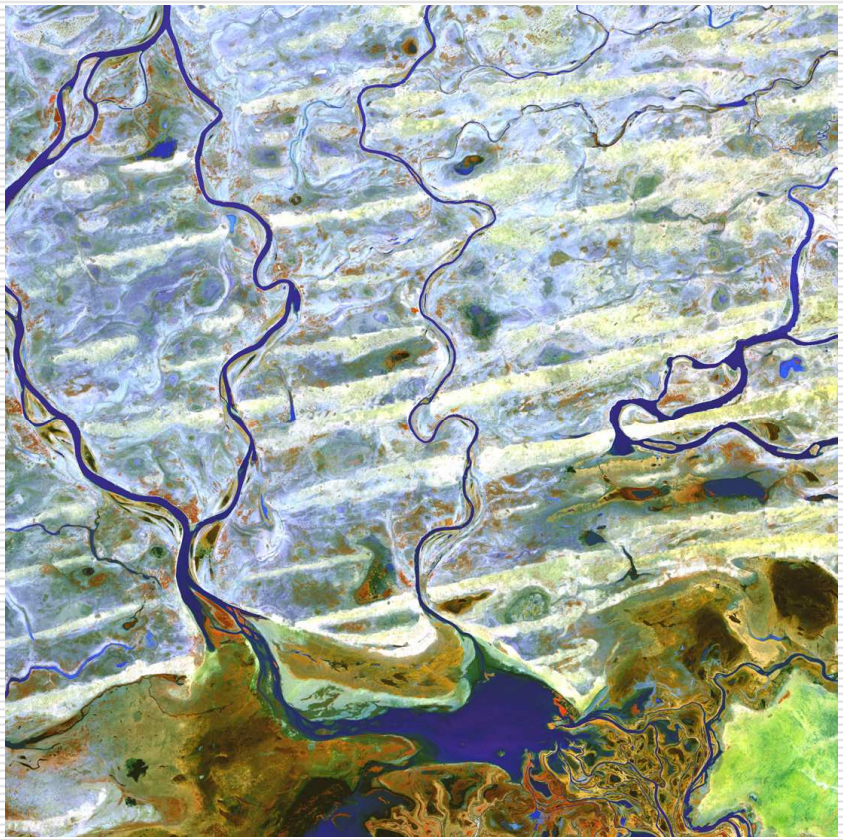
Remote Sensing – an Introduction



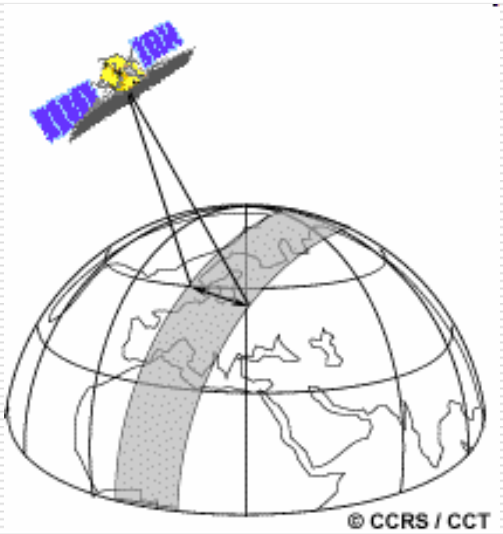
Seminar: Space is the Place

Referenten: Anica Huck &
Michael Schlund

Remote Sensing…

…means the observation of, or gathering information about, a target by a device separated from it by some distance.

Cracknell & Hayes 1991



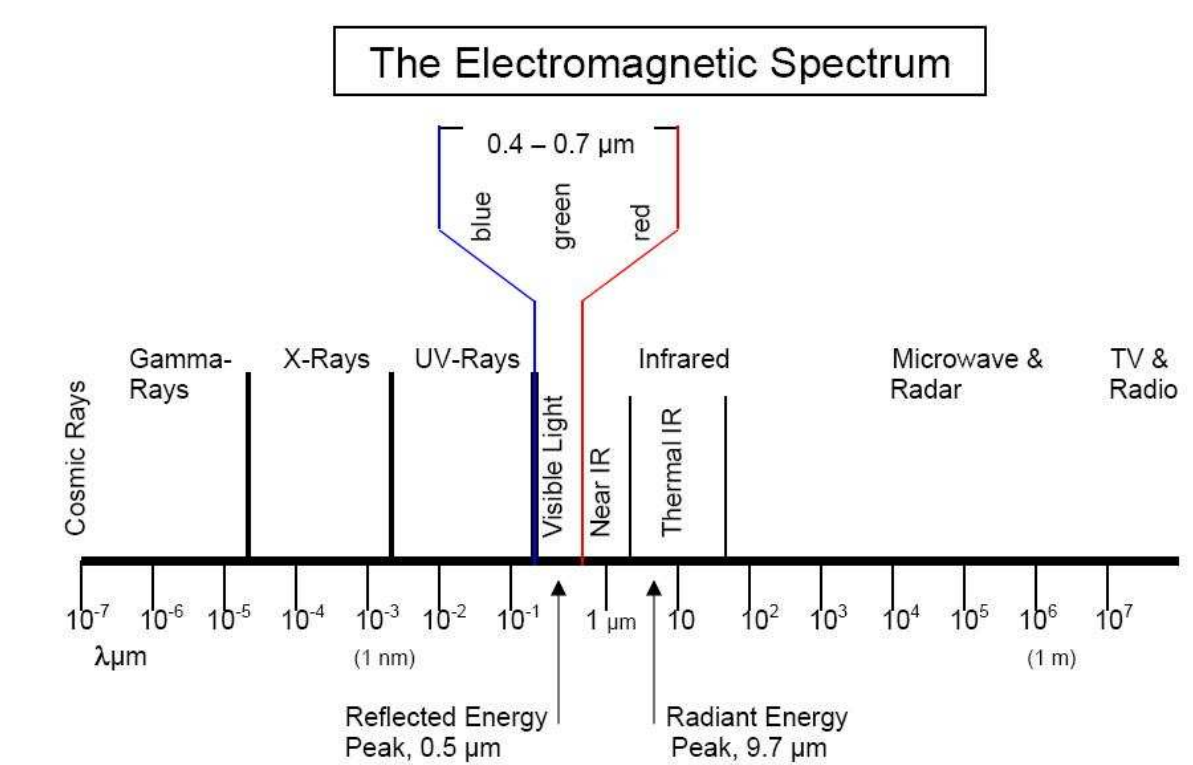
www.zeit.de/online/2007/39/bg-satelliten

http://www.fe-lexikon.info/lexikon-s.htm

Remote Sensing

A major characteristic of an image is the wavelength band it represents.

Richards & Jia 1999



http://www.yale.edu/gsp/gis-files/remote_sensing_intro.pdf

Remote Sensing

Spectral resolution

wavelength width of the different frequency bands recorded

Temporal resolution

frequency of flyovers by the satellite or plane

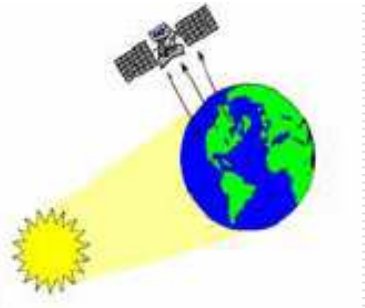
Spatial resolution

size of a pixel that is recorded in a raster image

Radiometric resolution

number of different intensities of radiation the sensor is able to distinguish

Measurements…



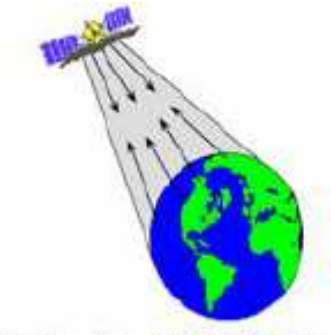
…of the spatial distribution of reflected solar radiation

→external energy source *(passive)*

…of the spatial distribution of the energy emitted by the earth itself

…of the relative return from the earth´s surface of

energy transmitted from the vihicle itself *(active)*



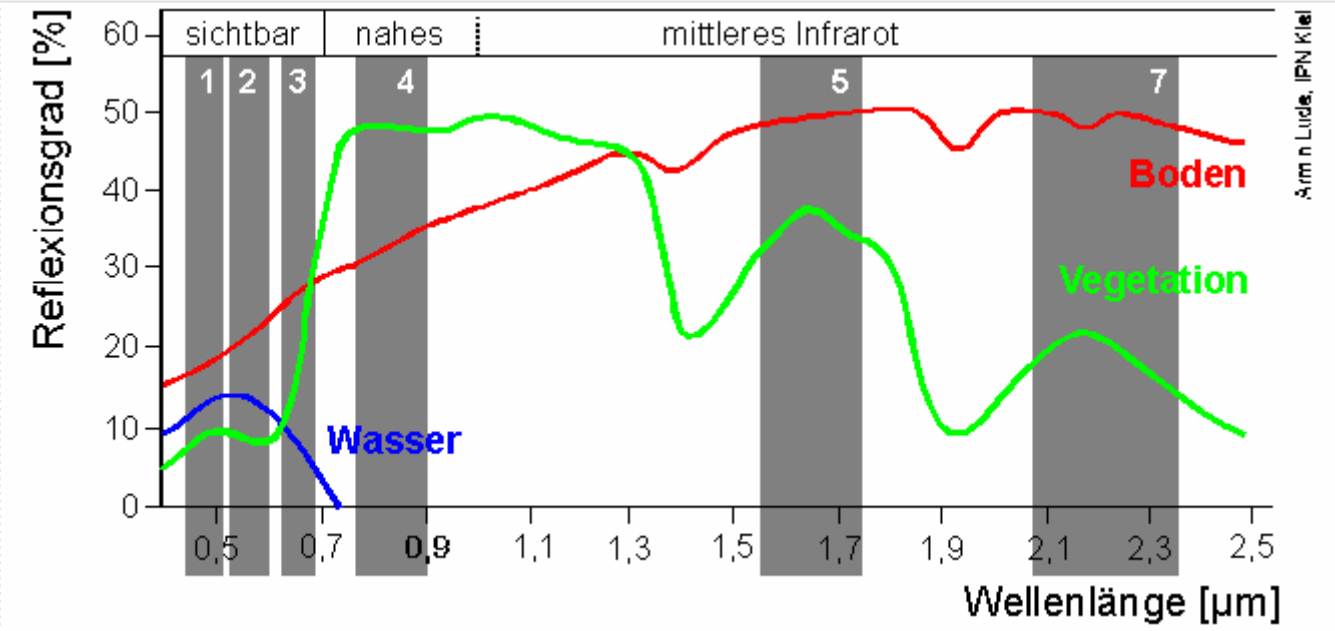
Richards & Jia 1999

[1] http://www.ccrs.nrcan.gc.ca/ccrs/eduref/tutorial/chap1/C1secte.html#1.6 (2002-06-03)

Interaction mechanism

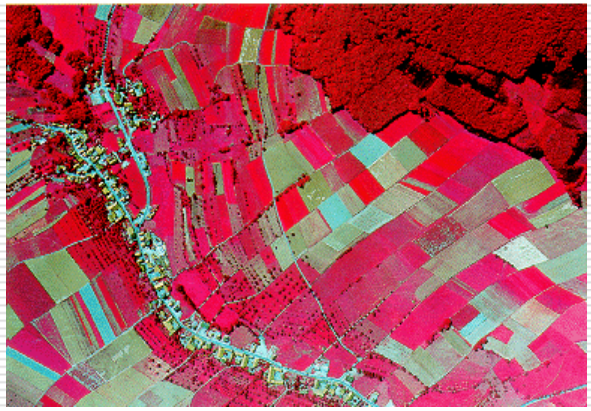
„Significance of diffenrent ranges lies in the interaction mechanism between the electromagnetic radiation and the material being examed“

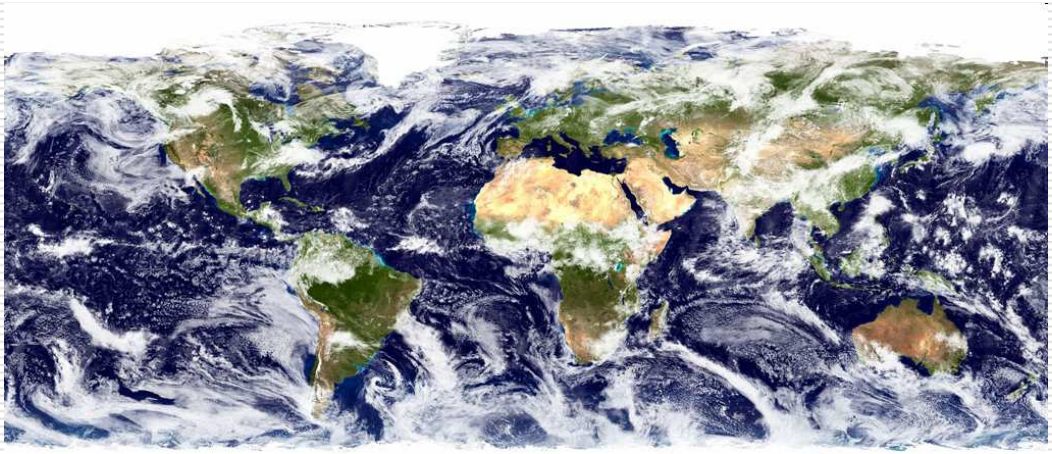
Richards & Jia 1999



http://www.ipn.uni-kiel.de/projekte/a7_2/landsat.htm

Interaction mechanism - Examples

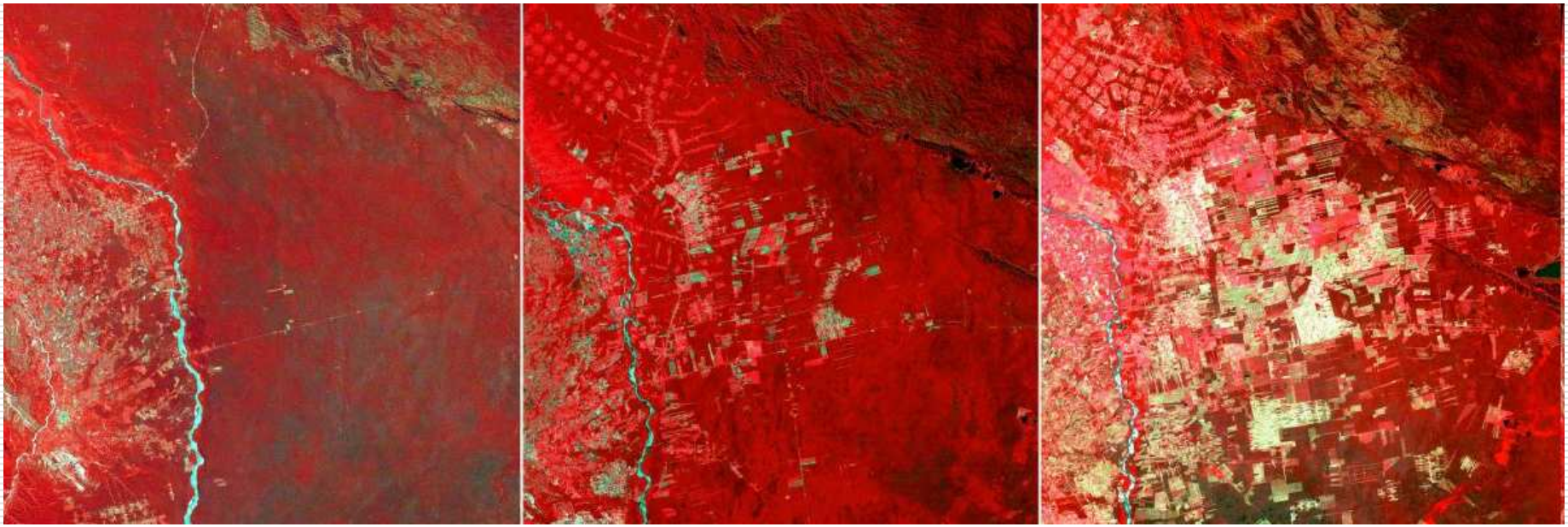




http://ivvgeo.uni-muenster.de/Vorlesung/FE_Script/2_2.html

http://als.wikipedia.org/wiki/Datei:Land_ocean_ice_cloud_1024.jpg

Examples of use - Deforestation



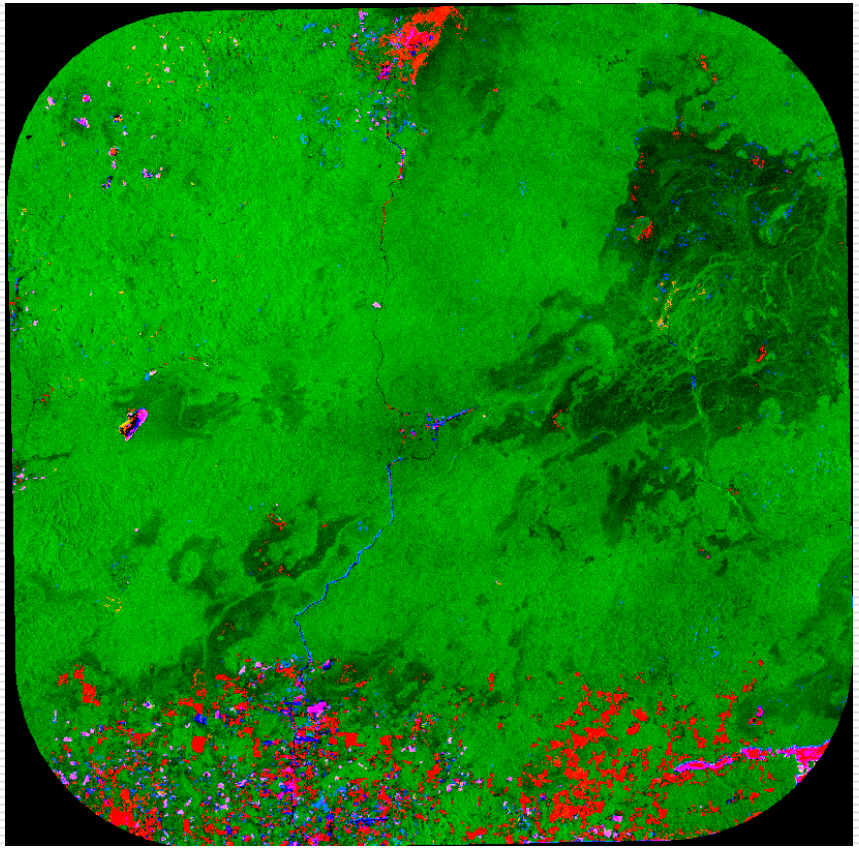
http://news.satimagingcorp.com/2009/10/satellite_image_technology_monitoring_global_warming_and_climate_change_.html

Examples of use - Deforestation

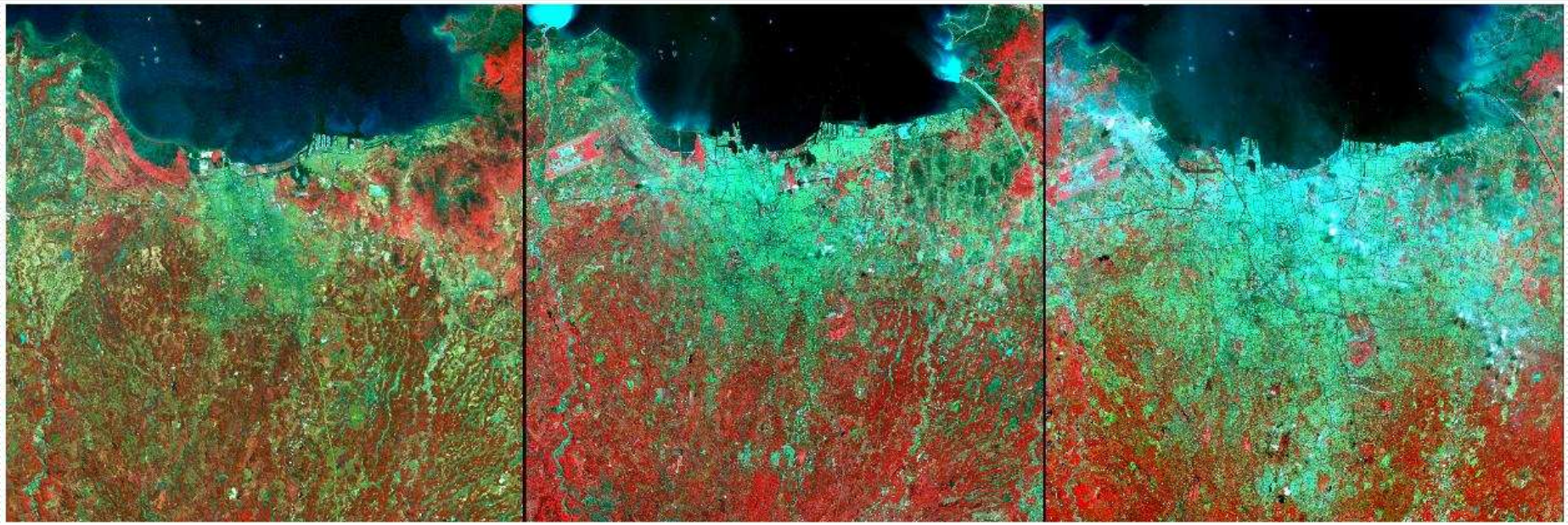
-Ratios

→NDVI = (band 4 – band 3)/
(band 4 + band 3)

-Color space transformations



Examples of use – Urban growth



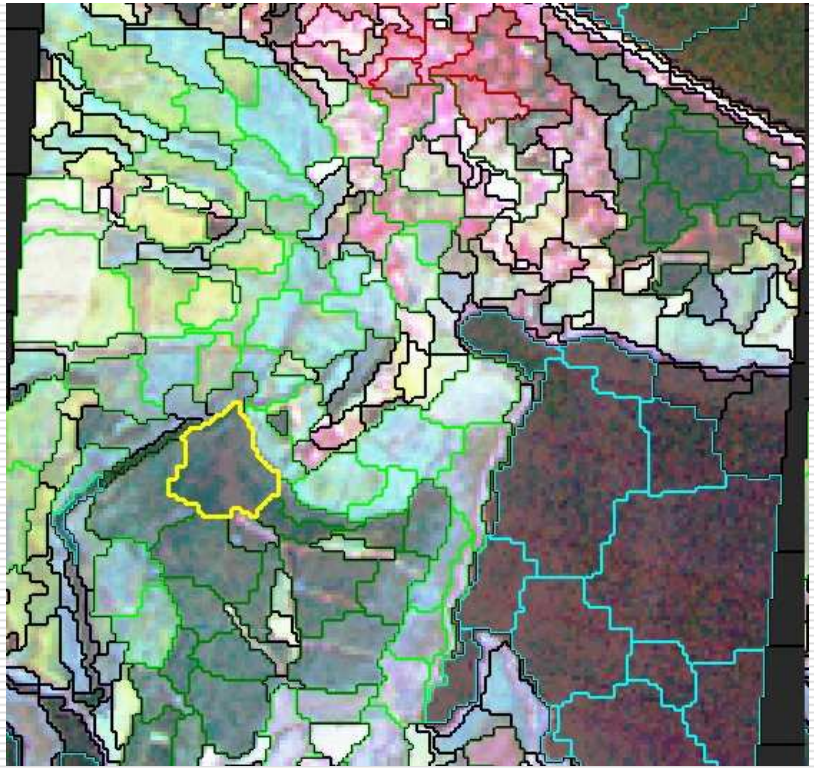
http://earthobservatory.nasa.gov/IOTD/view.php?id=5693

Examples of use – Urban growth

-Segmentations

→Creating objects by:

- shape
- size
- color
- pattern
- shadow
- texture



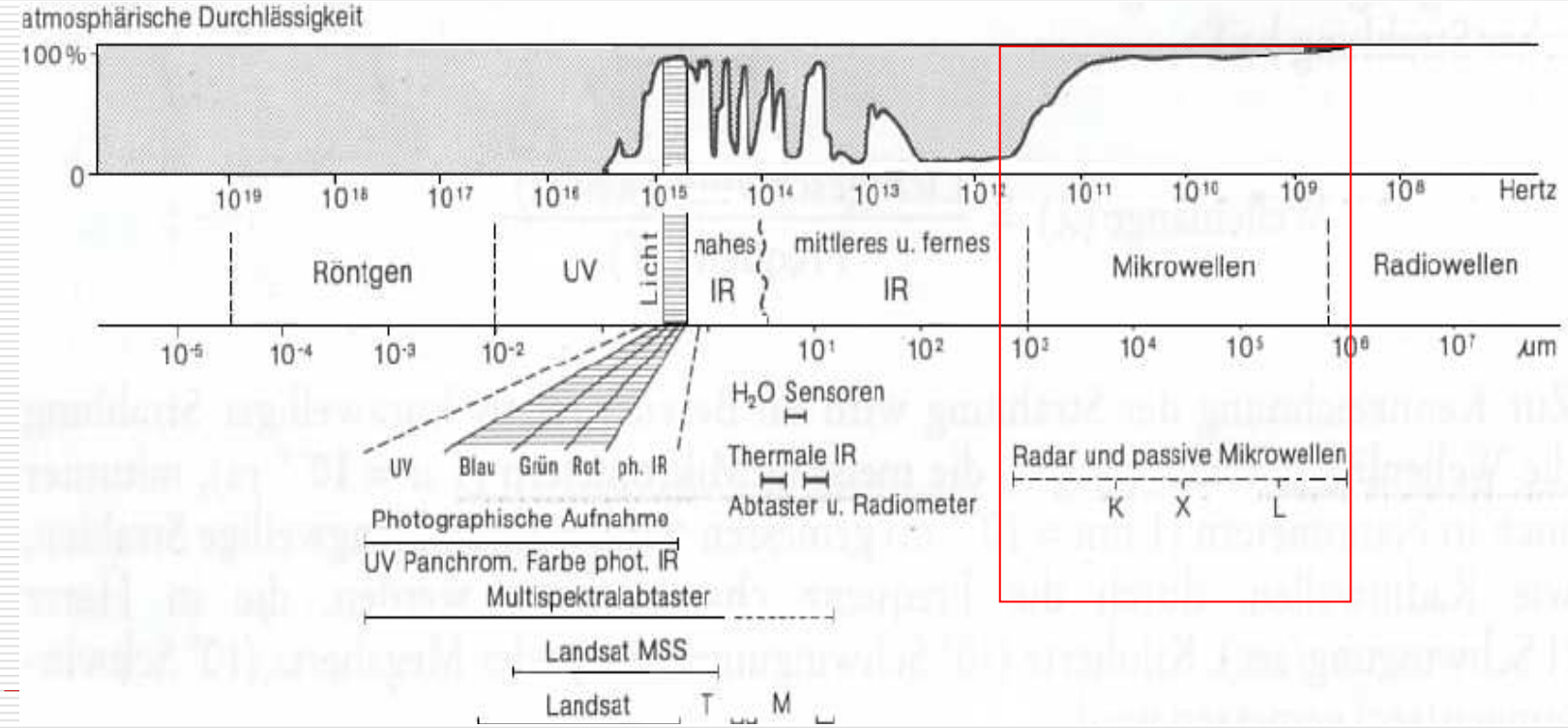
http://ivvgeo.uni-muenster.de/Vorlesung/FE_Script/3_7.html

RADAR Remote Sensing

-RADAR = Radio Detection and Ranging

-Often active system

-Backscatter of Microwaves (1 cm to 1 m)



(Löffler 1994:18)

RADAR Remote Sensing

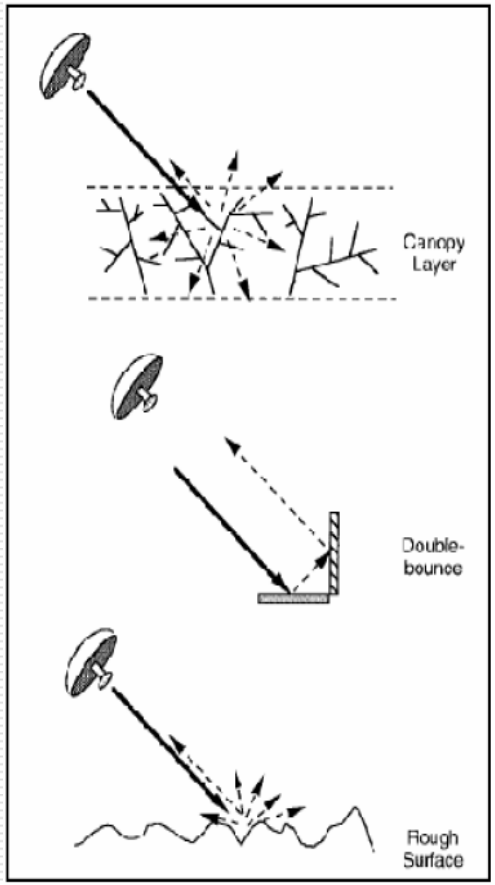
-Can penetrate the surface

-Backscattering depends on:

-Electrical properties (wetness)

-Roughness

-Microwaves are polarized (sending & receiving)



(FREEMAN & DURDEN 1998:963)

RADAR Remote Sensing

(Google Earth 2009)

(E-SAR from Görmin: HH-Polarization)

Advantage / Disadvantage of RADAR RS

-Adavantages

-Active systems→day & night

-Can penetrate atmospheric „troubles" (like clouds)

-Can penetrate the surface (depends on „wetness"→soil moisture)

-Can used for biomass measurements (e.g. Polarization)

-multiple images can create height or elevation models (Interferometry)

→Fields of application:

-Forest monitoring

-Agriculture

-Hydrology

-Cryosphere

-…

Advantage / Disadvantage of RADAR RS

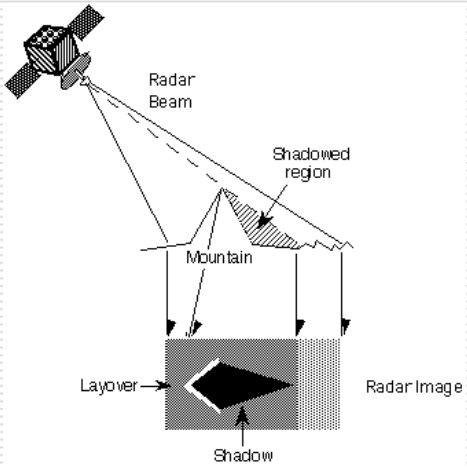
-Disadavantages:

-Speckle(-Noise) (Salt & Pepper-Effect in homogeneous regions)

-Forshortening

-Layover

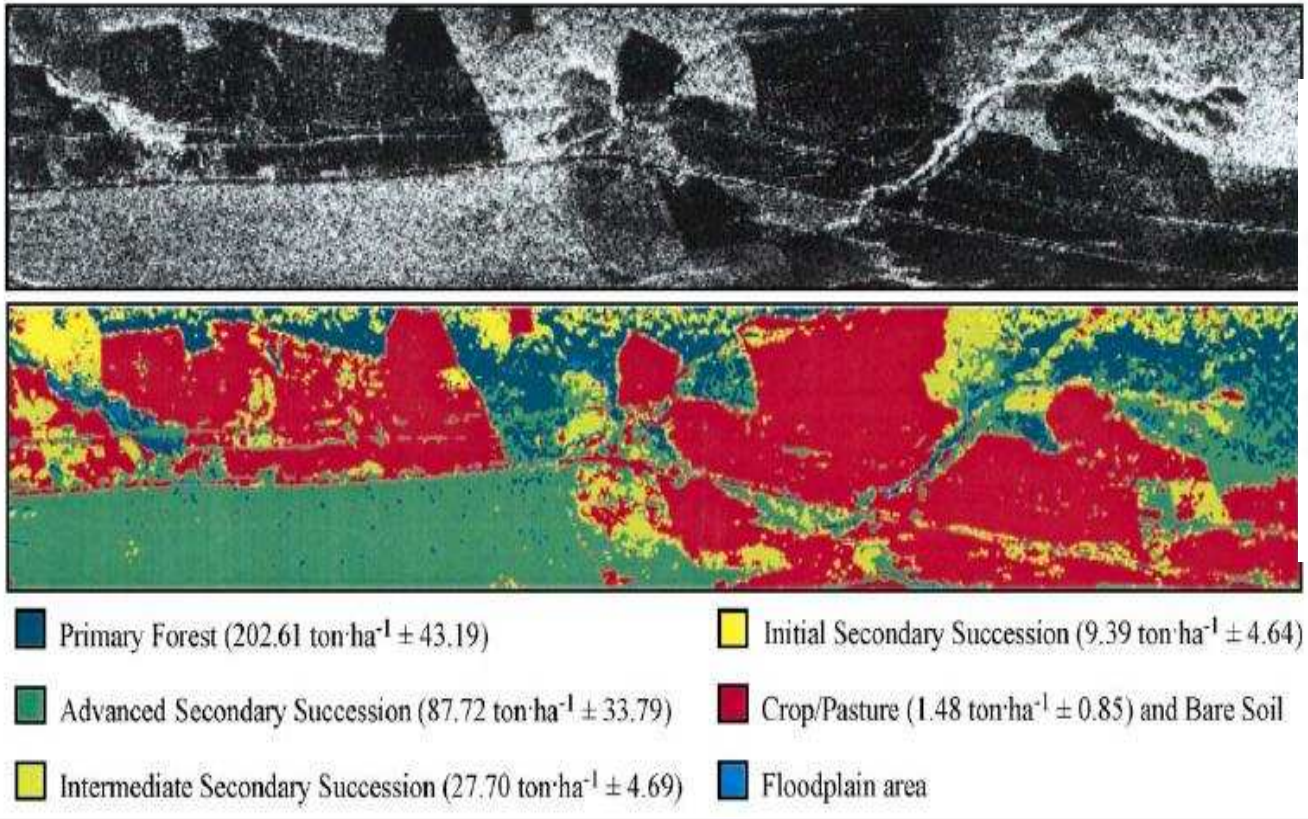
-Radarshadow



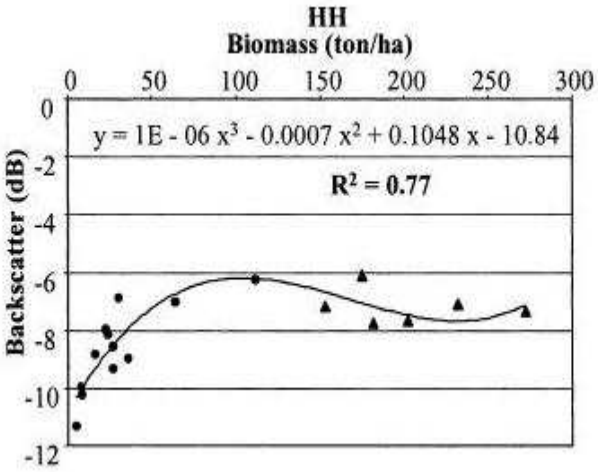
(http://southport.jpl.nasa.gov/cdrom/sirced03/cdrom/DOCUMENT/HTML/TEACHERS/MODULE02/MOD2SECB.HTM)

→Porblems in heterogeneous reliefs

Examples of use – Forest monitoring



(Santos et al. 2003:491)



(Santos et al. 2003:489)

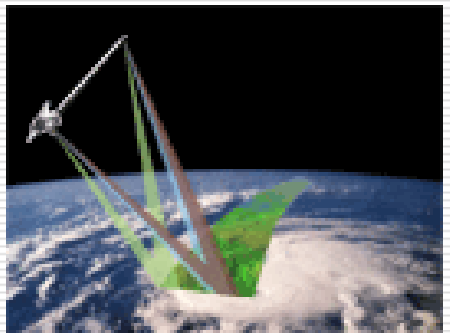
Examples of use – Elevation Models

-Famoust topography mission by radar interferometry is SRTM

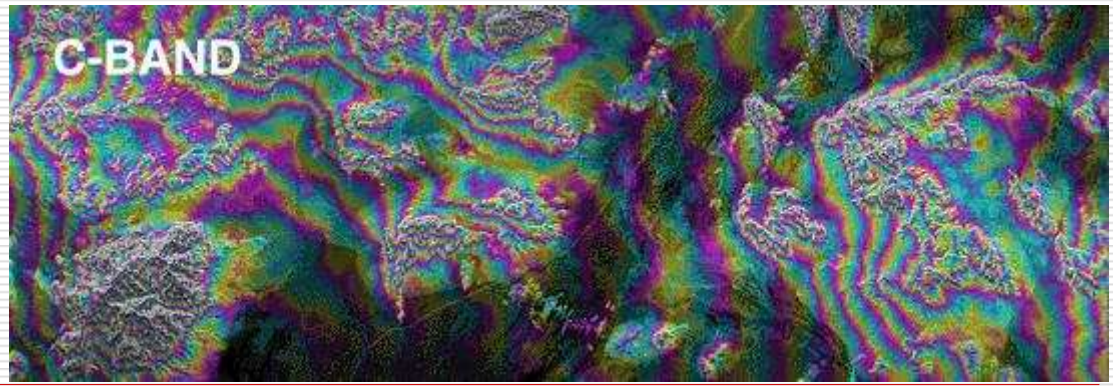
-Goal: 1st dataset of global land elevations

-Interference by combining two data sets

-Information about distance of two antennas
+ differences in reflected signal + flat earth
→accurate elevation



(http://www2.jpl.nasa.gov/srtm/mission.htm)

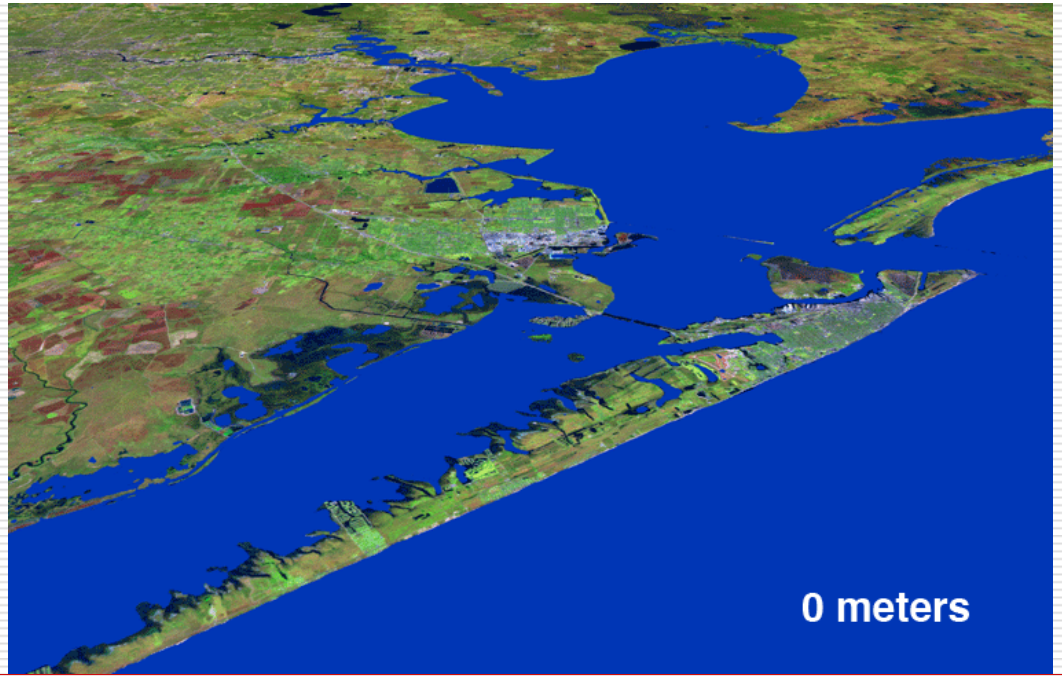


(http://www2.jpl.nasa.gov/srtm/images/bin/sc-irwin.gif)

Examples of use – Elevation Models

Applications & animations by NASA JPL

http://www2.jpl.nasa.gov/srtm/multimed.htm



(http://photojournal.jpl.nasa.gov/archive/PIA06674.gif)

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