bands
- These bands can be:
 - Any 3 of the spectral bands
 - Other datasets etc
 - The choice depends on your specific project
- What is the best combination of data for your purpose.....

Satellites' observation bands received at the Earth Observation Center

Examples of Reflecting Features

Examples of Radiating Characteristics



Band	Use
1 - Blue	Coastal water mapping, distinguishing soil & vegetation, forest type, cultural features
2 - Green	Green reflectance of healthy vegetation
3 - Red	Discriminates many plant species. Also good for geology & soil boundaries
4 – Reflected IR	Responds to amount of plant biomass
5 – Mid IR	Sensitive to amount of water in plants. Can discriminate between cloud, snow & ice
6 – Thermal IR	Crop stress, heat intensity, locating thermal pollution
7 – Mid IR	Geology, soil boundaries; soil & vegetation moisture content

EXAMPLE: Landsat ETM+ Seeb area

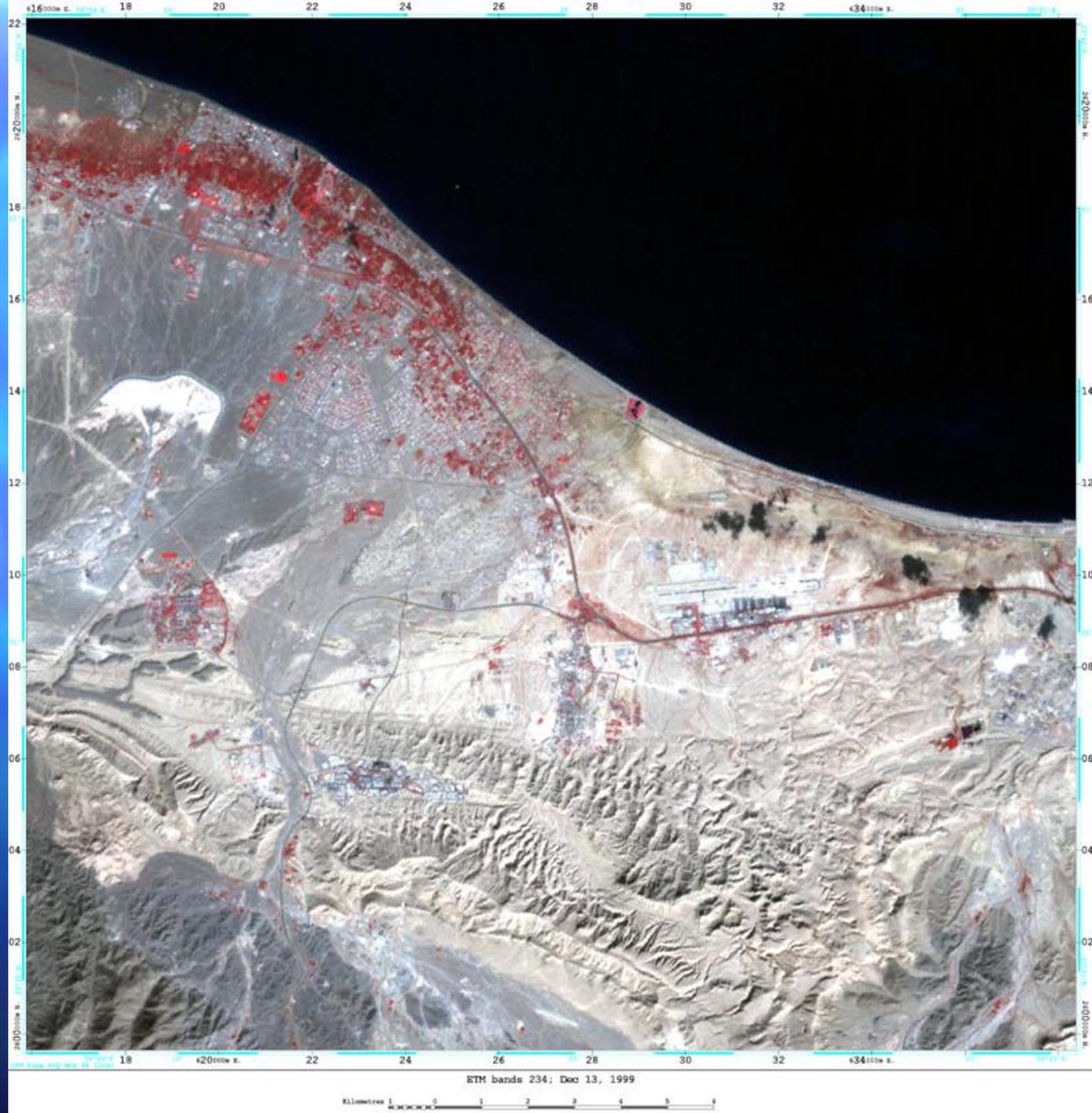
- Image recorded on December 13, 1999
- Bands listed in BGR order
- Bands pan-sharpened with 15 m panchromatic band

ETM bands
1,2,3 (BGR)—
True color
Most suitable
combination
for studying
marine
environment





ETM bands
2,3,4
(BGR)
False
color





ETM bands
5,4,7
(BGR)—
False color



