

# Vores levende Jord

## Hvad ser vi fra rummet

Jordskælv – Klimaændringer – GALATHEA-3

Ole Baltazar Andersen,  
Danmarks Rumcenter – DTU Space

## Indhold

### Del 1

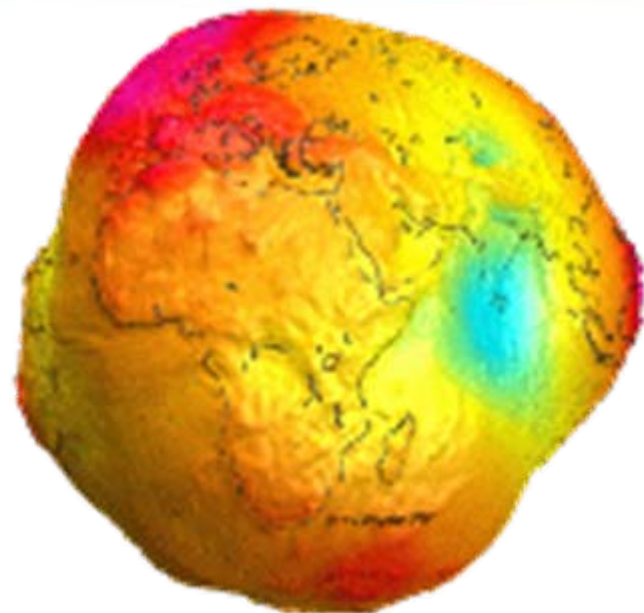
- Satellitter – Typer og Funktioner.
- Spion Satellitter

### Del 2

- Vores Levende Jord.
- Pladetektonik fra Rummet. Jordskælv og Tsunamier
- Klima ændringer – Hvad sker der på Grønland

### Del 3

- Værktøjer / LeoWorks, ESA atlas, Google Earth
- Galathea-3 / Virtuel Galathea 3



Danmarks Rumcenter i København ([www.space.dtu.dk](http://www.space.dtu.dk)).  
Fra 1/1-2008 En del af DTU (DTU space)

Vi er 110 ansatte:

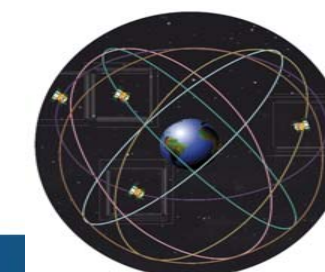
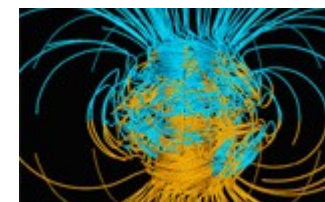
Forsker i Solens påvirkning af Jordens klima

Deltager i satellit-konstruktion og  
Opsendelser (Ørsted og Swarm – 3 satellitter i 2009)

Forsker i jordens ydre lag  
Her lyn-opslag fra øvre atmosfære ud i rummet)

Sorte huller, gamma glimt og fjerne galakser

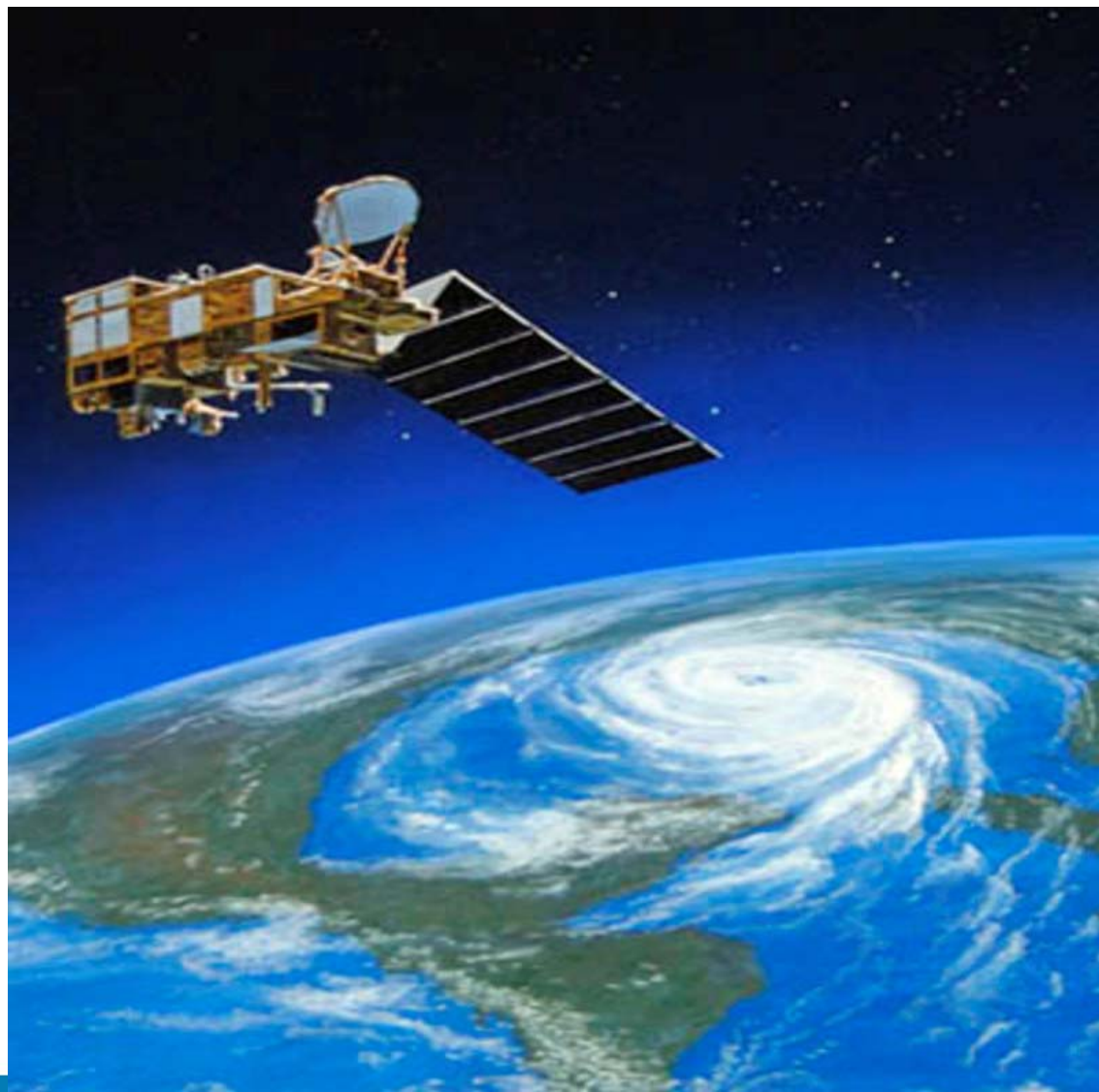
Kortlægning af Jordens fra rummet. Form og ændringer  
(os der var med på GALATHEA-3)



## Indhold

### Del 1

- Satellitter
  - Vejr
  - Kommunikation
  - Navigation
  - Jordobservation
- Spion Satellitter
- Hvad er billeder





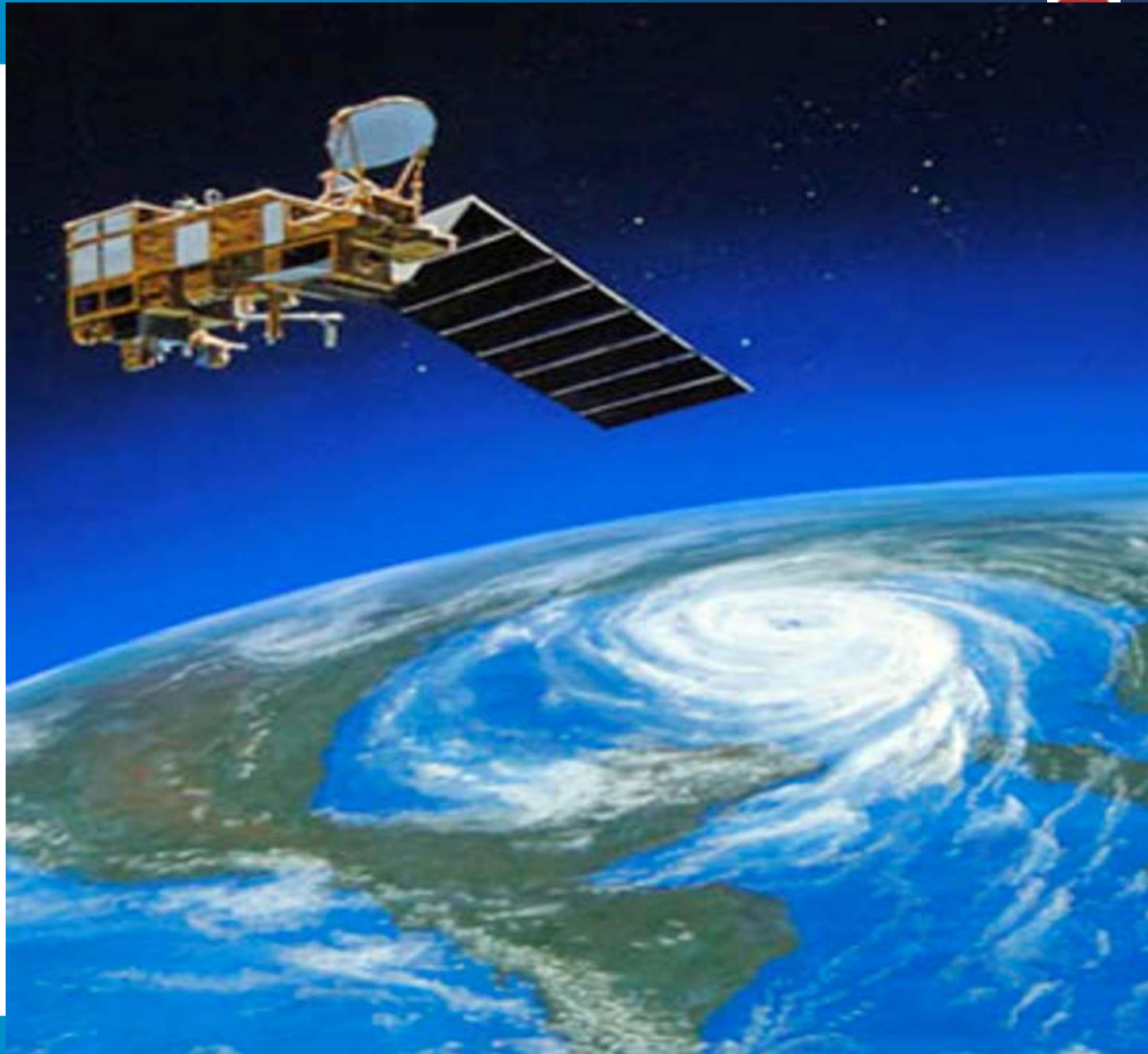
- Fast position
- Lav Opløsning
- Langt væk

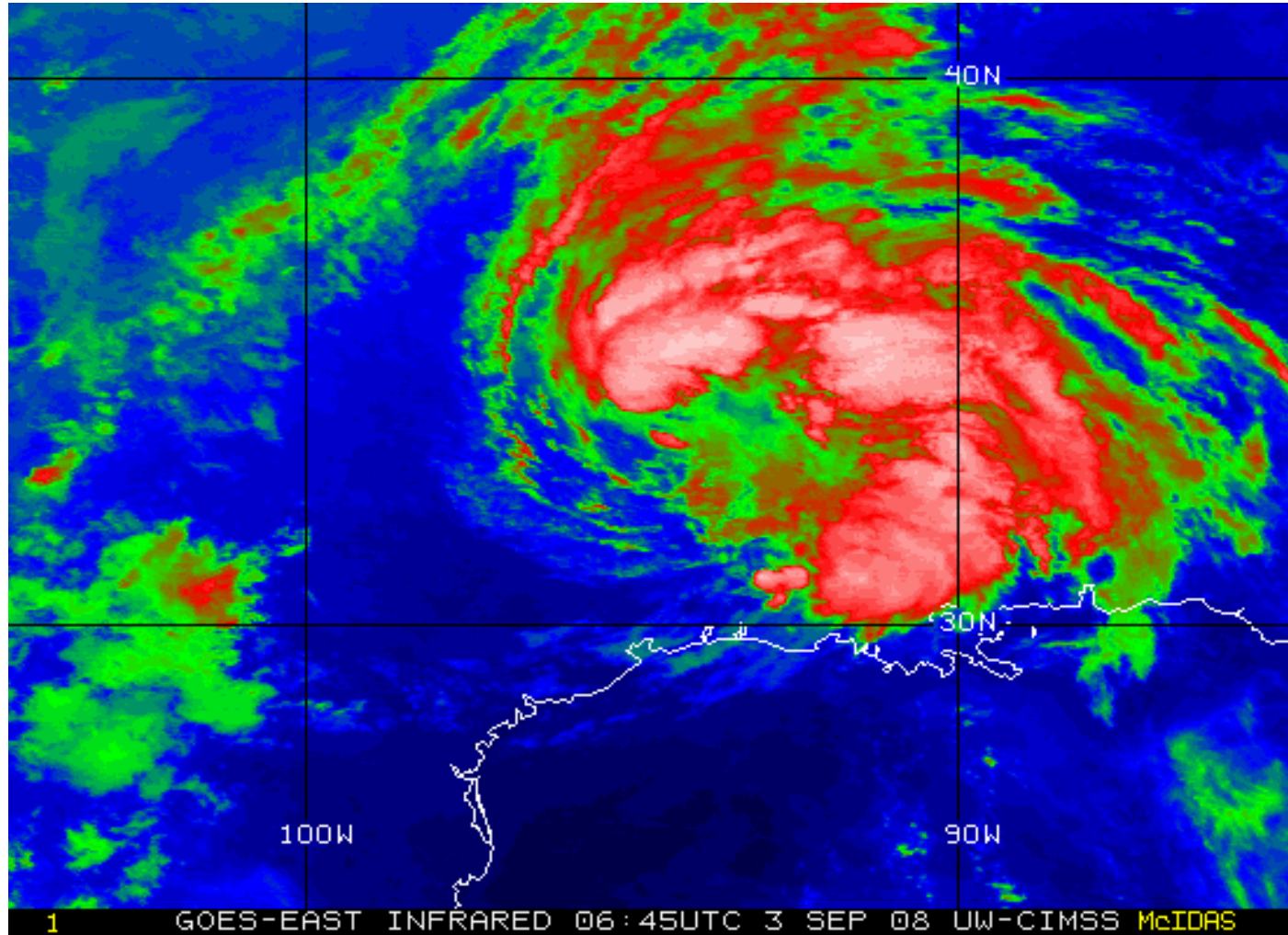




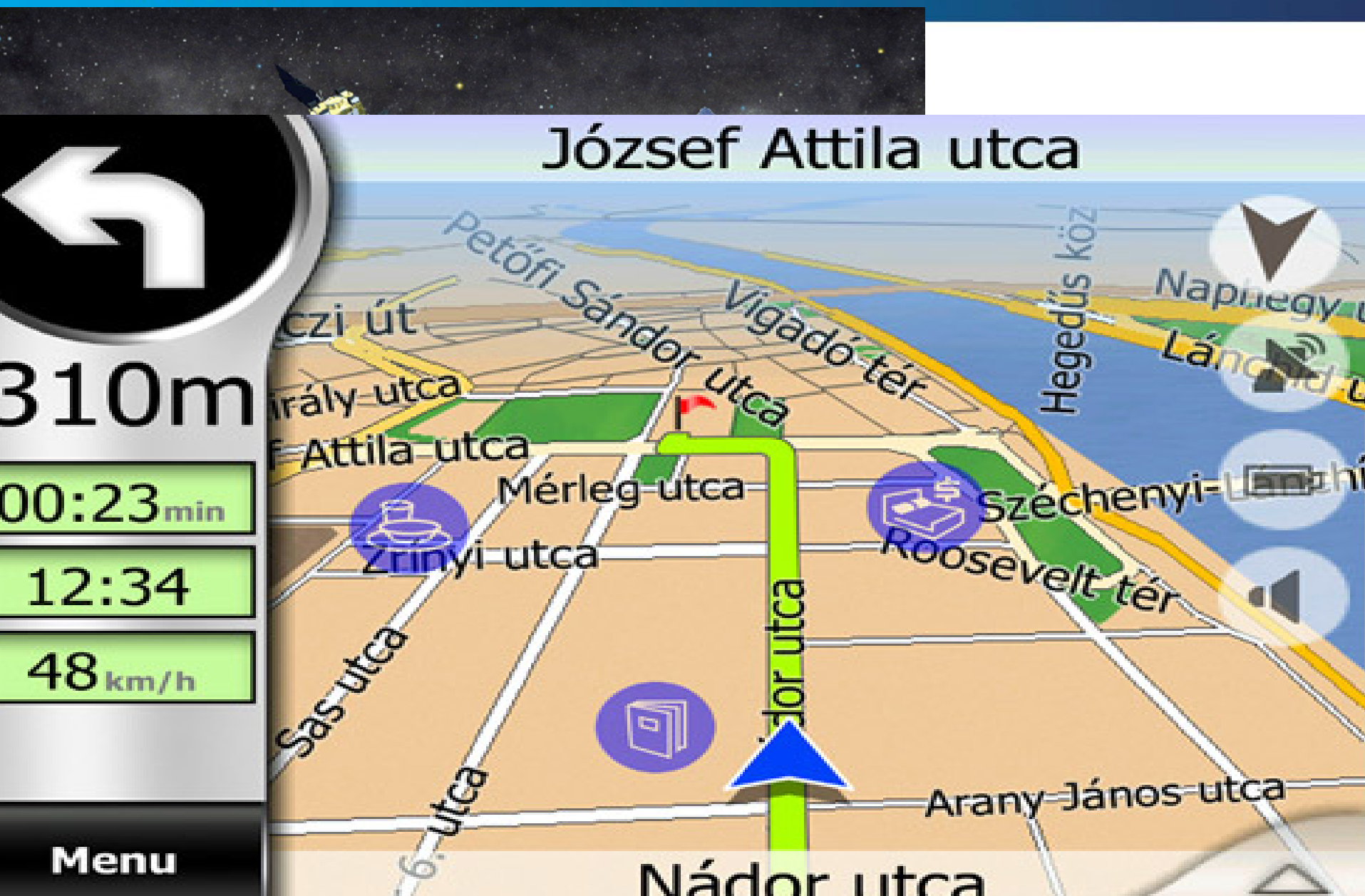
## **TRACKING and DATA RELAY SATELLITE (TDRS-H)**

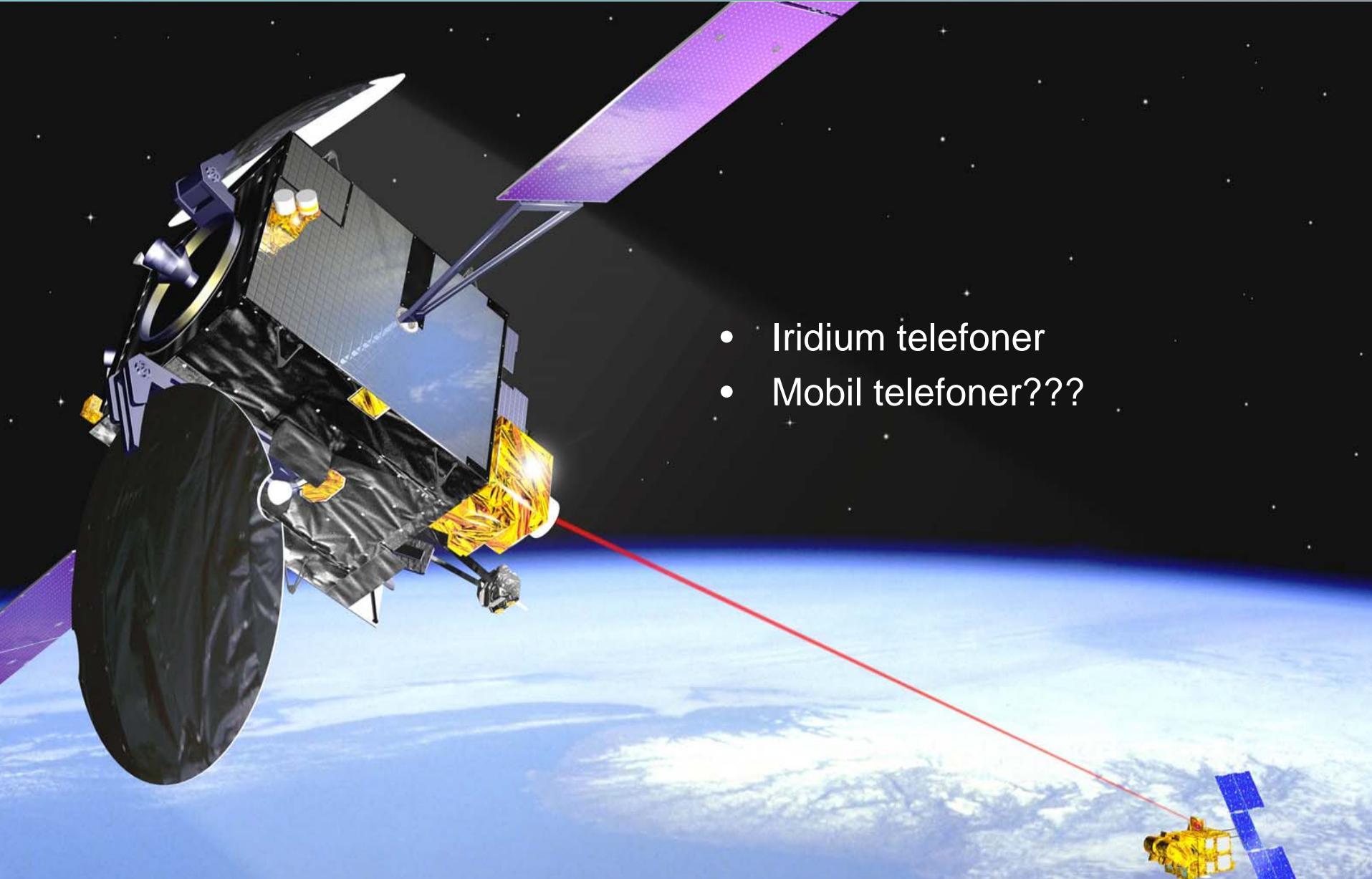










- 
- The image shows a satellite in space with a large black dish antenna and a purple solar panel. A red laser beam originates from the satellite and points towards another satellite in the distance. The Earth's surface is visible in the background.
- Iridium telefoner
  - Mobil telefoner???

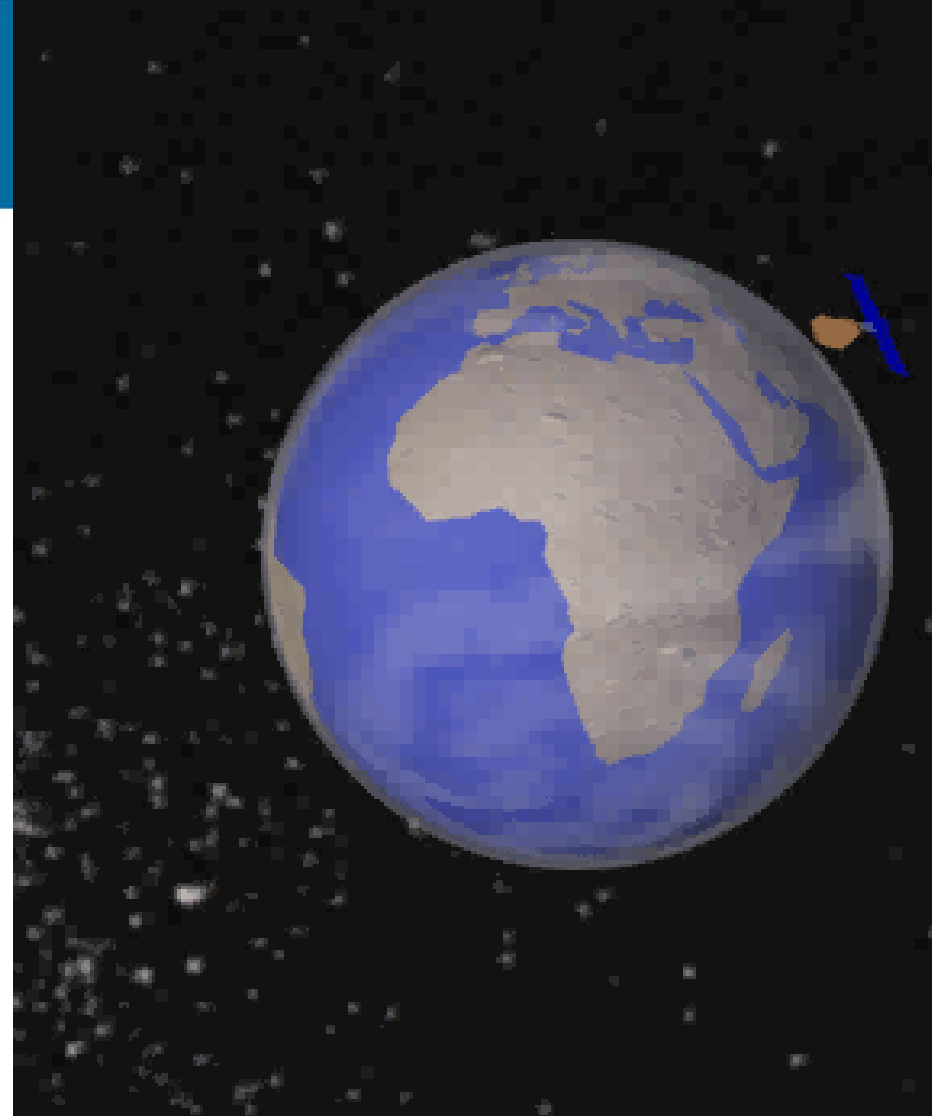






# Jordobservation

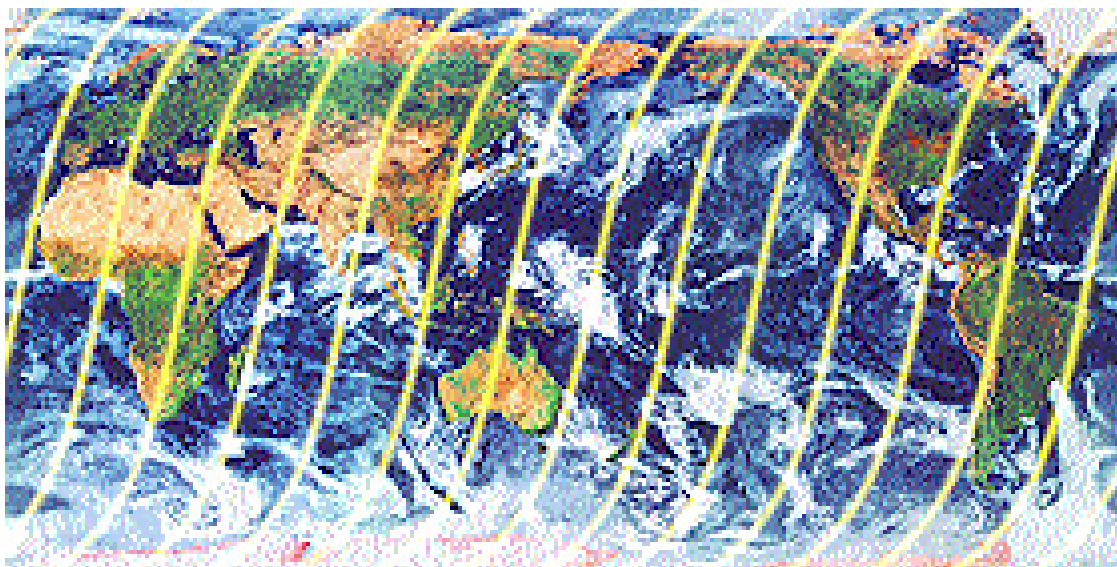
- Jordobservation
- Spion satellitter
- Klima ændringer
- Jordskælv / Tsunami etc
  
- HØJ RUMLIG OPLØSNING



**500-1000 km fra jorden**

# Jordobservation - Begrænsninger

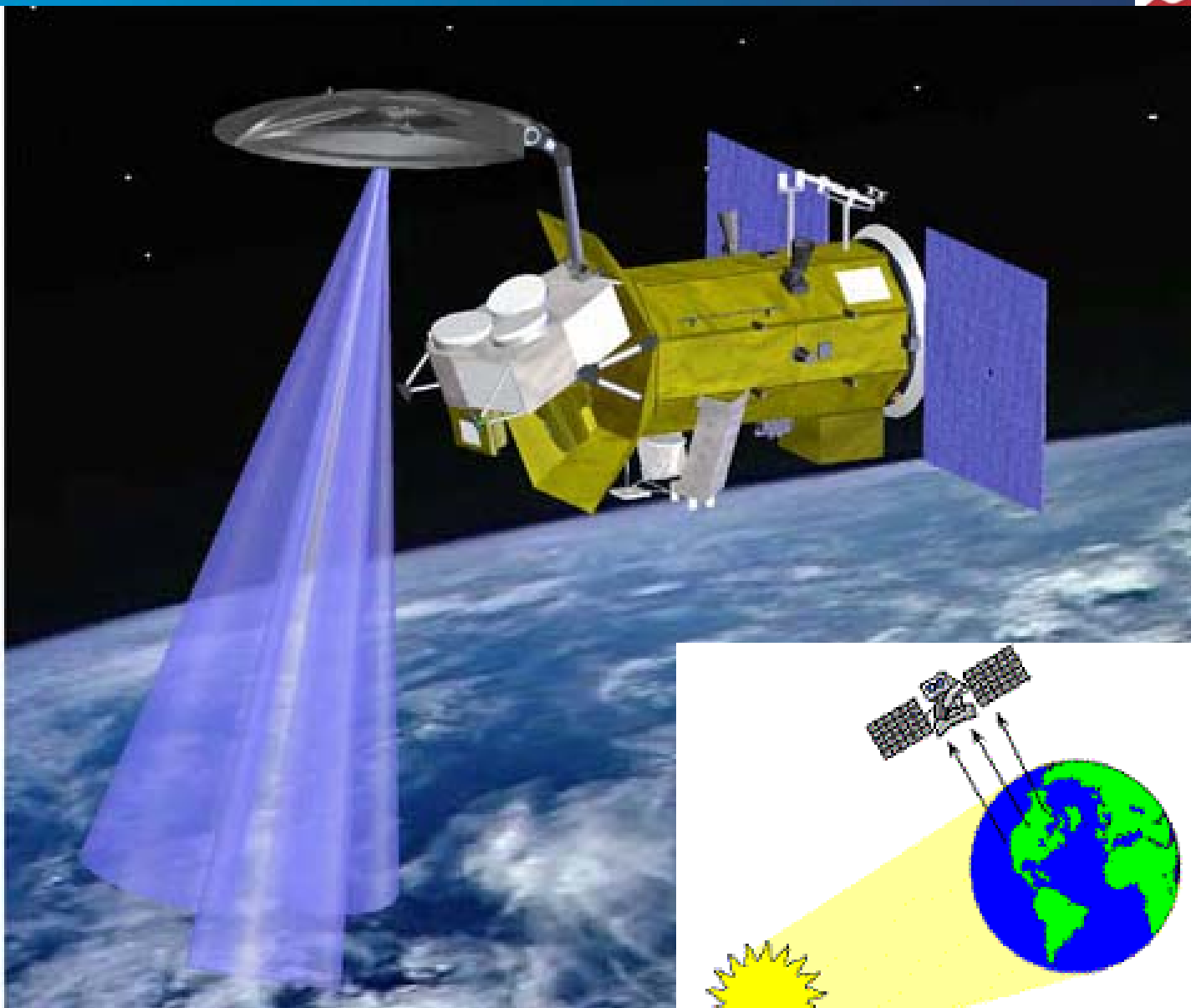
- Faste baner – Typisk repeat 10-40 Dage
- Billeder ikke altid i Nadir.
- Man kan ikke følge personer / hændelser .
- Vinkelbegrænsning
- Ser ikke gennem Skyer.







*Ser på reflekteret lys fra solen*





# Hvad Ser Satellitter

- Billed dannende satellitter (Landsat, Spot, Ikonos, Quickbird )

Ny teknik giver højere opløsning.

1990

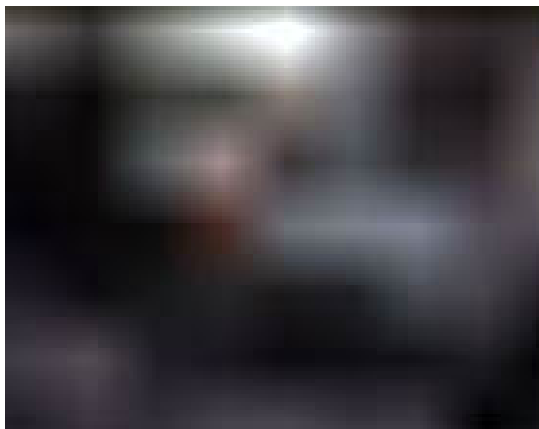
1995

2005

LANDSAT – 15 m

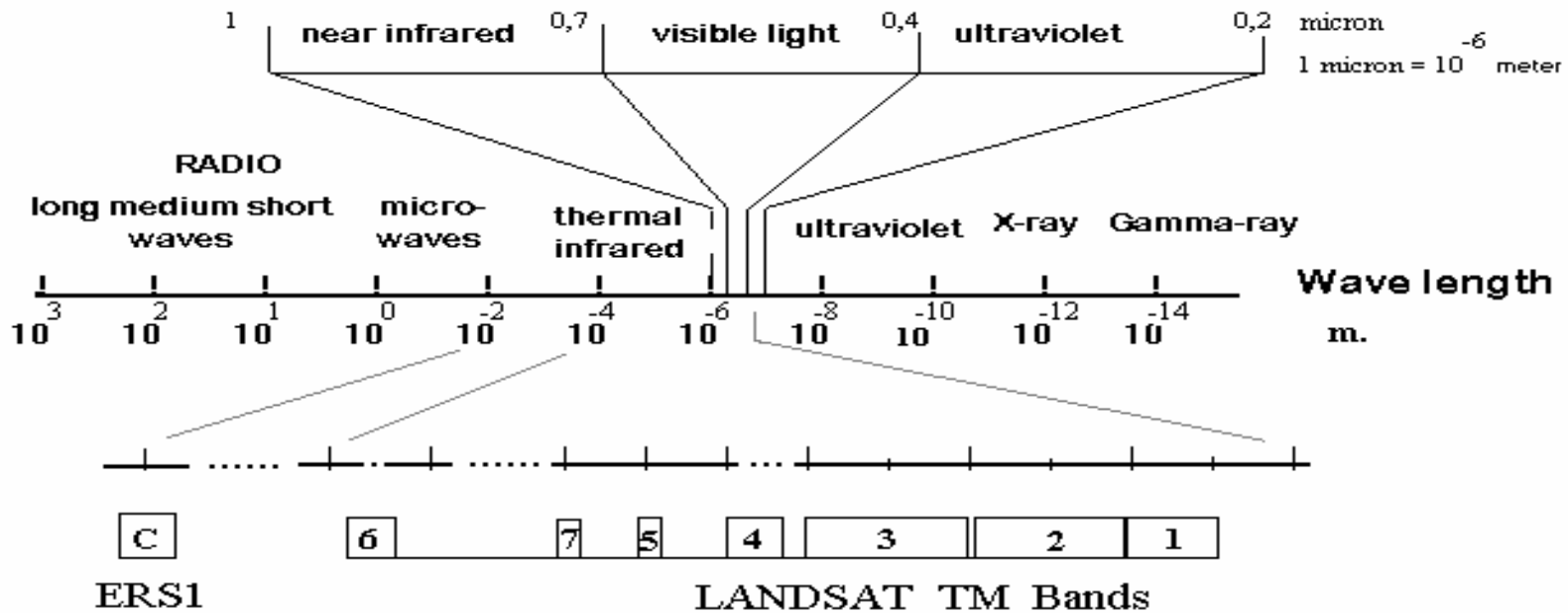
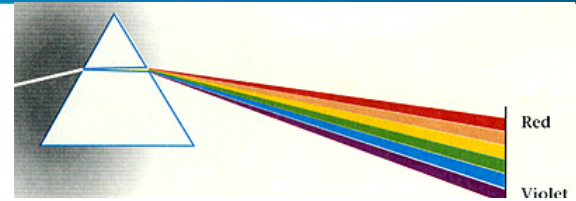
SPOT – 5 m.

IKONOS - 1 m.

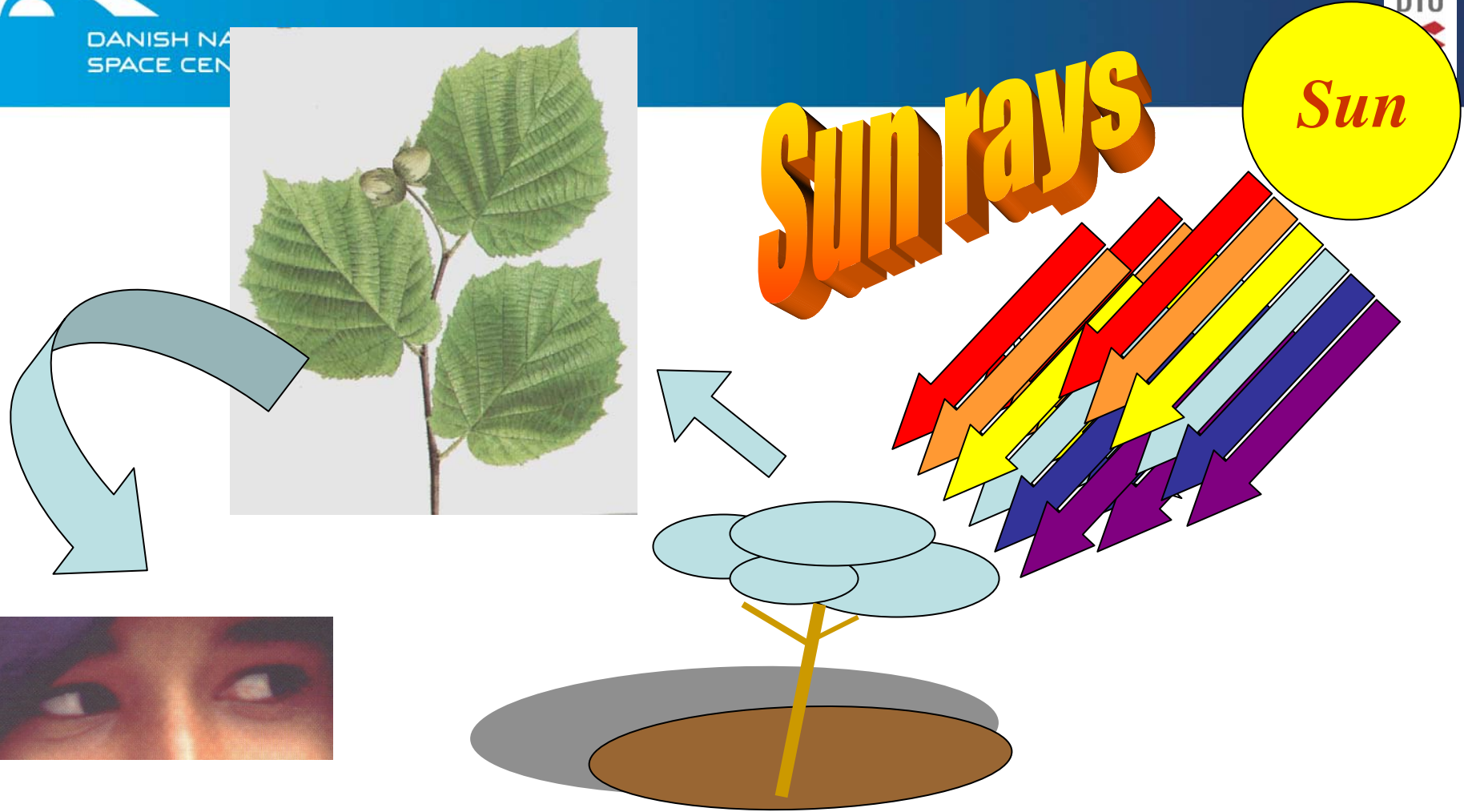




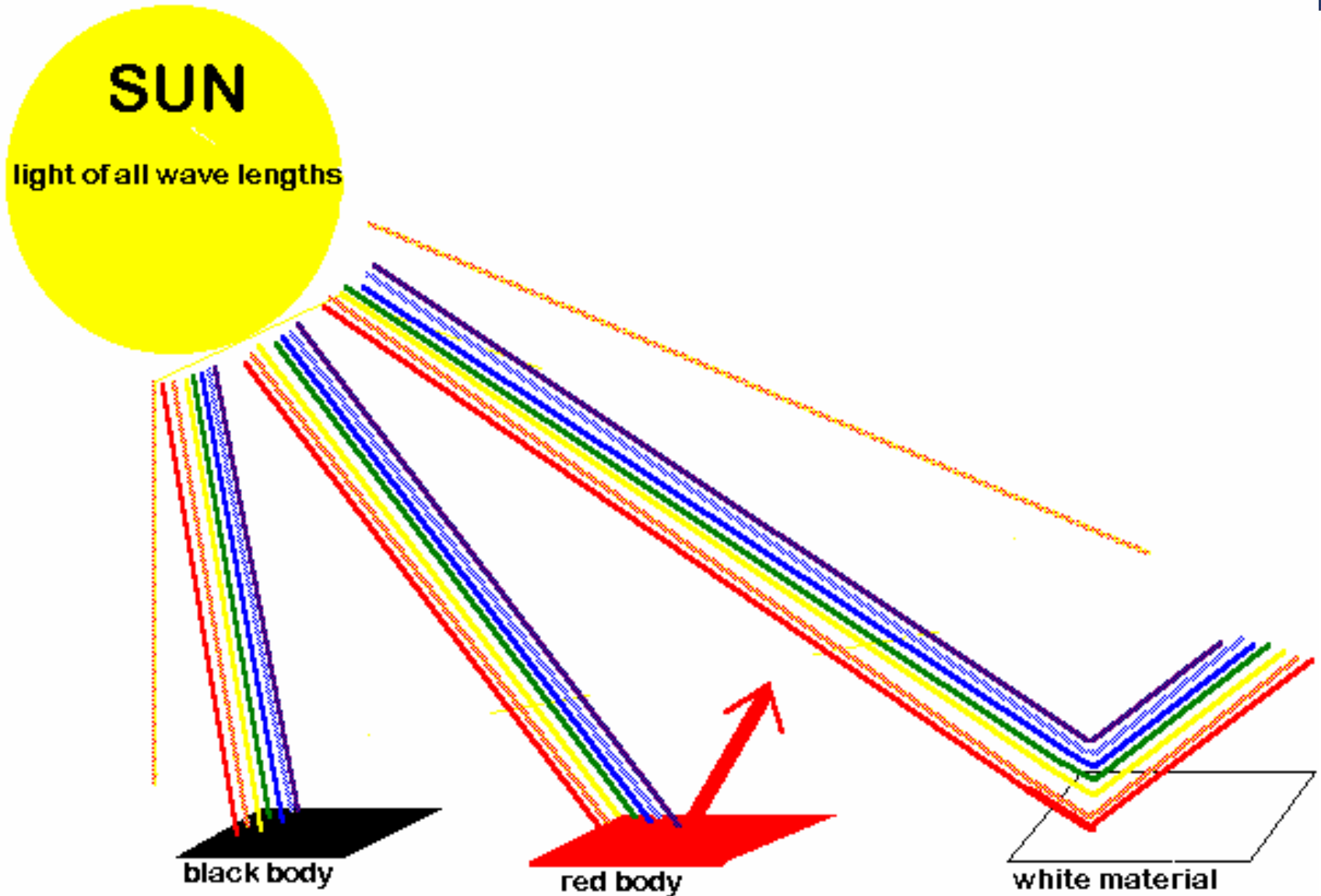
# Multikanal billeder



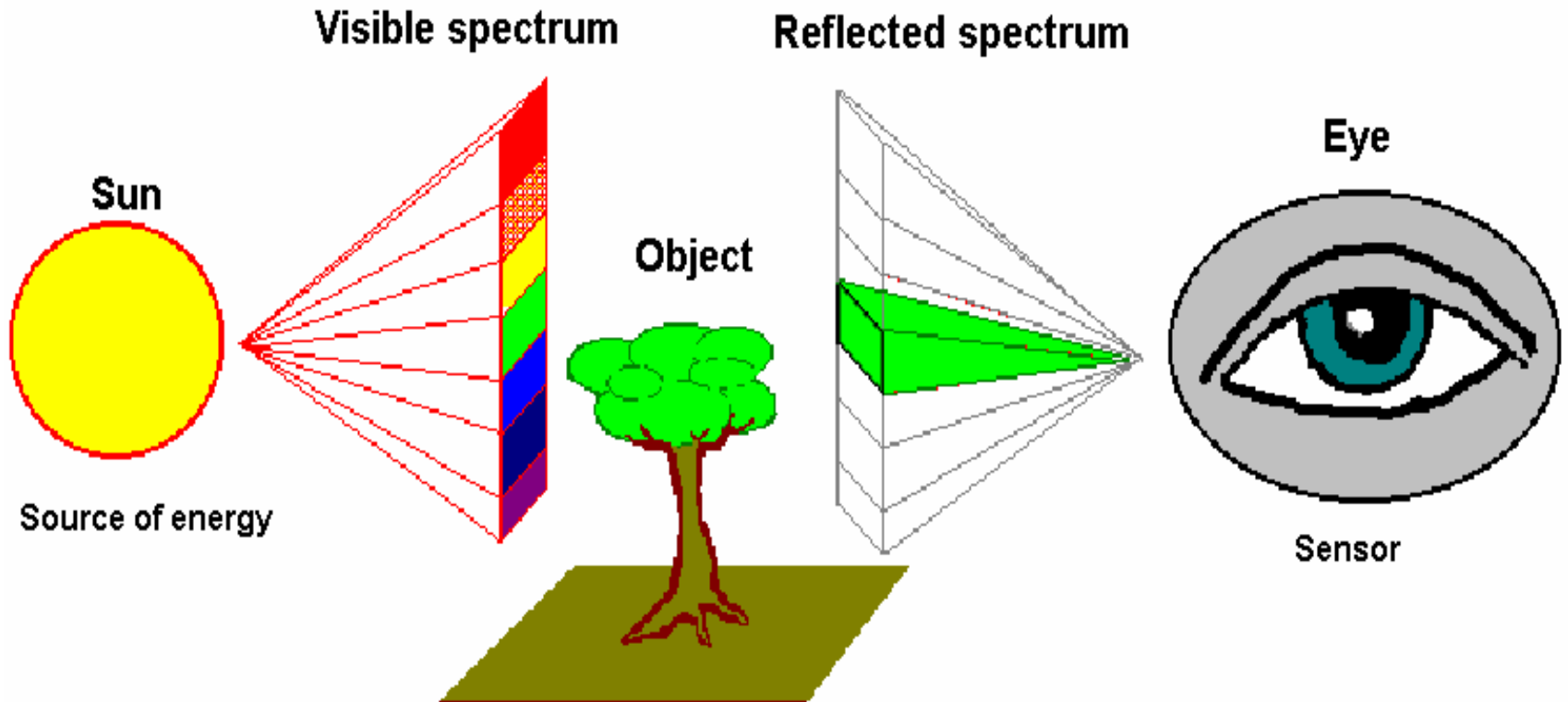
*Landsat optager i 7 kanaler – herunder en rød, grøn og blå men også to infra-røde*



**Vegetation absorberer det blå og røde lys men reflekterer det grønne lys.**



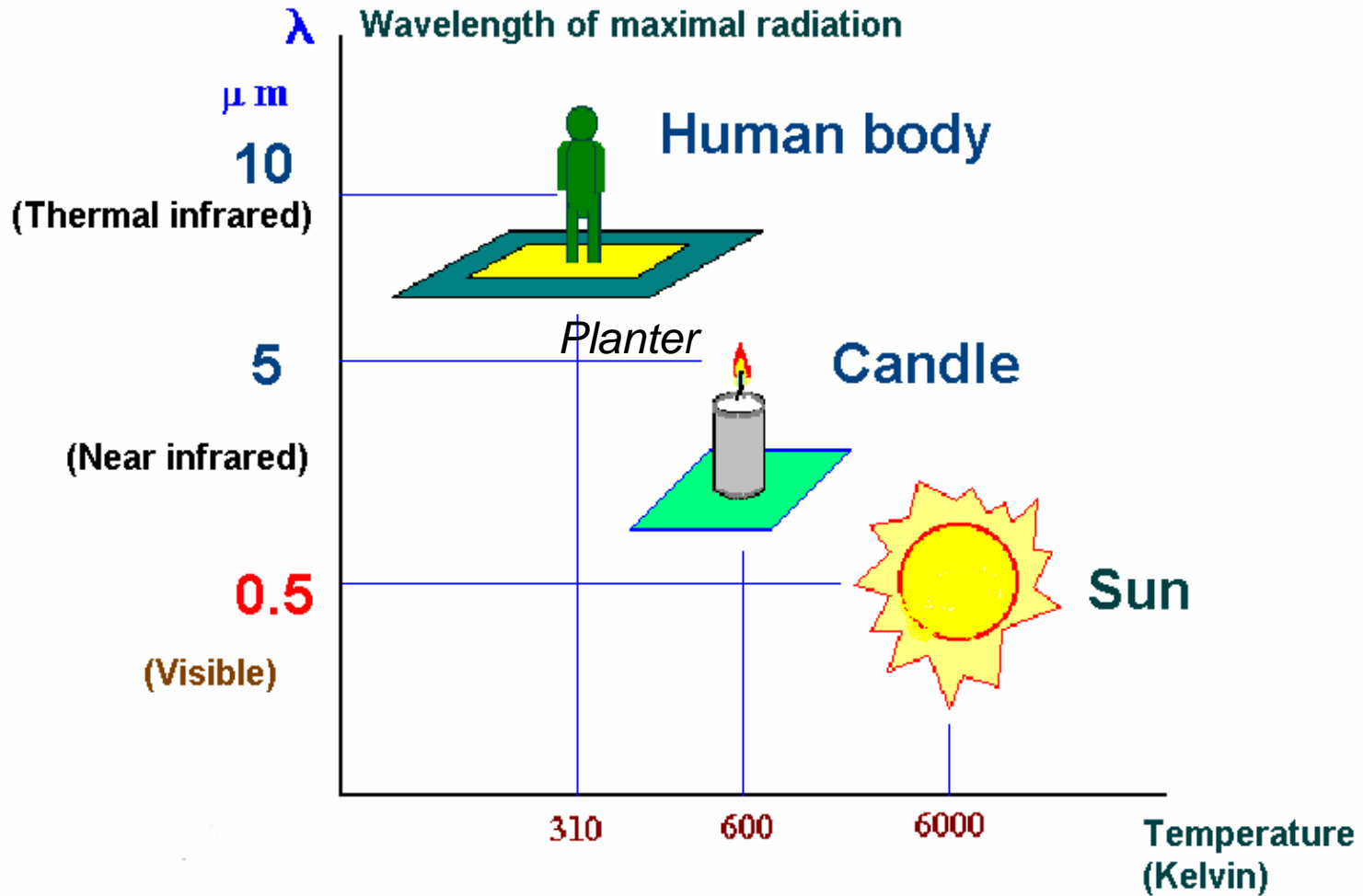
# Reflection of colours



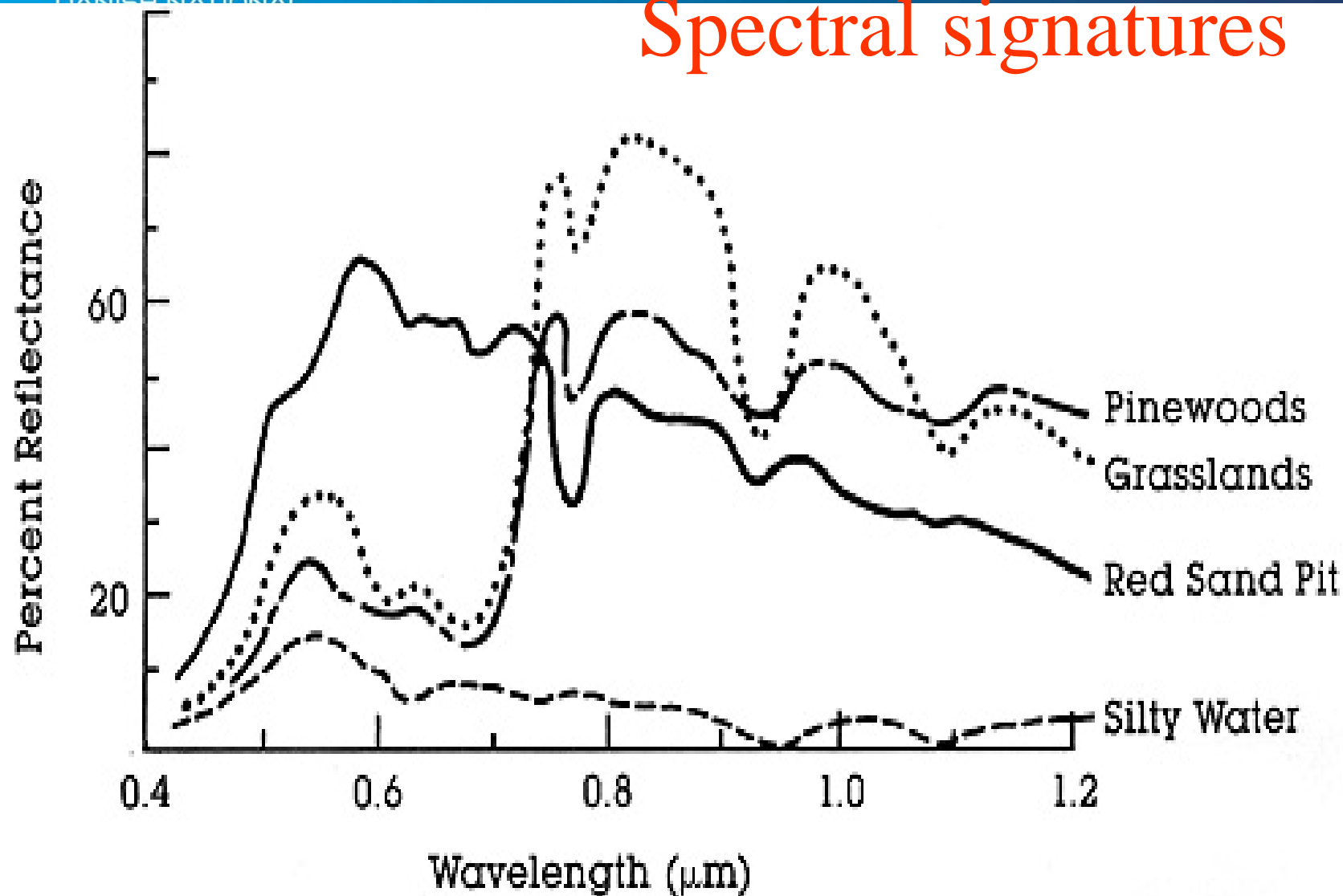
E. L.



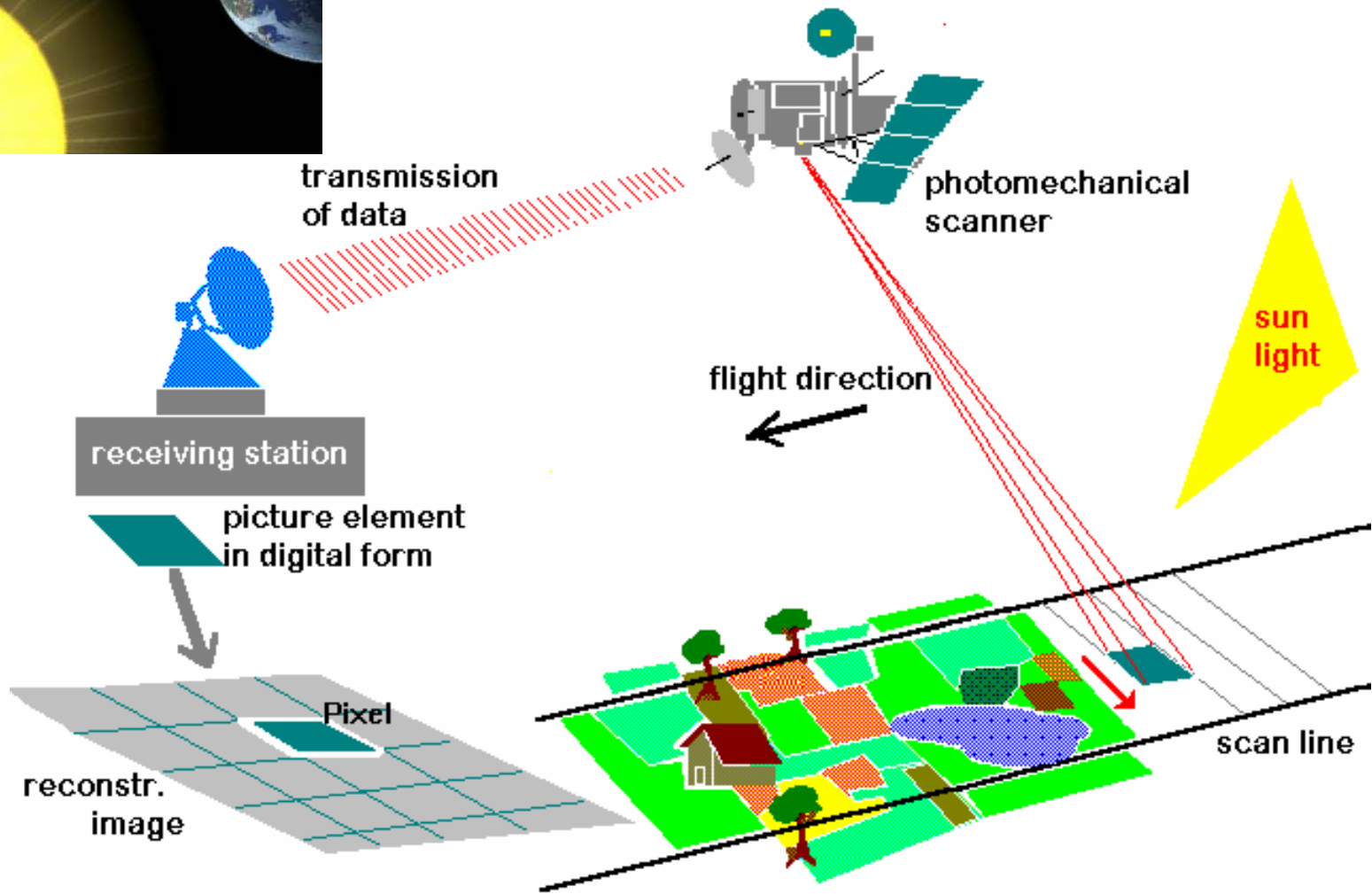
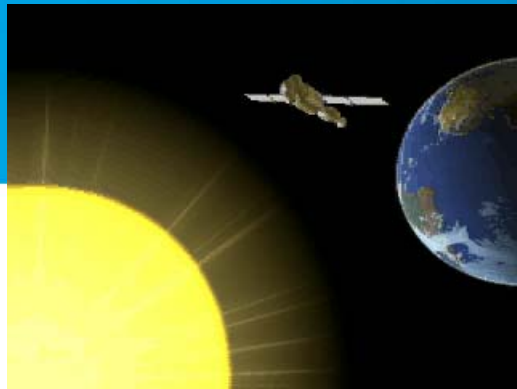
# Radiation of bodies: the real Temperature



# Spectral signatures



# Passive Sensor: Radiometer

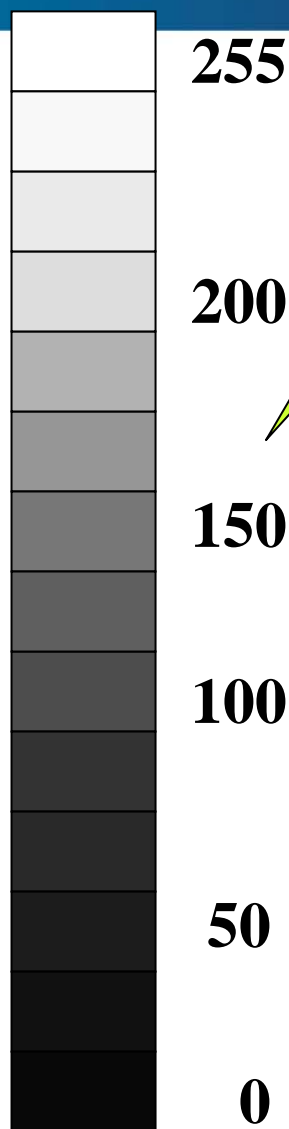




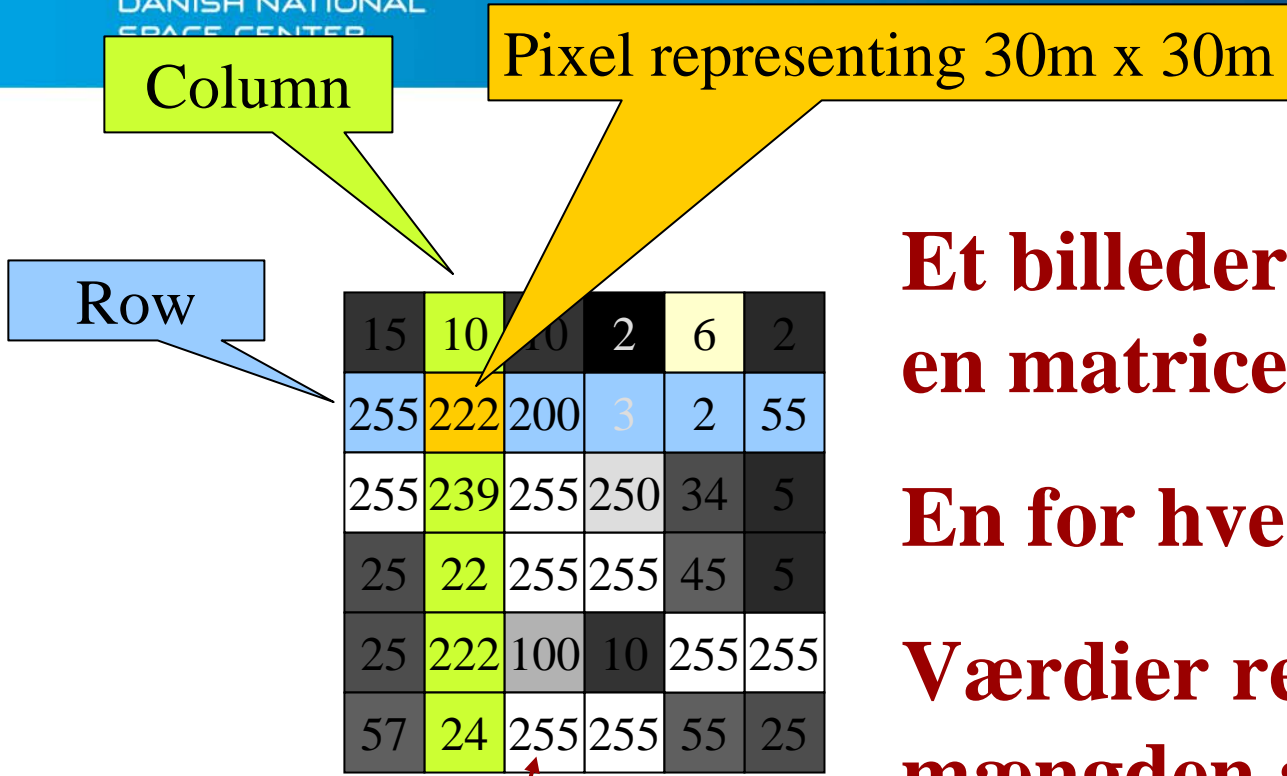


**Satellite billeder sendes i digital form til jorden**

**DVS hver pixel i hver kanal udtrykkes i 256 gråtoner (eller 2048 gråtoner for Ikonos)**



Pixel values



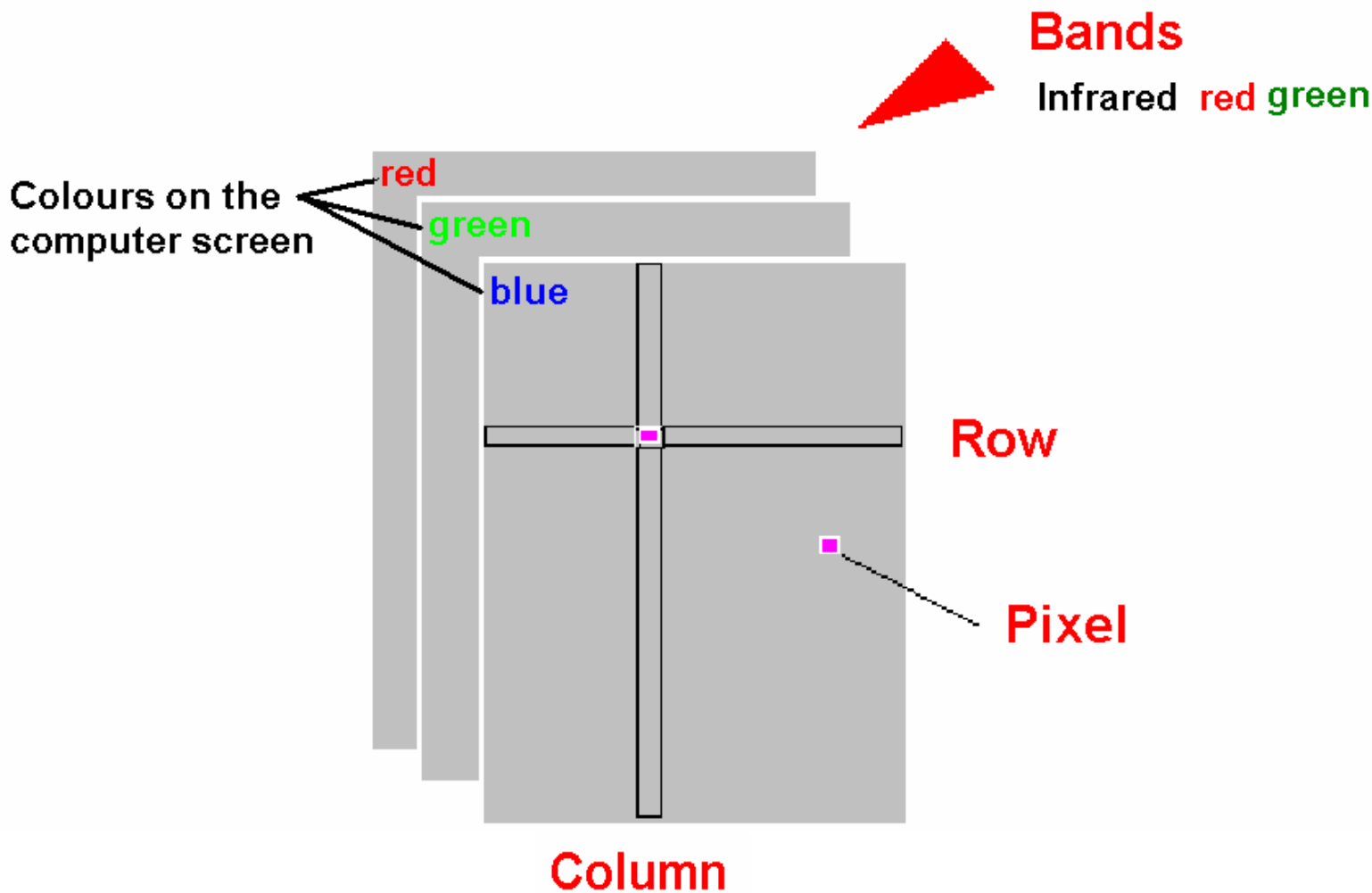
**Et billede er simpelthen en matrice af værdier**

**En for hver kana.**

**Værdier repræsenterer mængden af sollyset reflekteret i et bestemt bånd, og værdier repræsenterer et område (e.g. 30mx30m)**

Radiometric value of the pixel

# Digital colour image





# Farver – Lyngby



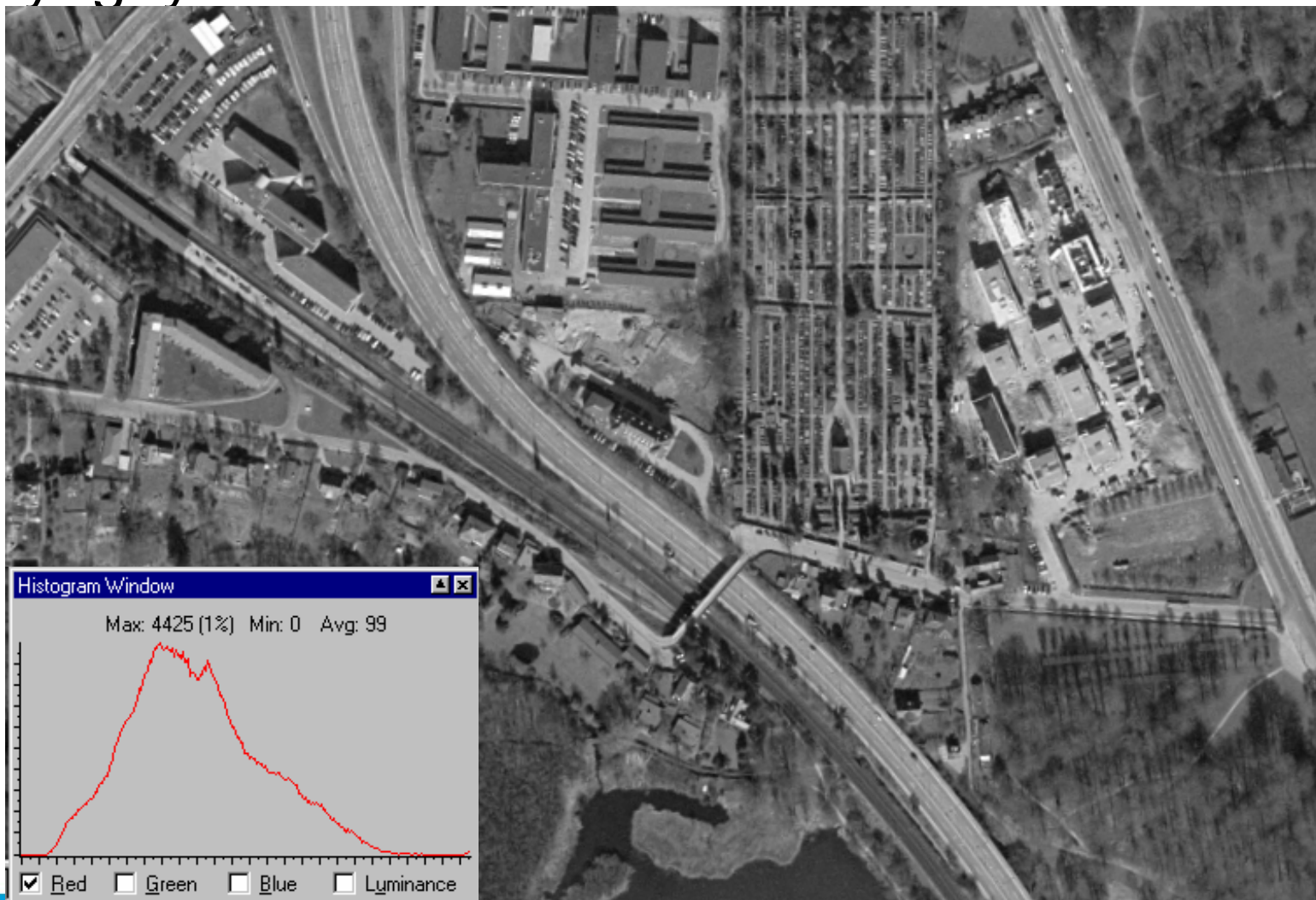


# Lyngby – Blå kanal



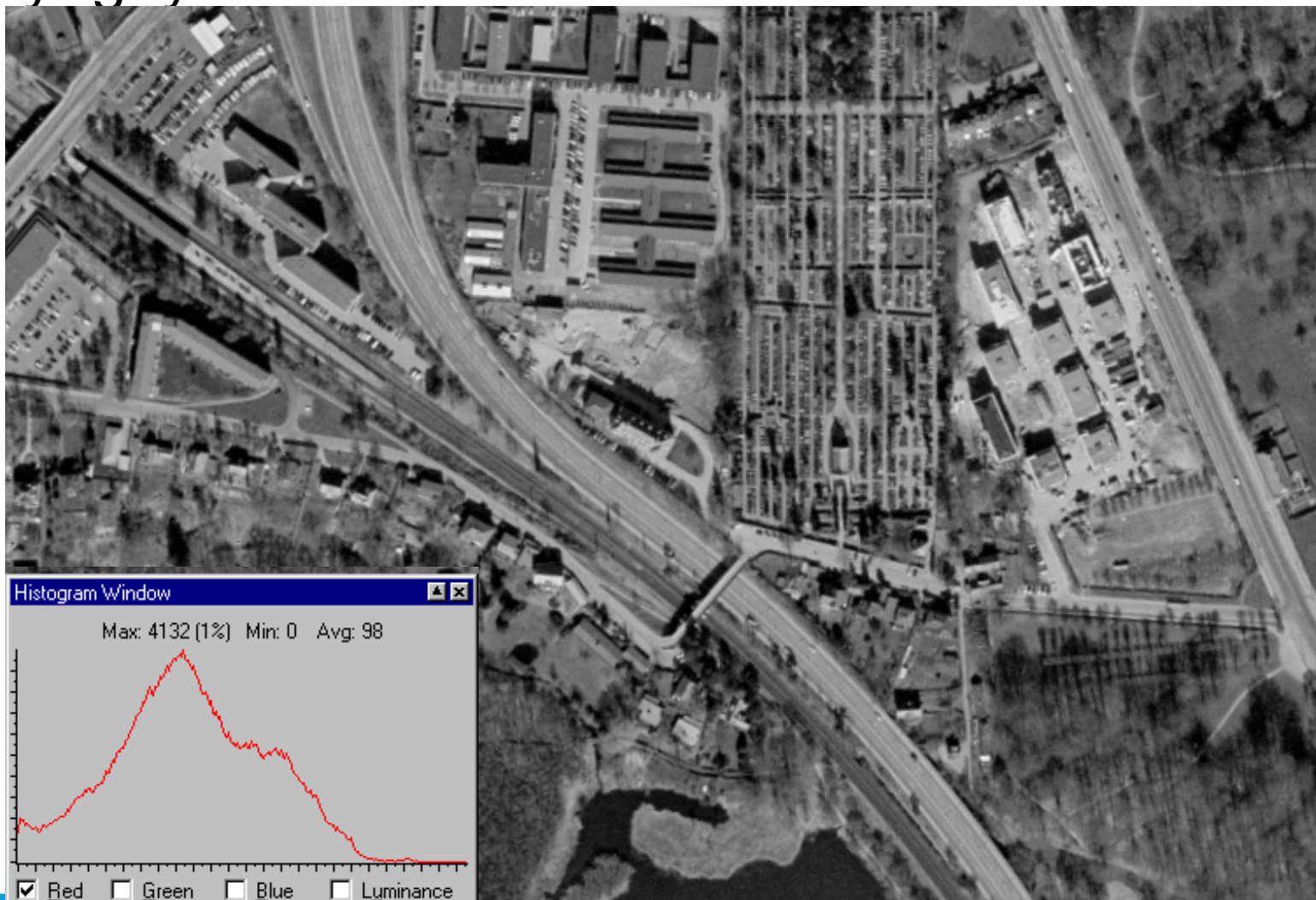


# Lyngby – Grøn Kanal



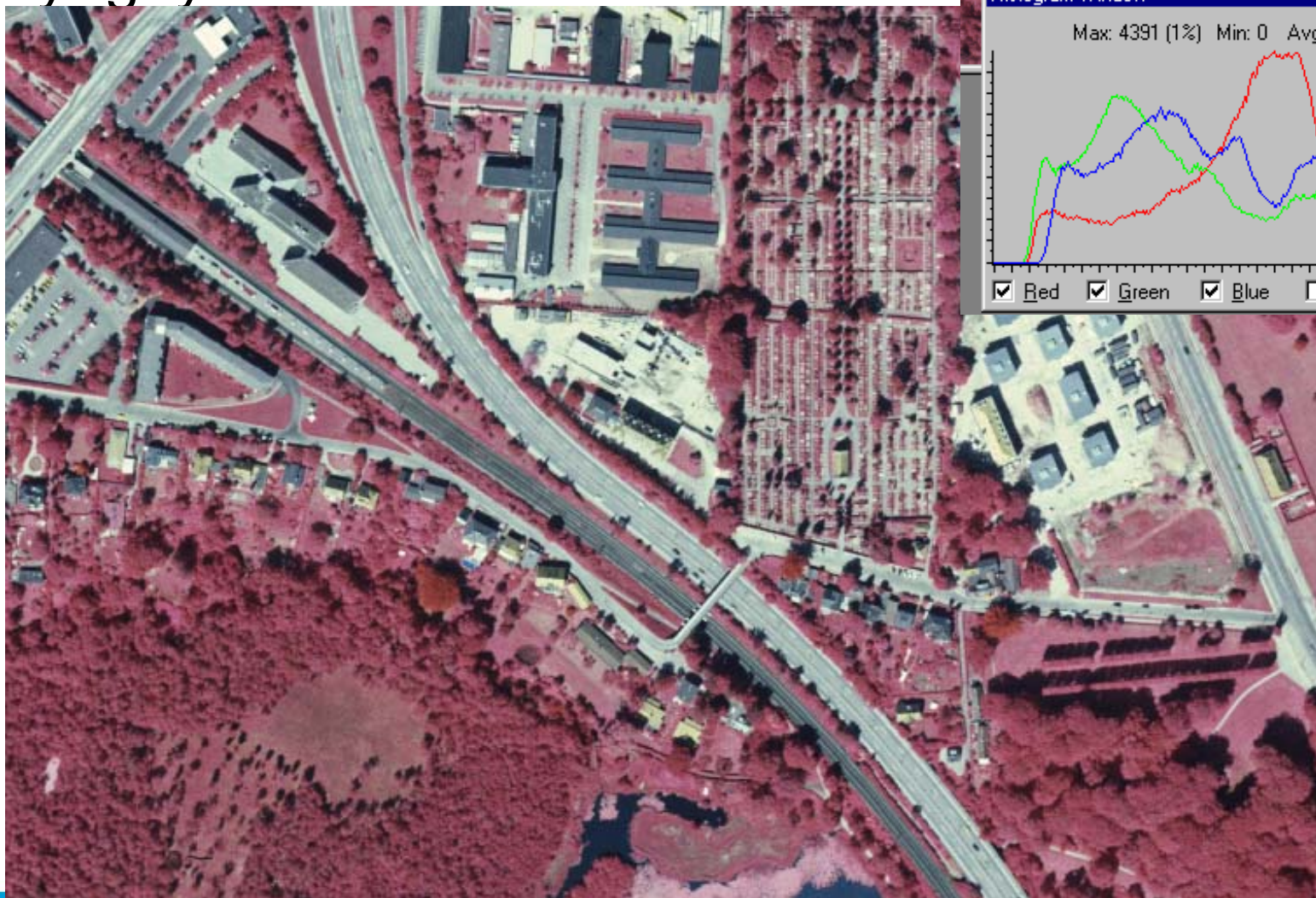


# Lyngby – Rød Kanal





# Lyngby – Nær Infrarødt








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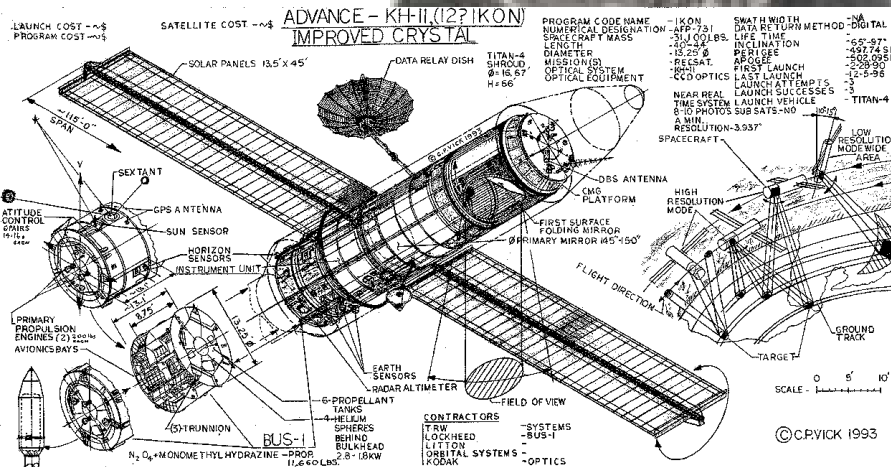
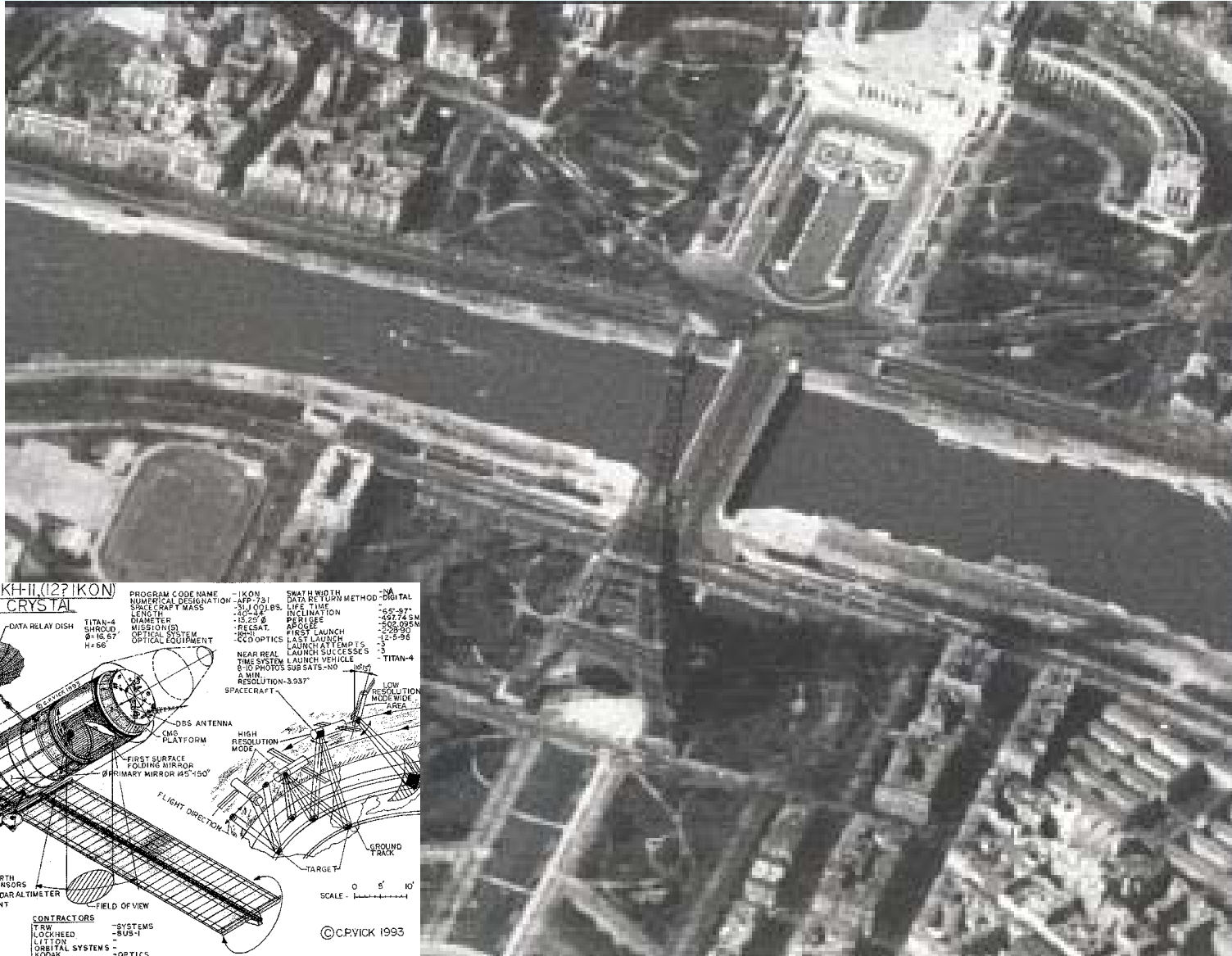
# Hubble Teleskopet / Spion Kameraer





*Vend Hubble mod Jordan  
Det giver 15cm opløsning*

- 1957











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Amagertorv, 1160 København, Danmark

12°34'21\" E 12°34'27\" E 12°34'33\" E 12°34'39\" E 12°34'45\" E 12°34'51\" E 12°34'57\" E 12°35'3\" E 12°35'9\"



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Muligheder:

”Hvor er Holger”

Hvor er ???

