PARIS LODRON UNIVERSITÄT SALZBURG

Fachbereich Geoinformatik

Geoinformation und Geokommunikation VU

Vorlesungsteil

Paris-Lodron-University Salzburg
Department of Geoinformatics – Z_GIS

Katharina Wöhs & Johannes Scholz

Department of Geoinformatics – Z_GIS
Paris-Lodron-University Salzburg

katharina.woehs@plus.ac.at; johannes.scholz@plus.ac.at
www.zgis.at || www.johannesscholz.net
@Joe_GISc @Joe_GISc@mastodon.online

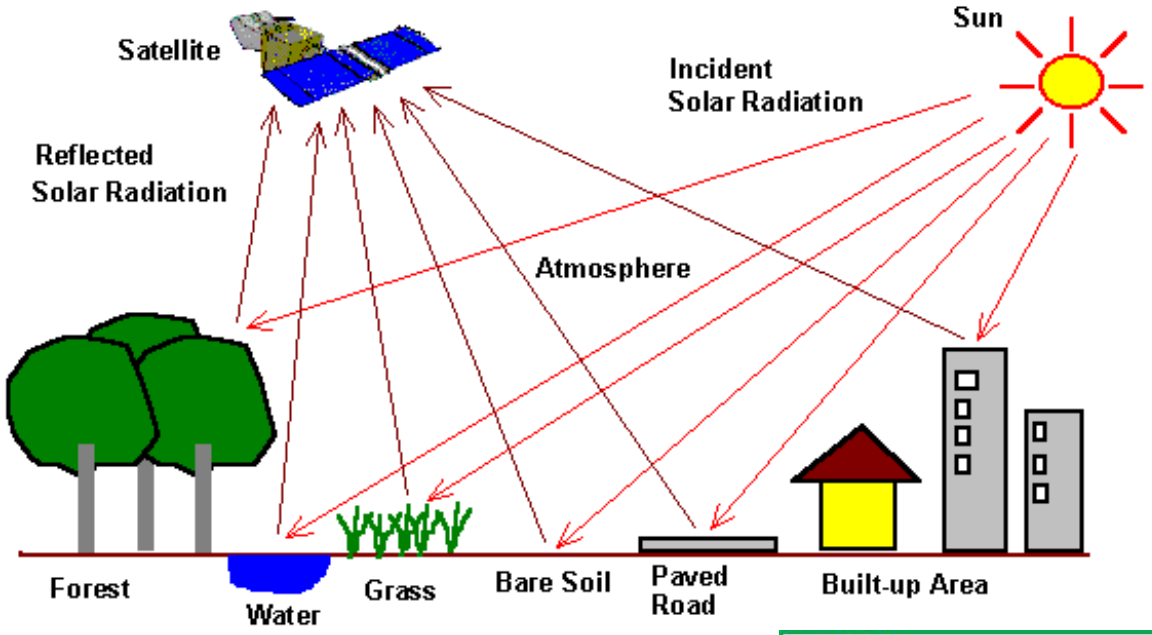
Z_GIS

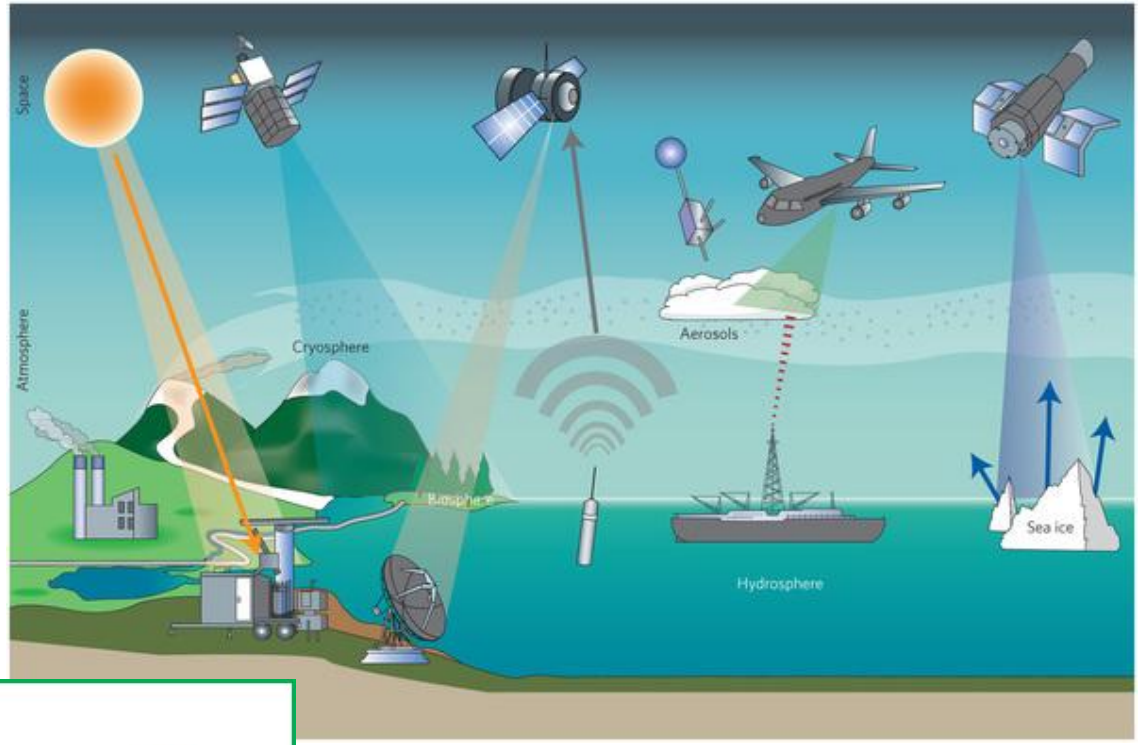
LV Übersicht

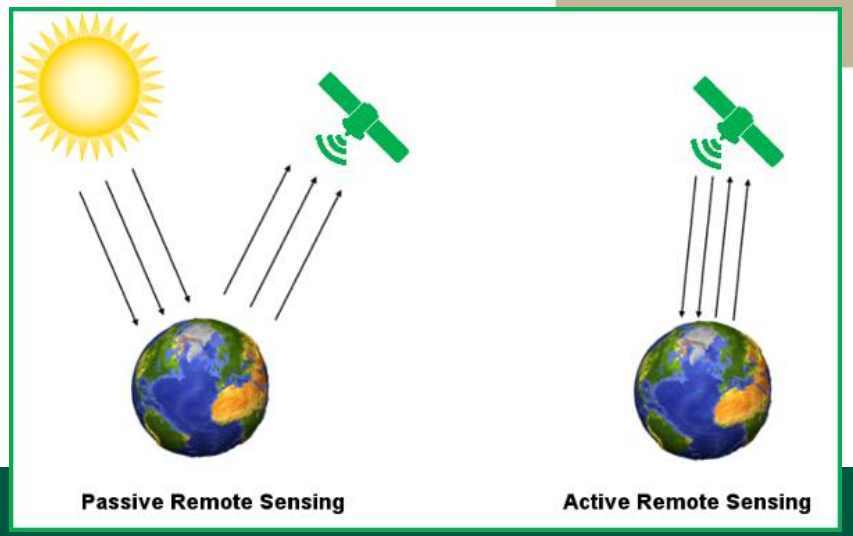
Date	Topic	Nr.	Vortragende
07.10.	Einführung: Karten, Geomedien und Geokommunikation	1	JS (KW)
14.10.	Gestalt der Erde und Gradnetz	2	JS
21.10.	Kartographische Projektionen	3	JS
28.10.	Landeskoordinaten: G-K und UTM	4	KW
04.11.	Topographische Karten und Kartenwerke (incl. Maßstab & Generalisierung)	5	JS
11.11.	Vom Luftbild zum Orthophoto	6	JS
19.11	GISDay 2026 (ACHTUNG!!! Mittwoch)	7	
25.11.	Erdbeobachtung aus Satellitenperspektive	8	JS
02.12.	**Mit 'anderen Augen' - multispektrale Aufnahmen**	**9**	**JS**
09.12.	GNSS – Satellitenpositionierung	10	KW
16.12.	iDEAS:lab	11	
13.01.	Relief und 3D	12	KW
20.01.	Offene Daten(portale) (OGD, SAGIS, ...) / Raumordnung / Katastralmappe - Teil I	13	KW
27.01.	Offene Daten(portale) (OGD, SAGIS, ...) / Raumordnung / Katastralmappe - Teil II	14	KW

Fernerkundung |Multispektrale Aufnahmen | Aktive System

Aktive vs. Passive Systeme







Elektromagnetische Energie

Maßeinheit: Frequenz oder Wellenlänge

$v = \lambda * f$ (Meter, oder Hertz)

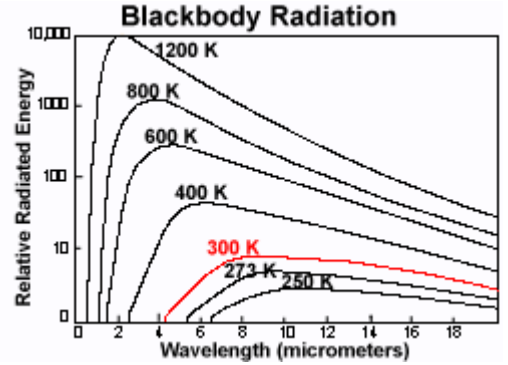
Stefan-Boltzmann

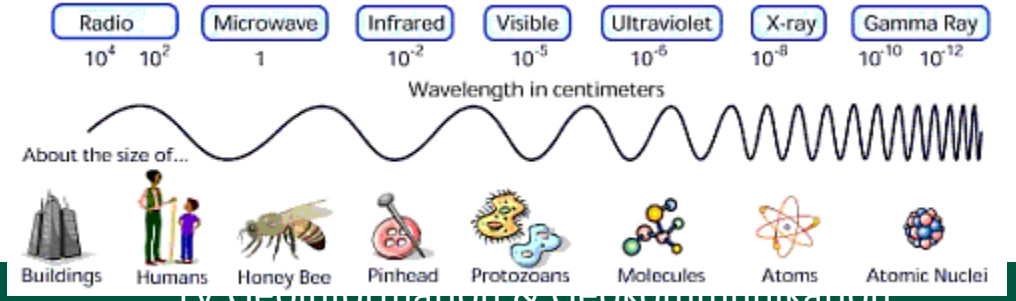
$$W = \sigma T^4$$

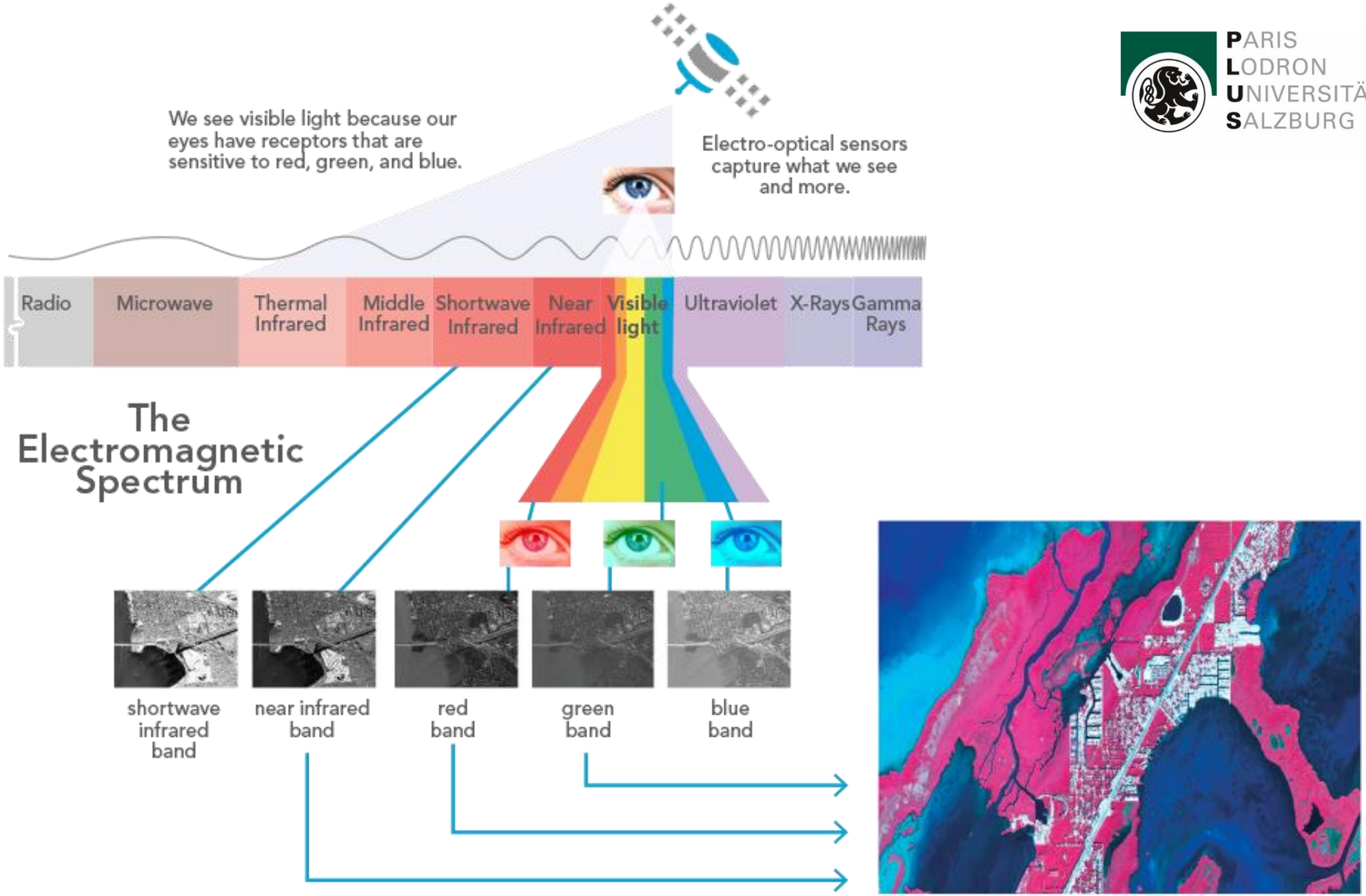
WHERE:

<B>σ</B> = STEFAN - BOLTZMANN CONSTANT
(5.6697 X 10^{-8}) W / m^3 / K^4

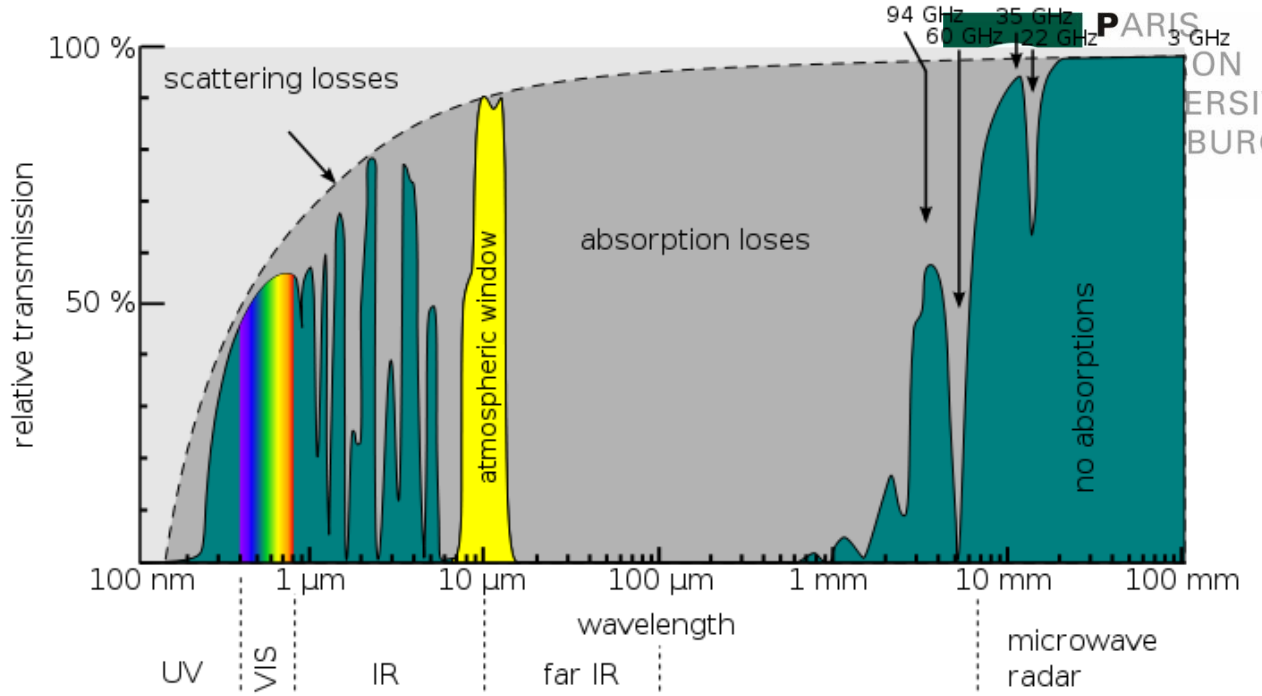
Wien‘sche Verschiebung

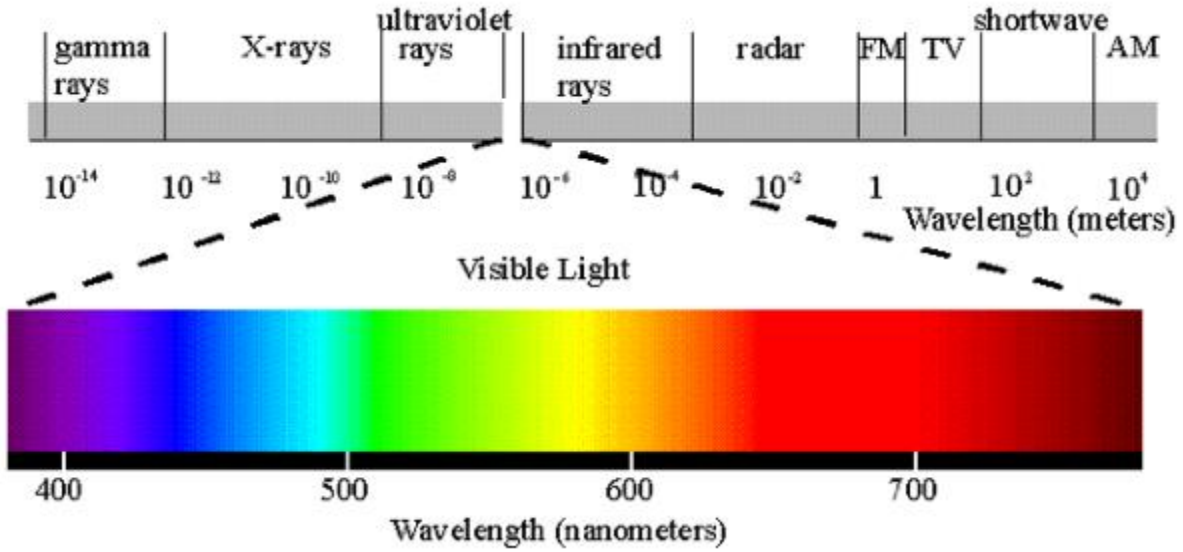





We see visible light because our eyes have receptors that are sensitive to red, green, and blue.
Electro-optical sensors capture what we see and more.
Radio
Microwave
Thermal Infrared
Middle Infrared
Shortwave Infrared
Near Infrared
Visible light
Ultraviolet
X-Rays
Gamma Rays
The Electromagnetic Spectrum
shortwave infrared band
near infrared band
red band
green band
blue band

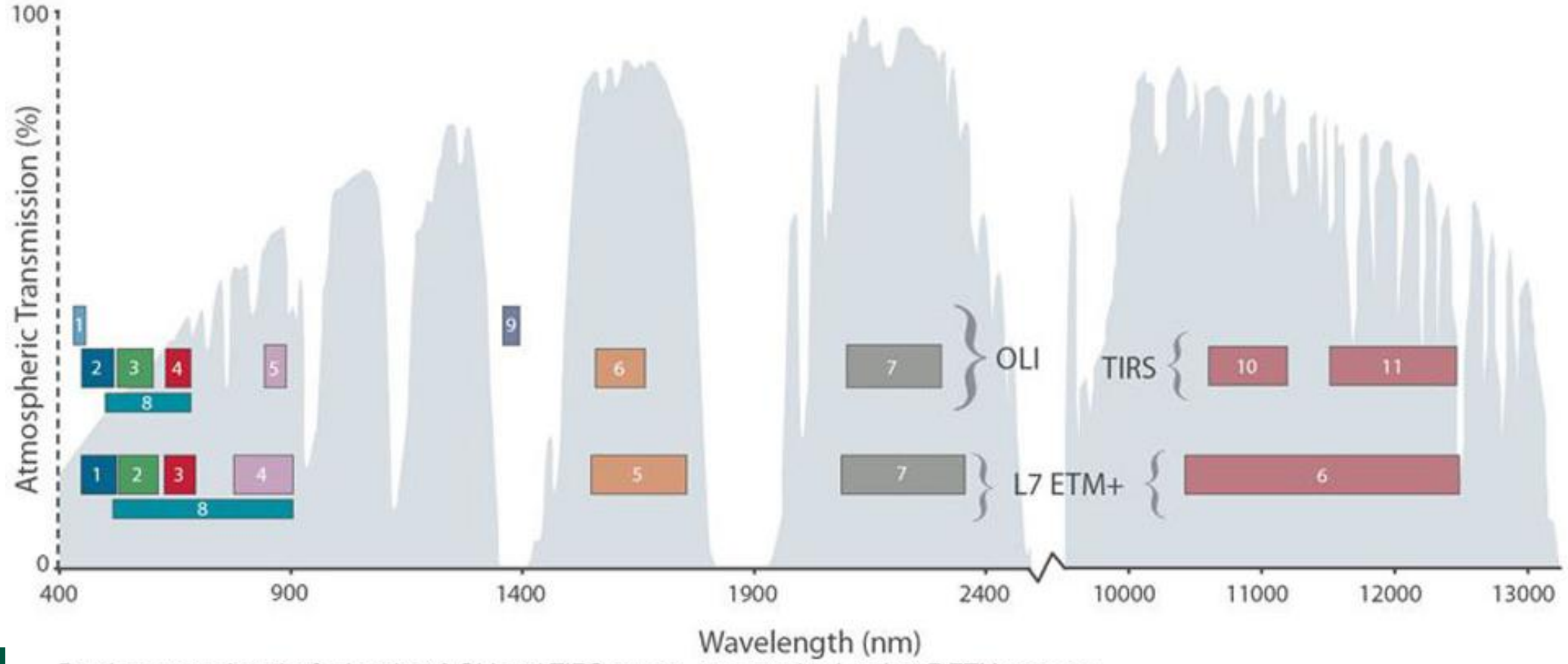
Spektren


100 %
50 %
relative transmission
scattering losses
absorption loses
atmospheric window
no absorptions
94 GHz
35 GHz
60 GHz
22 GHz
3 GHz
100 nm
1 µm
10 µm
100 µm
1 mm
10 mm
100 mm
wavelength
UV
VIS
IR
far IR
microwave
radar


gamma rays
X-rays
ultraviolet rays
infrared rays
radar
FM
TV
shortwave
AM
Wavelength (meters)
Visible Light
400
500
600
700
Wavelength (nanometers)

Spektralkanäle

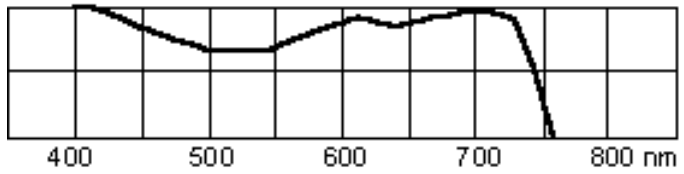
Abschnitte des kontinuierlichen elektro-magnetischen Spektrums, innerhalb derer die Reflexion bzw Emission gemessen wird = ‚Kanal' oder ‚band'.

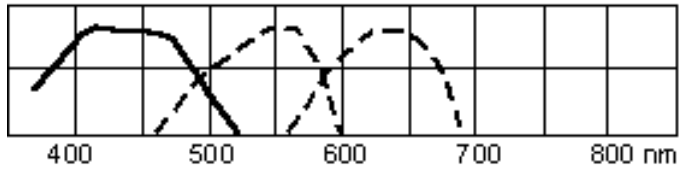


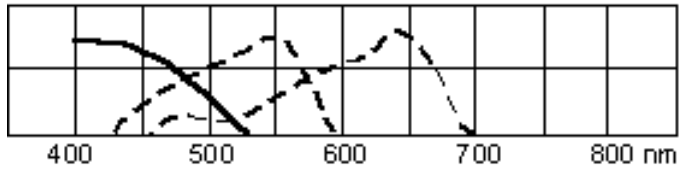
Bandpass wavelengths for Landsat 8 OLI and TIRS sensor, compared to Landsat 7 ETM+ sensor

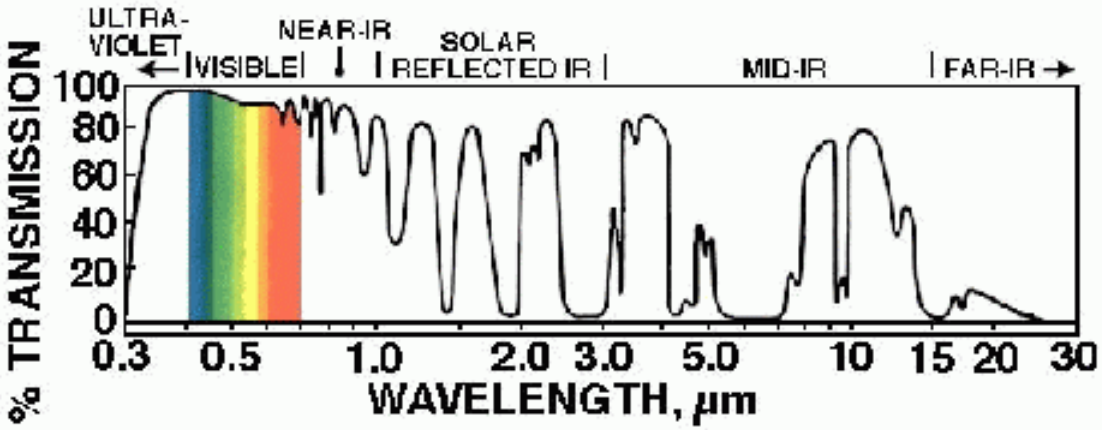
Note: atmospheric transmission values for this graphic were calculated using MODTRAN for a summertime mid-latitude hazy atmosphere (circa 5 km visibility).

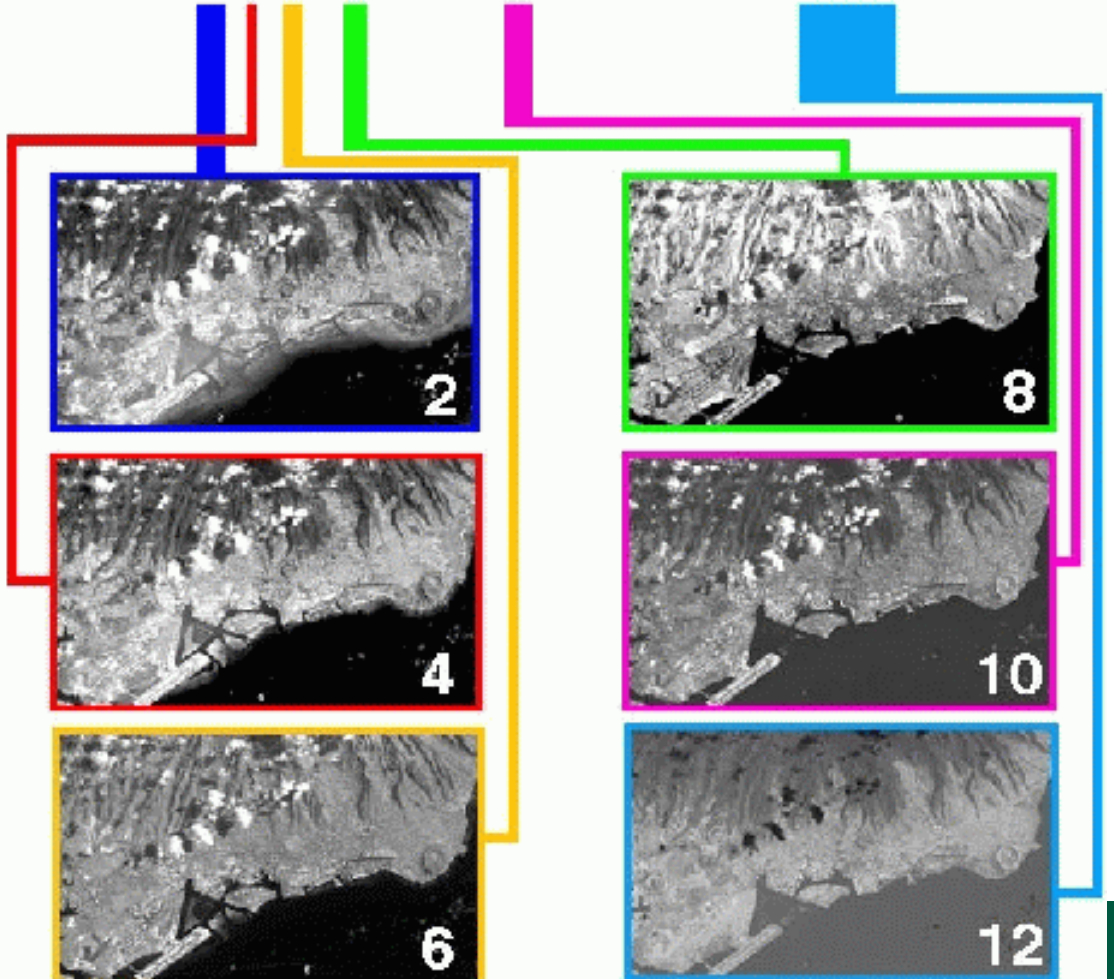
Spektren


400
500
600
700
800 nm


400
500
600
700
800 nm


400
500
600
700
800 nm

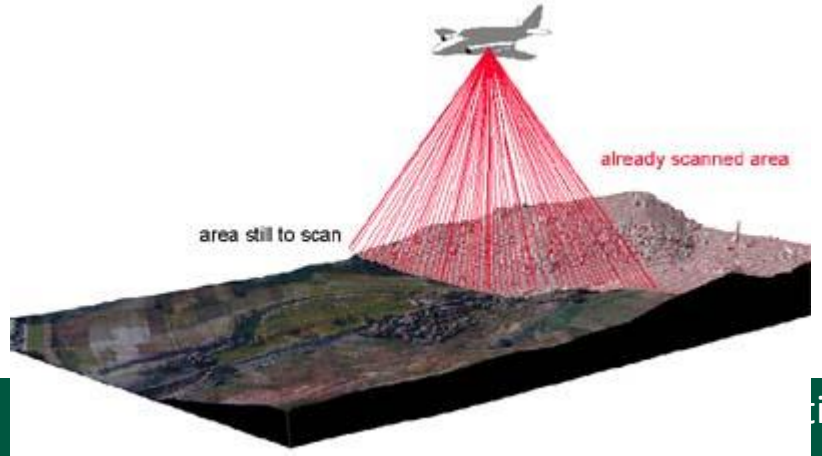

ULTRA-
VIOLET
VISIBLE
NEAR-IR
SOLAR
REFLECTED IR
MID-IR
FAR-IR
% TRANSMISSION
100
80
60
40
20
0
0.3
0.5
1.0
2.0
3.0
5.0
10
15
20
30
WAVELENGTH, μm

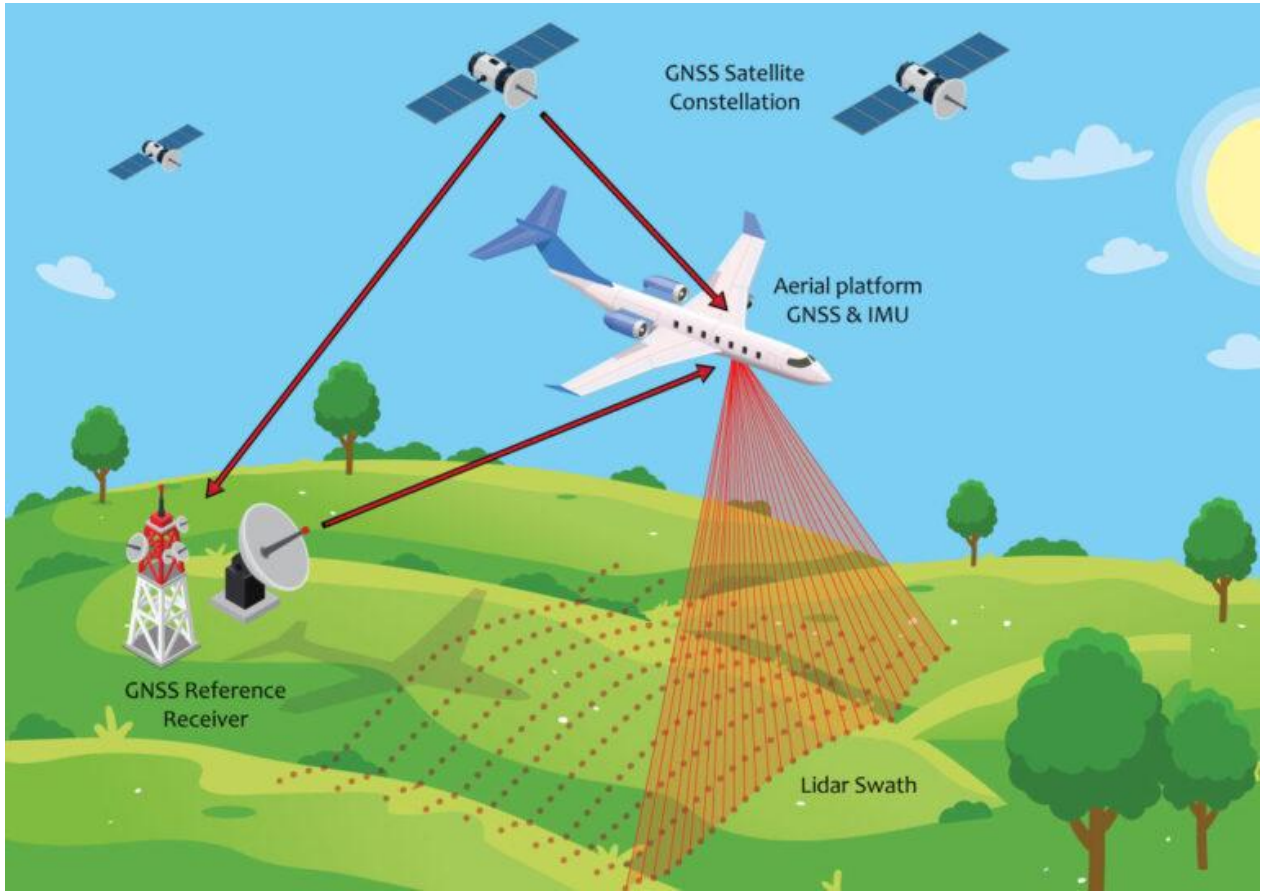

2
8
4
10
6
12

Aktive Sensoren

Laser Scanning

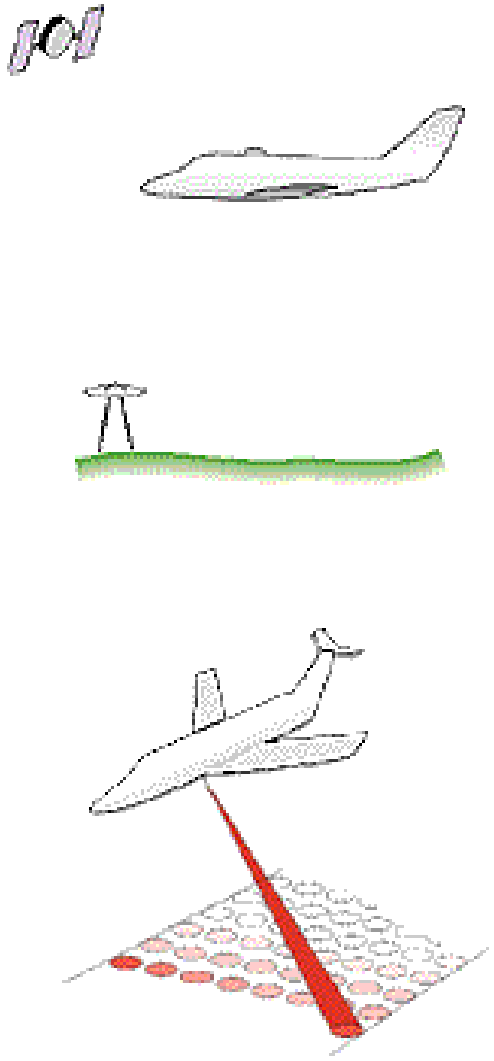
- LIDAR (LIght Detecting And Ranging)
- Hochfrequente Abtastung des Geländes, meist von Flugzeug oder Helikopter
- Distanzmessung von Sensor zu Gelände: erfordert exakte Flugzeugposition (GPS)
- Mehr als eine Reflektion …





LIDAR Funktionsprinzip

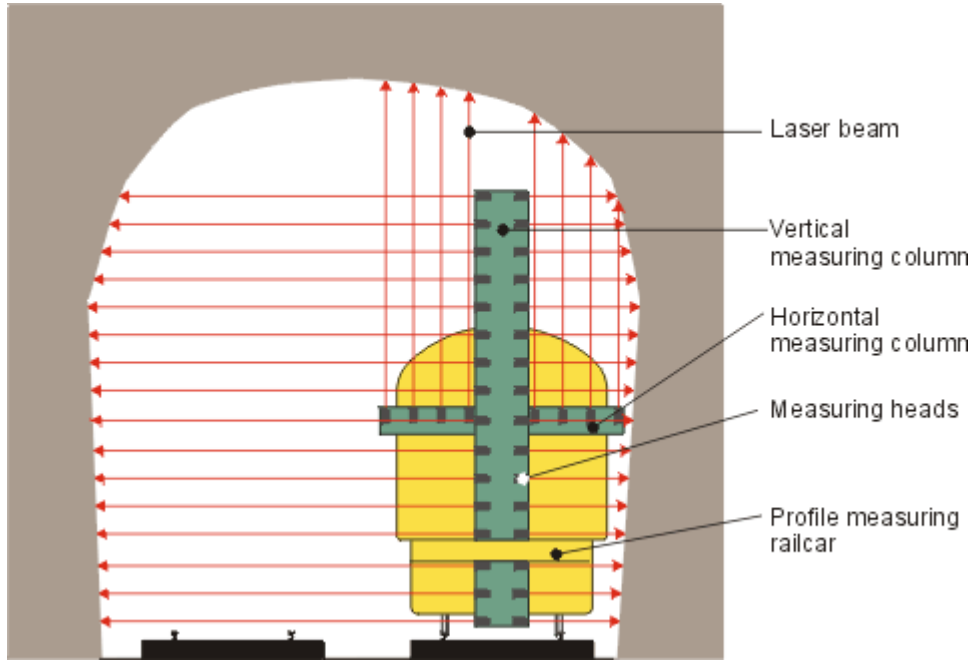
- Laser-Puls
- Messung der Laufzeit (Lichtgeschwindigkeit)
- Aus Position des Sensors und Winkel des Strahls: Höhenberechnung



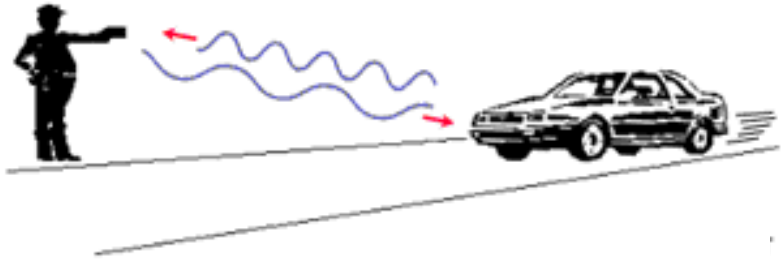
Laser-Scanning Kenndaten

- Messfrequenz: 100K-1M Pulse/sek
- Punktedichten: typisch 5 – 25 Pkt/m²
- Vertikale Genauigkeit: bis cm
- Horizontale Genauigkeit: bis dm
- Genauigkeit: bei GPS plus INS
- Aufnahmestreifen: bis einige km breit
- Auch Intensität der Reflektion

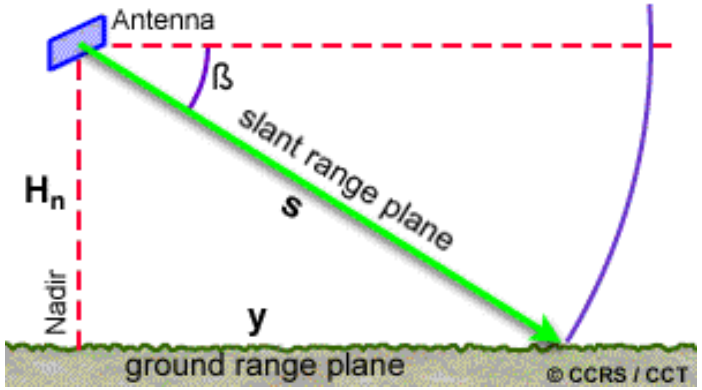
Laserscanning (terrestrisch)



Radar – SAR (Synthetic Aperture Radar)

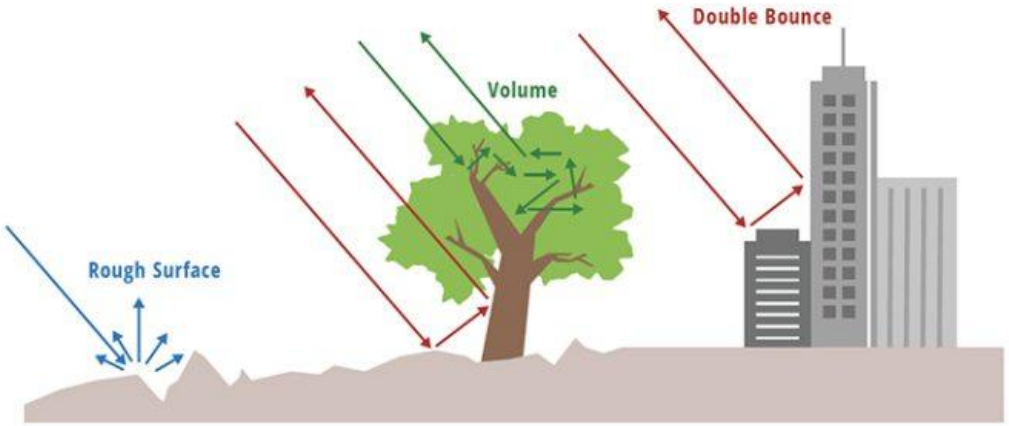


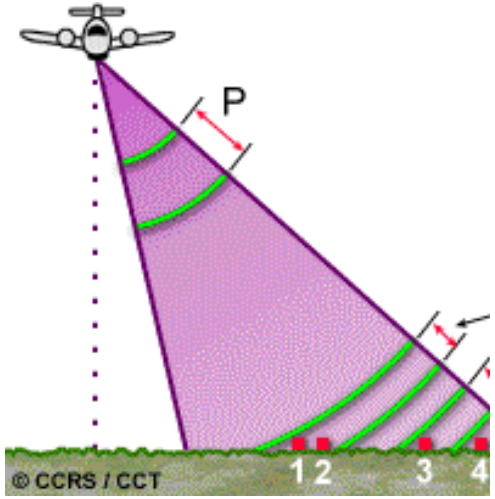
- Kein optisches System
- Mess-Prinzip:
  Signal-Laufzeit
- Komplexe geometrische und radiometrische Vorverarbeitung
- Kanäle – ‚Bänder‘

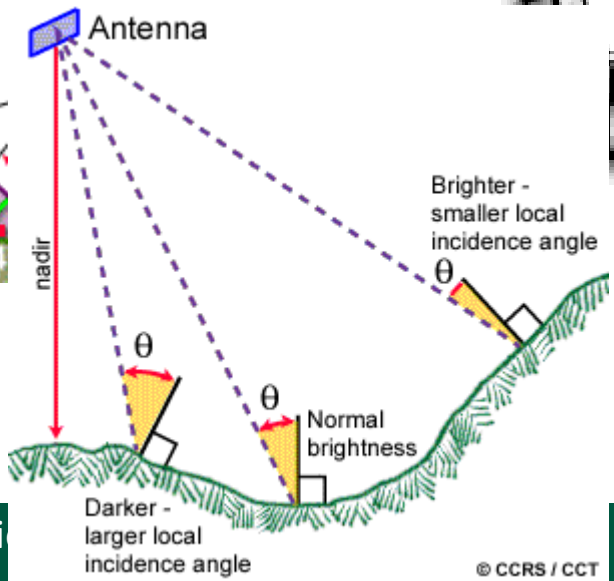


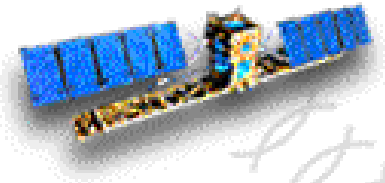
Meßverfahren RADAR

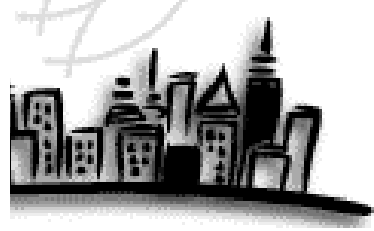
- The main advantage of this technology is that it can synthetically produce higher-resolution images in any weather condition and even at night.





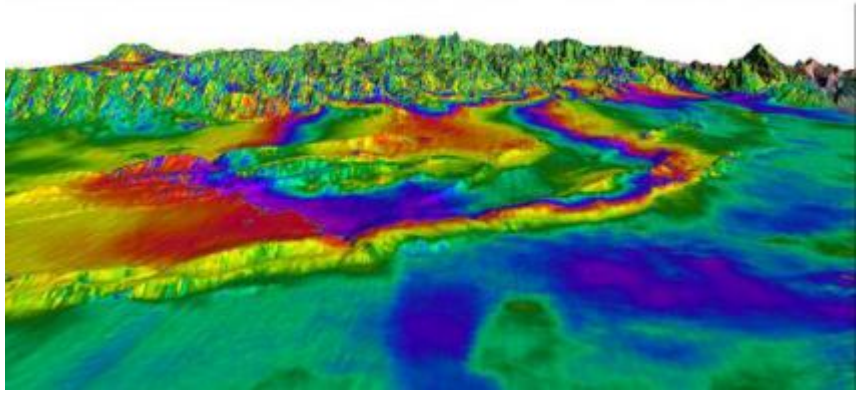






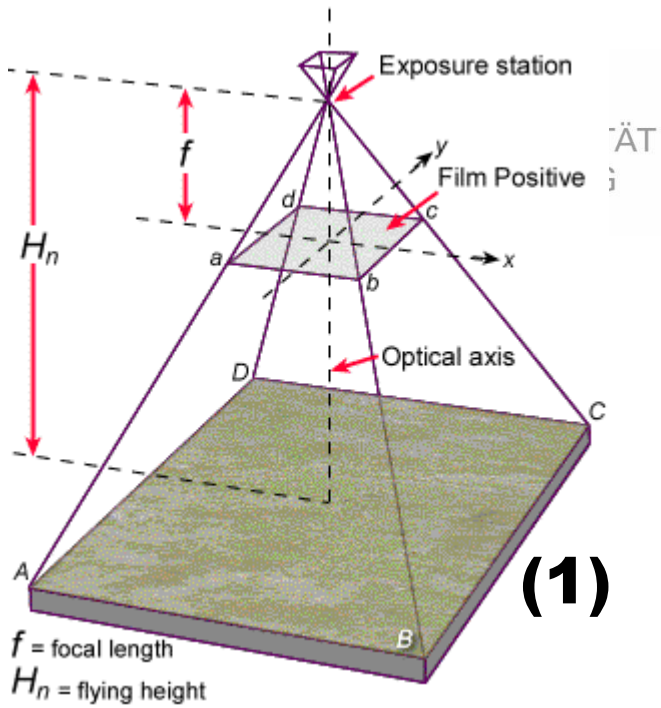
Anwendungsverfahren RADAR

- There are **hundreds of remote sensing applications**. Likewise, SAR has applications in the environment, safety, military, and more.
- In **search and rescue missions**, weather conditions are often poor. In the case of forest fires, smoke could completely block visibility.
- **Estimate surface elevation** with the Space Shuttle Radar Topography Mission inSAR. This satellite used interferometry (InSAR) generating one of the most accurate **elevation models** of the whole globe.
- microwave radar is sensitive to the dielectric constant in features. This is why researchers are trying to study **soil moisture** using synthetic aperture radar. In agriculture, farmers can use this to understand wetness in the first few centimeters of a bare soil profile.

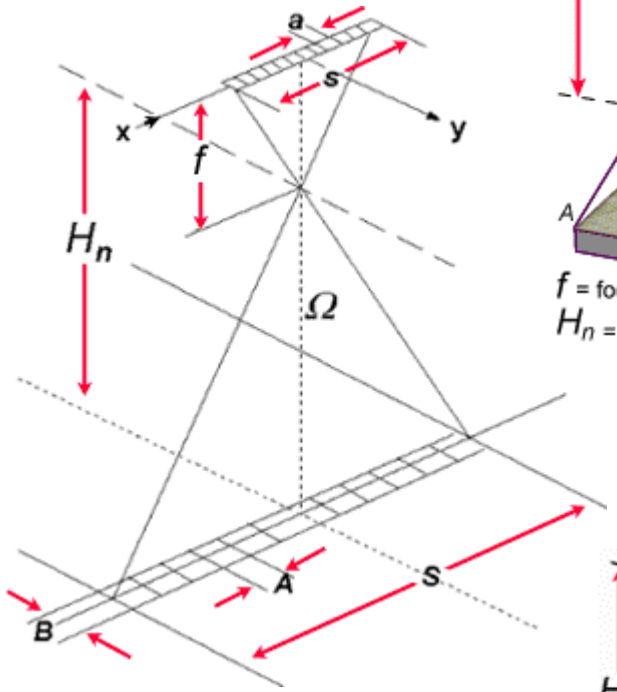


Vergleich Bildgeometrie

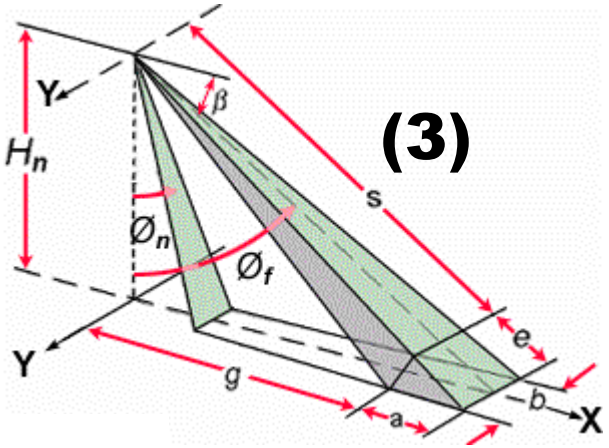
1. Kamera
2. Scanner
3. Radar



(1)



(2)



(3)

PARIS LODRON UNIVERSITÄT SALZBURG

Fachbereich Geoinformatik

Geoinformation und Geokommunikation VU

Vorlesungsteil

Paris-Lodron-University Salzburg
Department of Geoinformatics – Z_GIS

Katharina Wöhs & Johannes Scholz

Department of Geoinformatics – Z_GIS
Paris-Lodron-University Salzburg

katharina.woehs@plus.ac.at; johannes.scholz@plus.ac.at
www.zgis.at || www.johannesscholz.net
@Joe_GISc @Joe_GISc@mastodon.online

Z_GIS