

ÇEV 361

Coğrafi Bilgi Sistemleri ve Uzaktan Algılama

Uzaktan Algılamaya Giriş

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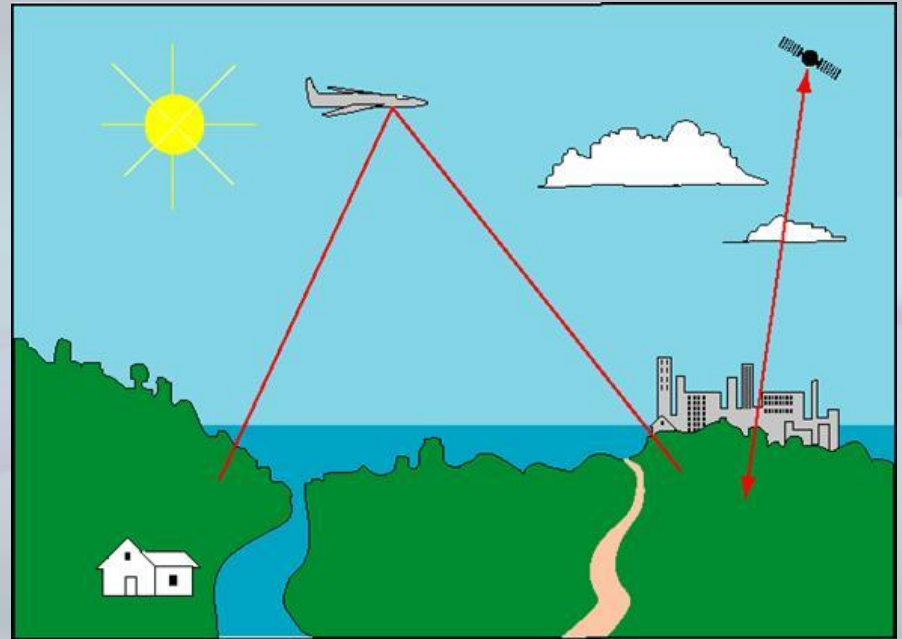
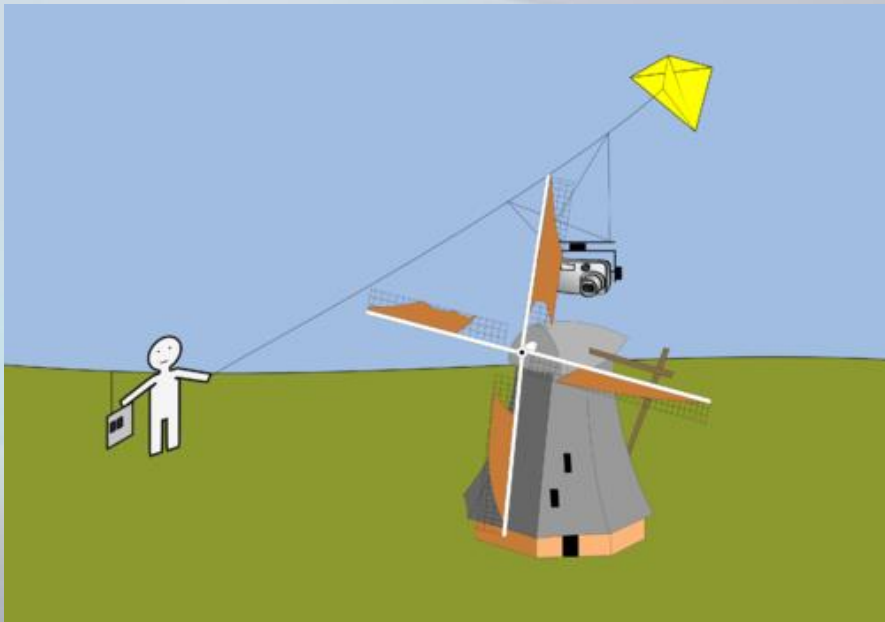
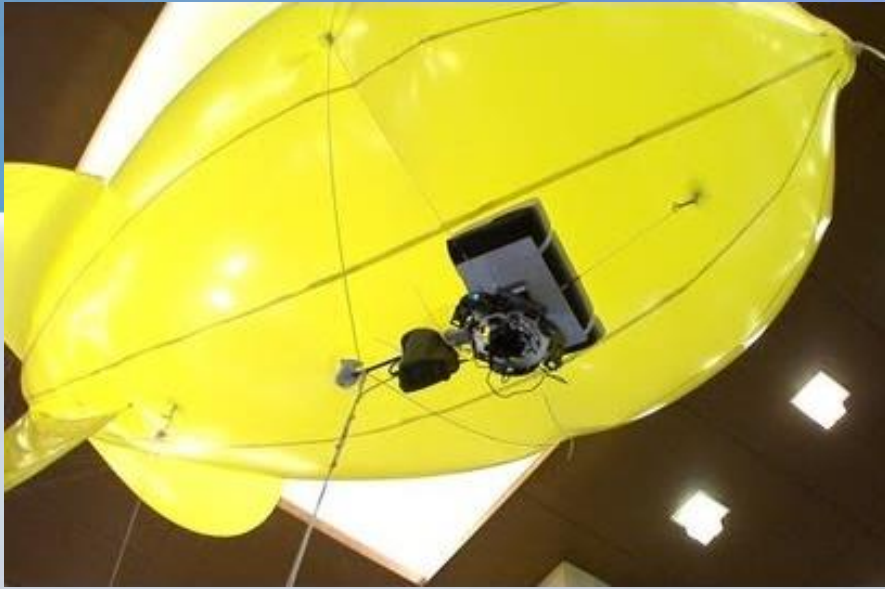
<http://www.ozgurzeydan.com/>

Uzaktan Algılama - Tanım

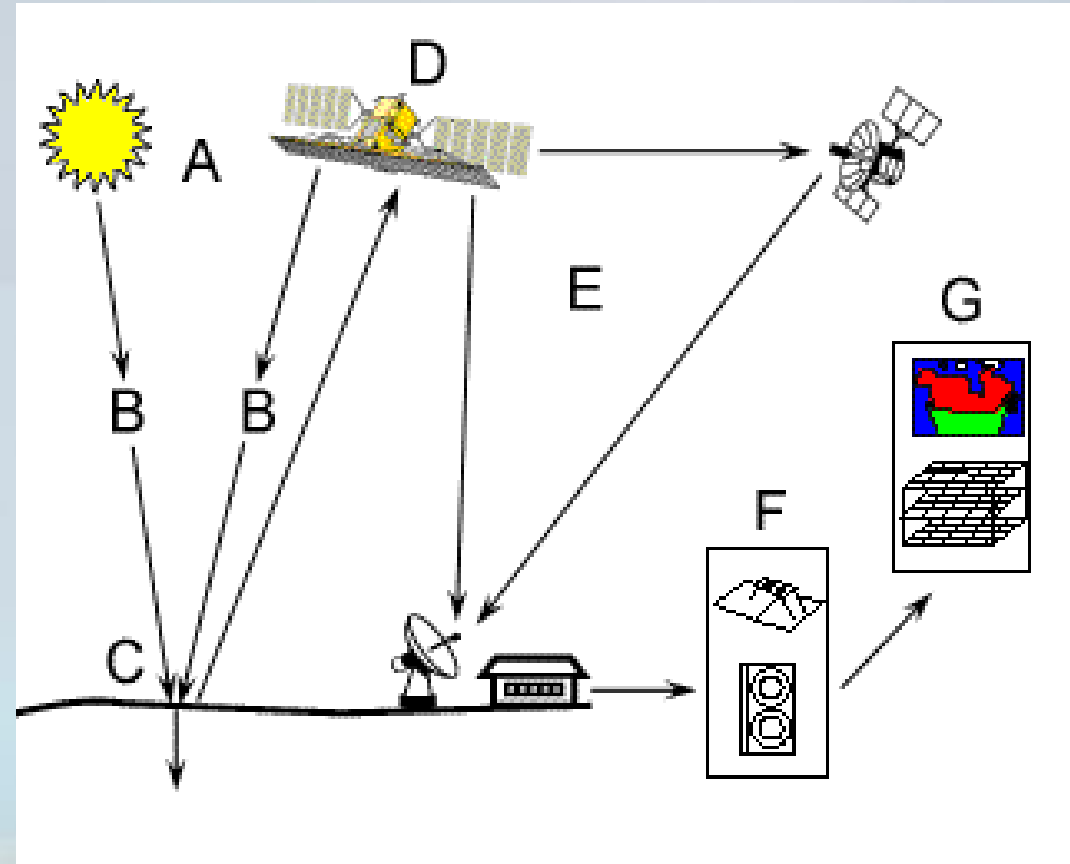
- Bir nesneye dokunmadan o nesne hakkında bilgi sahibi olma yöntemidir.
- Dünya üzerindeki bir bölge hakkındaki bilgiler, o bölge ile fiziksel temas halinde bulunmayan sensörler aracılığıyla elde edilir.
- Sensörlerin veri elde etmeleri sırasında atmosferik etkiler söz konusudur.

Uzaktan Algılama - Tarihçesi

- Balon fotoğrafları
- Güvercinler üzerindeki kameralar
- Uçurtma üzerindeki kameralar
- Uçaklardan çekilen fotoğraflar
 - Hava fotoğrafları
- Uzaydan alınan görüntüler
 - Uydu görüntüleri

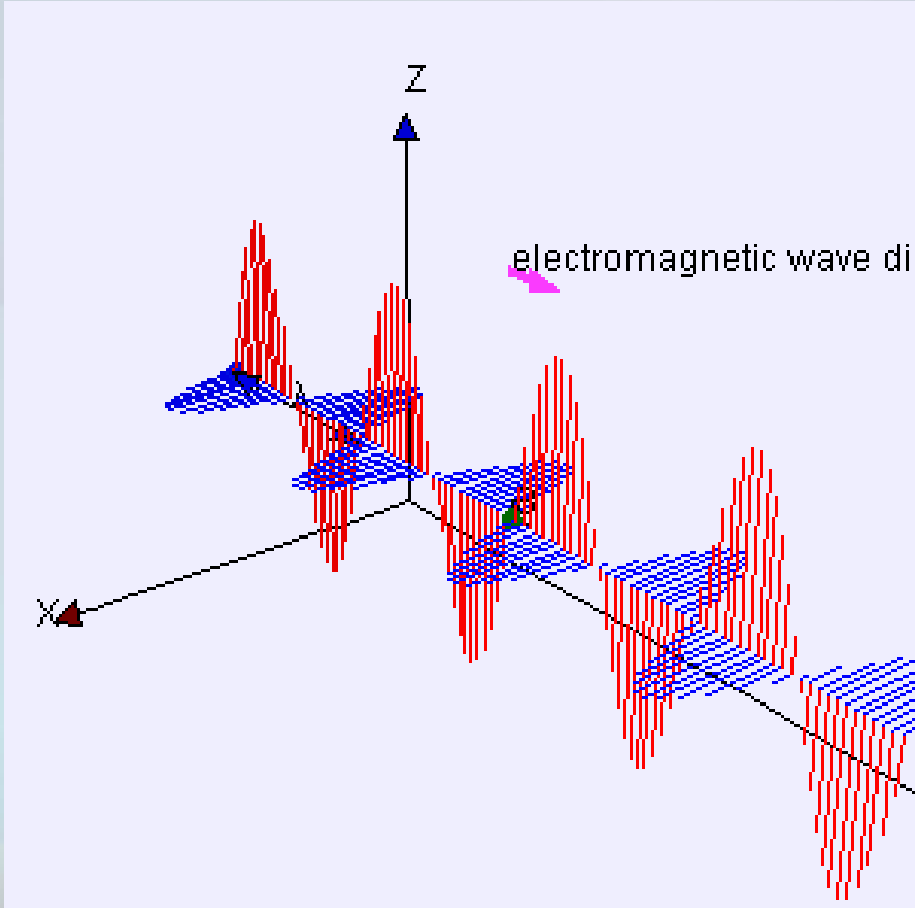


Uzaktan Algılamanın Bileşenleri



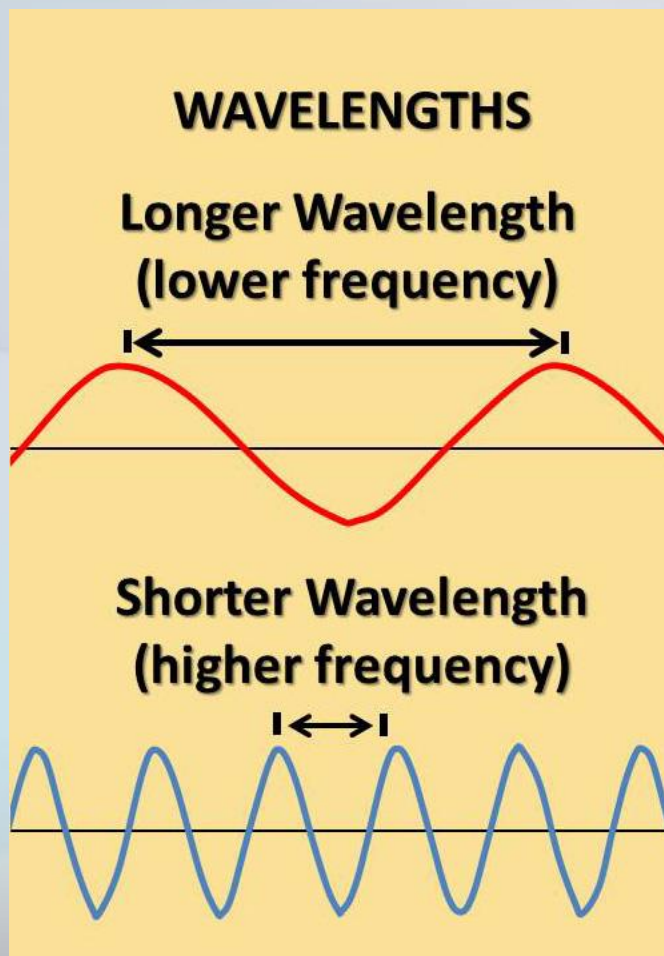
- A: Enerji kaynağı
- B: Atmosferik radyasyon
- C: Görüntülenen nesne
- D: Sensör tarafından kaydedilen enerji
- E: Verinin iletilmesi, kaydedilmesi ve işlenmesi
- F: Verinin yorumlanması ve analizi
- G: Uygulama

Elektromanyetik Dalgalar



- Mavi renk manyetik alanı, kırmızı renk elektrik alan temsil emektedir.
- Görüldüğü gibi manyetik alan, elektrik alan ve dalganın yayılma yönü birbirine diktir.
- (James Clerk Maxwell)

Elektromanyetik Dalgalar

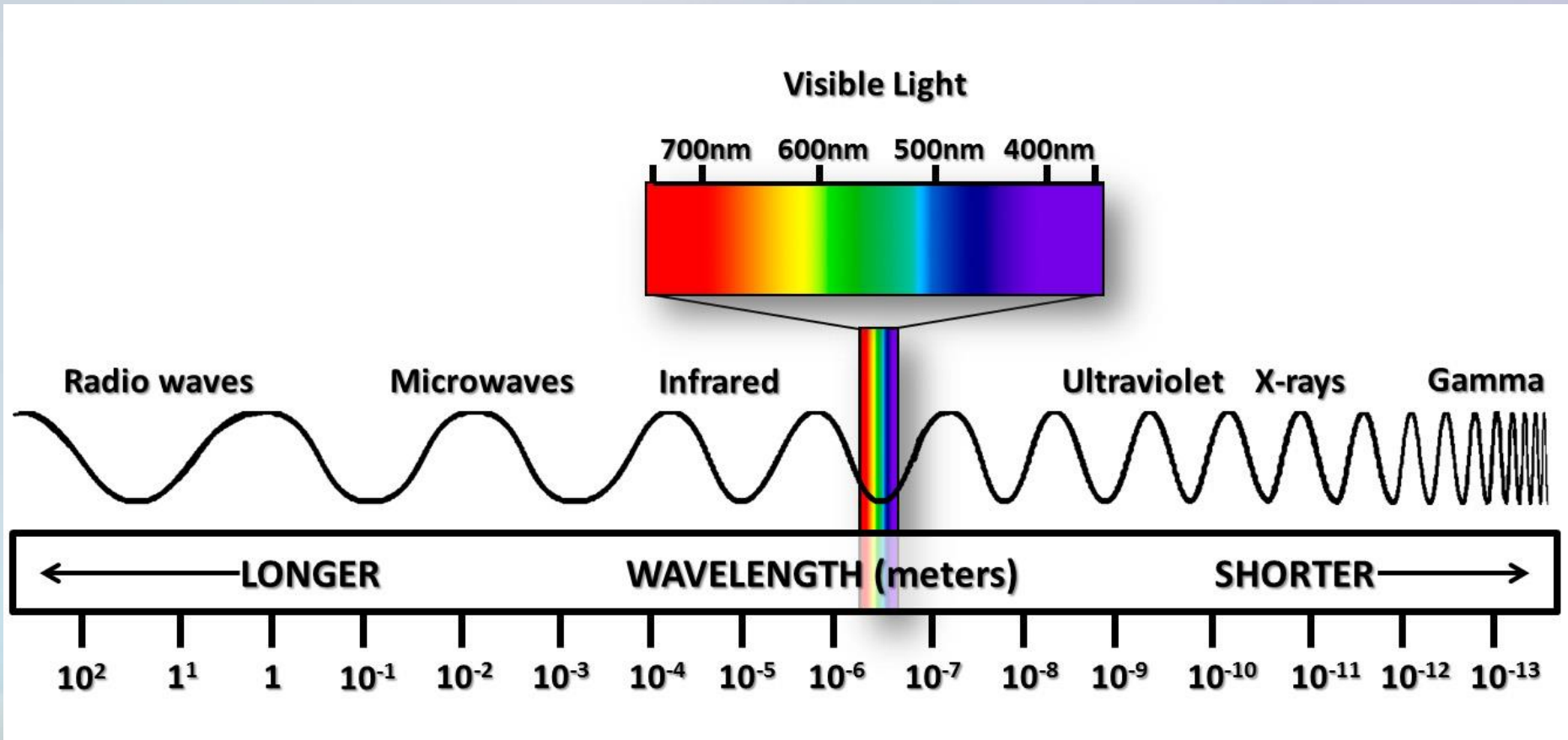


$$C = \lambda f$$

- C : ışık hızı (3×10^8 m/s)
- λ : Dalga boyu (m)
- f : Frekans (1/s - hertz)

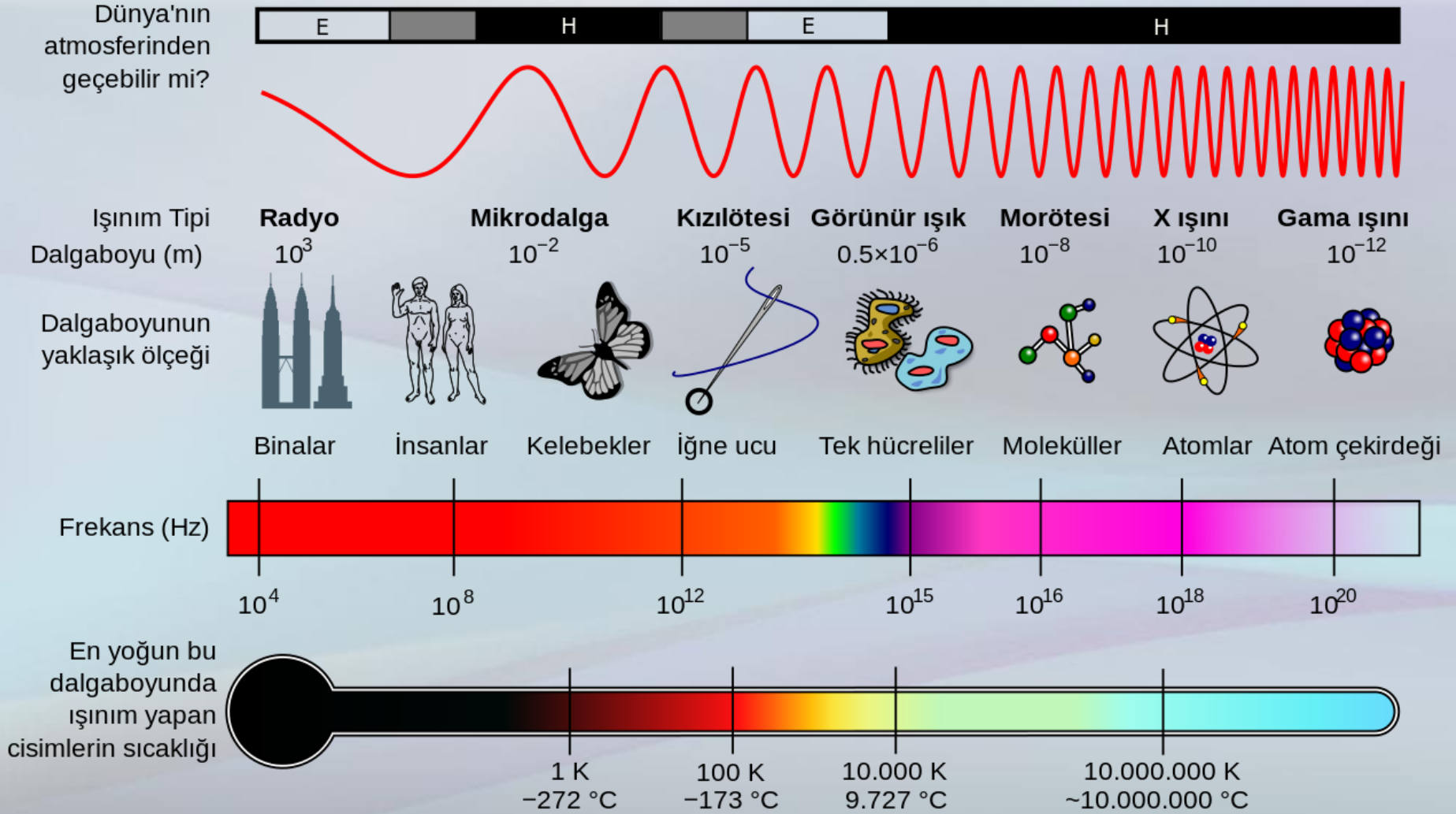
Wavelength units:	length
Angstrom (Å) :	$1 \text{ Å} = 1 \times 10^{-10} \text{ m};$
Nanometer (nm):	$1 \text{ nm} = 1 \times 10^{-9} \text{ m};$
Micrometer (μm):	$1 \mu\text{m} = 1 \times 10^{-6} \text{ m};$

Elektromagnetik Spektrum

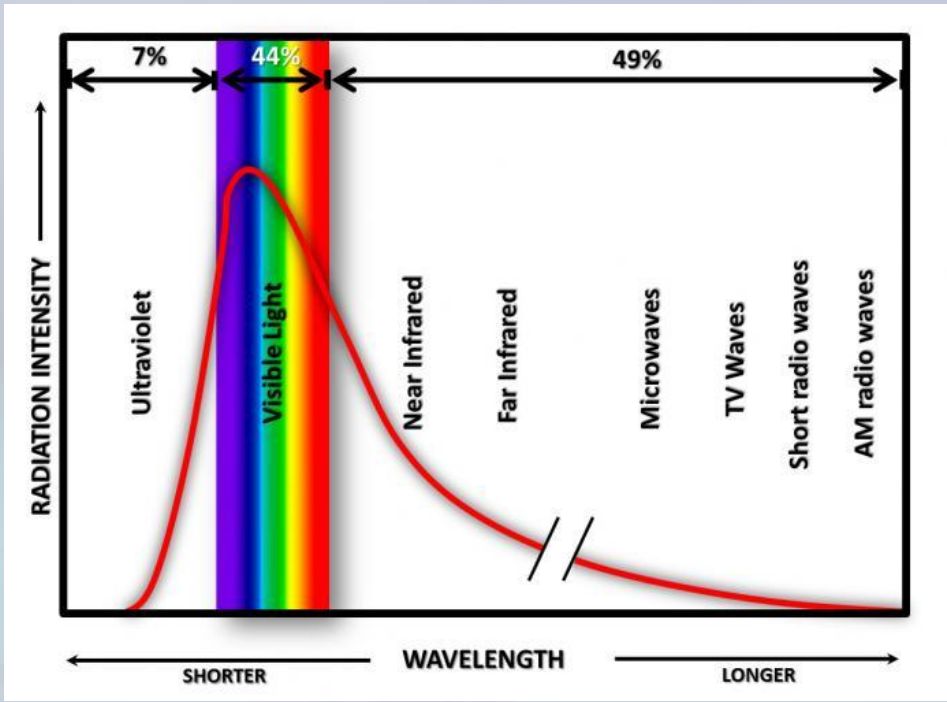
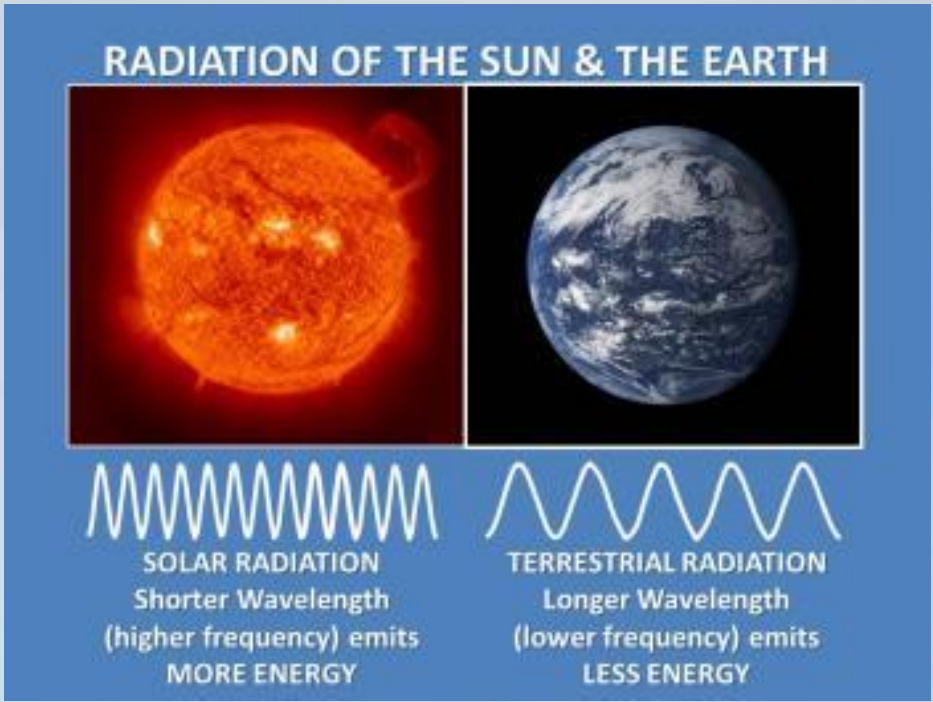


<http://www.ces.fau.edu/nasa/module-2/radiation-sun.php>

Elektromanyetik Spektrum

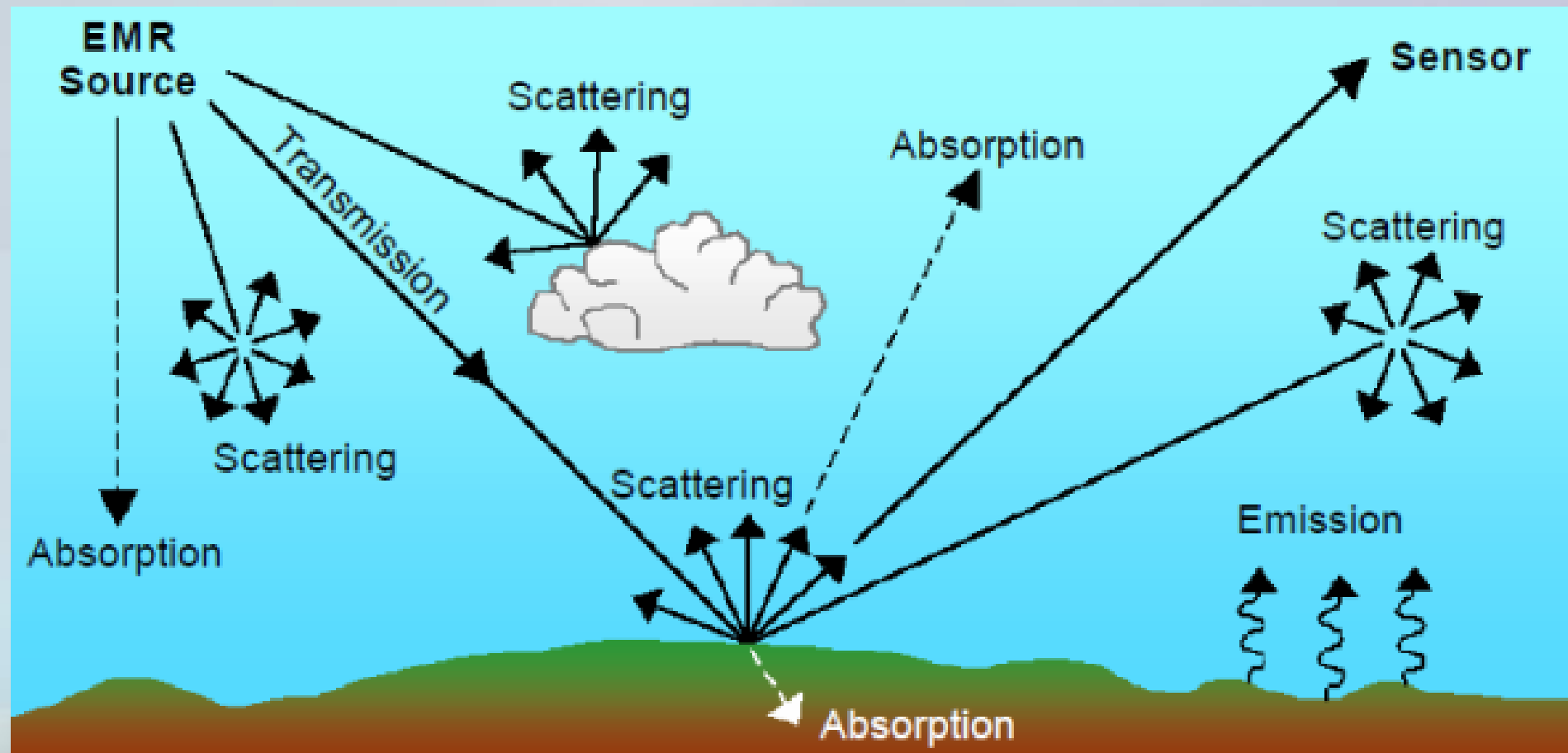


Güneşin Elektromanyetik Spektrumu

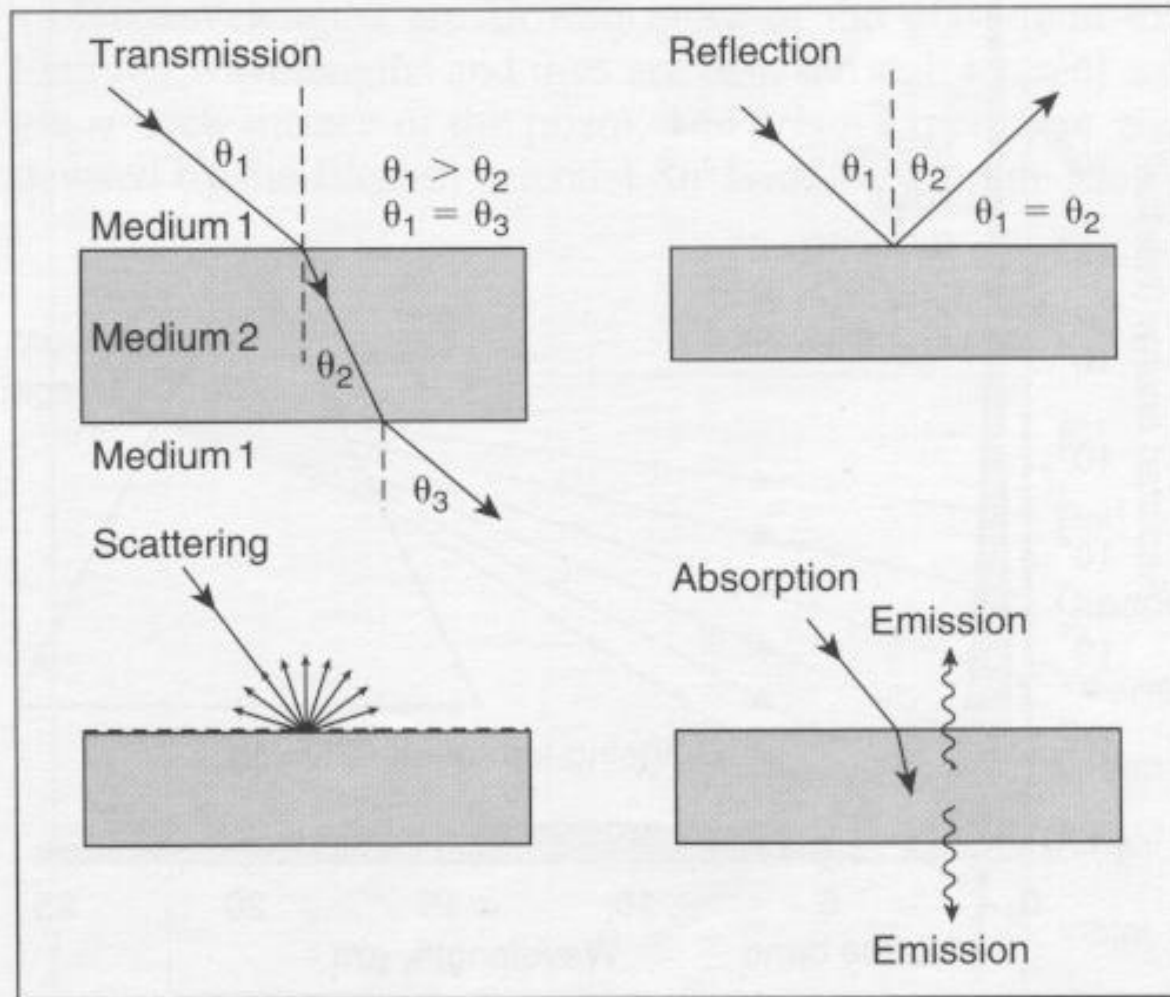


<http://www.ces.fau.edu/nasa/>

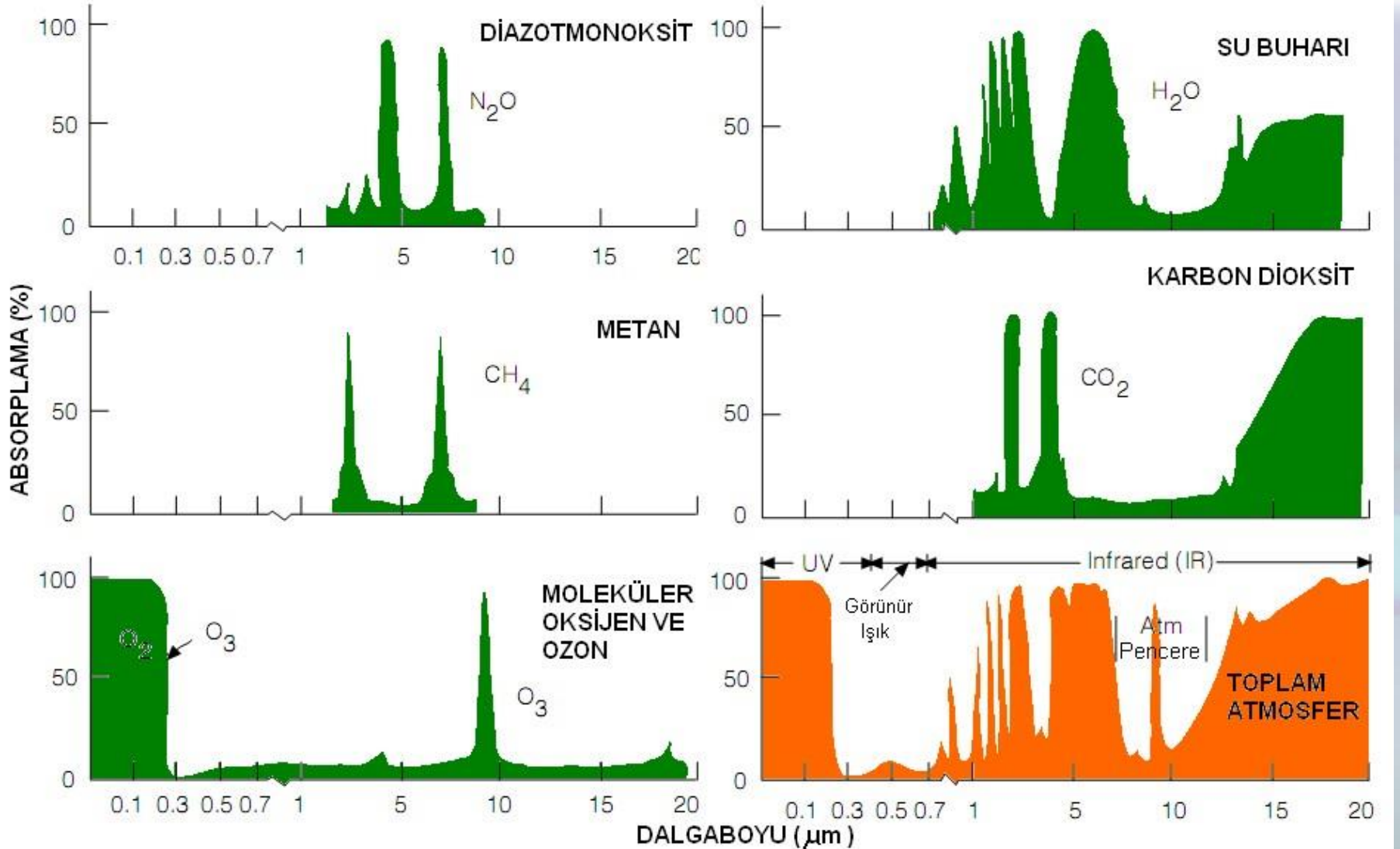
Atmosfer ile Etkileşim



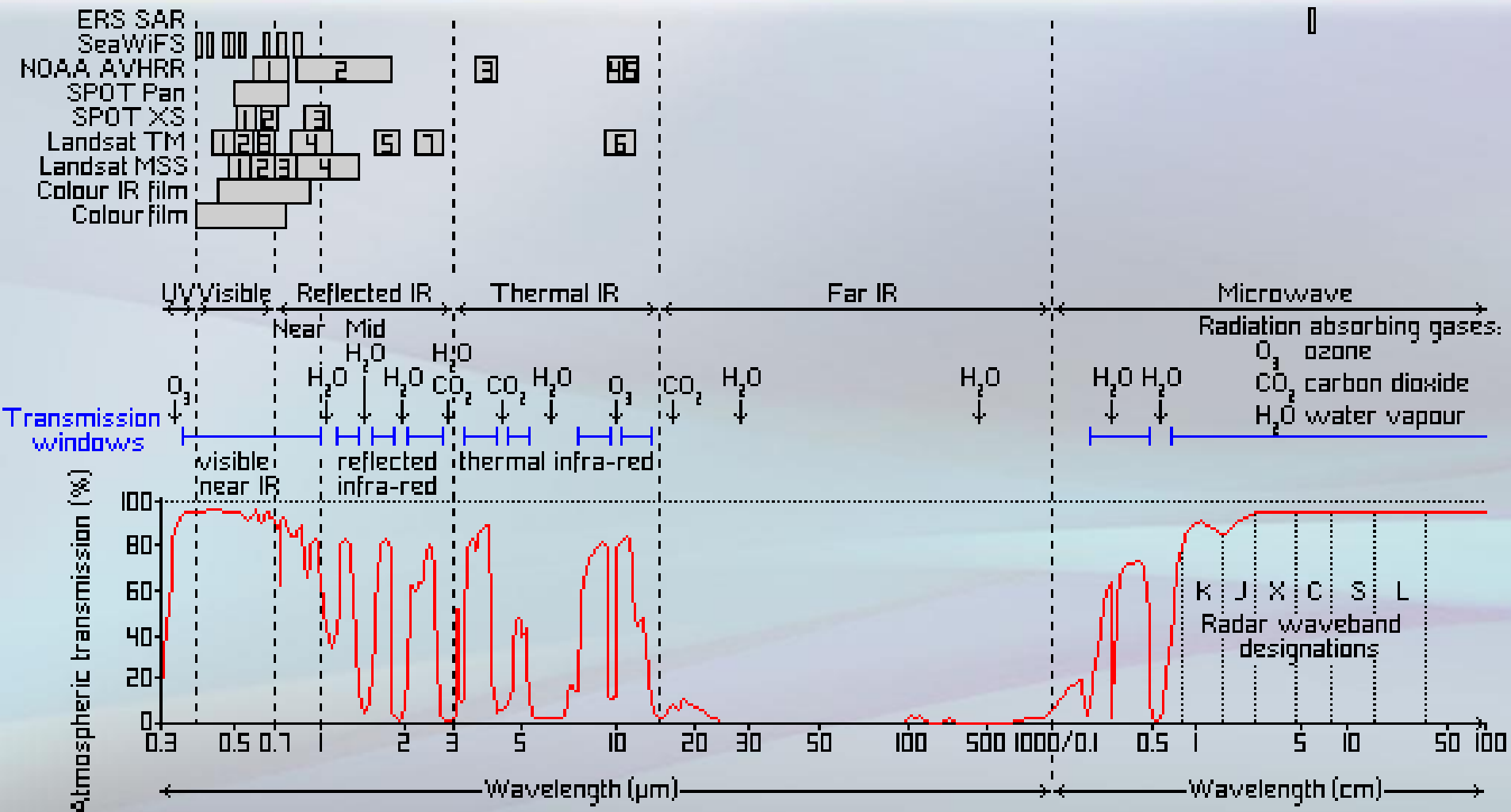
EMR - Madde Etkileşimleri



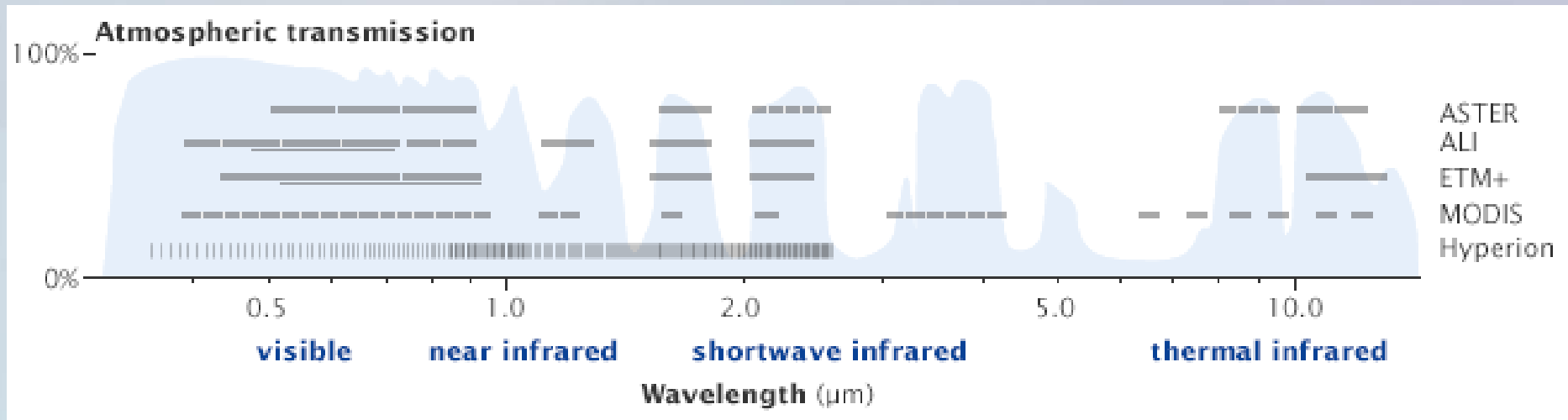
Atmosferik Absorplama



Atmosferik İletim ve Uyduların Dalga Boyları



Atmosferik İletim ve Uyduların Dalga Boyları



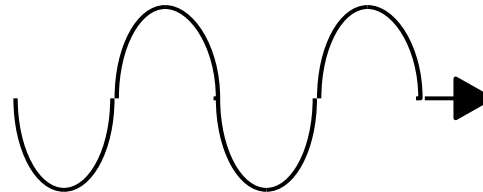
<http://earthobservatory.nasa.gov/Features/PaintedGlaciers/page5.php>

Atmosferik Saçılma

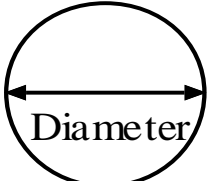
Atmospheric Scattering

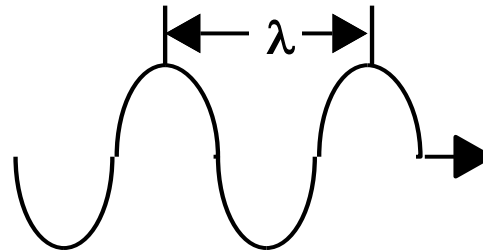
Rayleigh Scattering

a.  Gas molecule



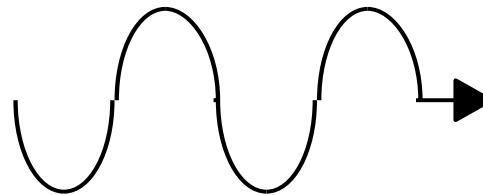
Mie Scattering

b.  Smoke, dust



Non-Selective Scattering

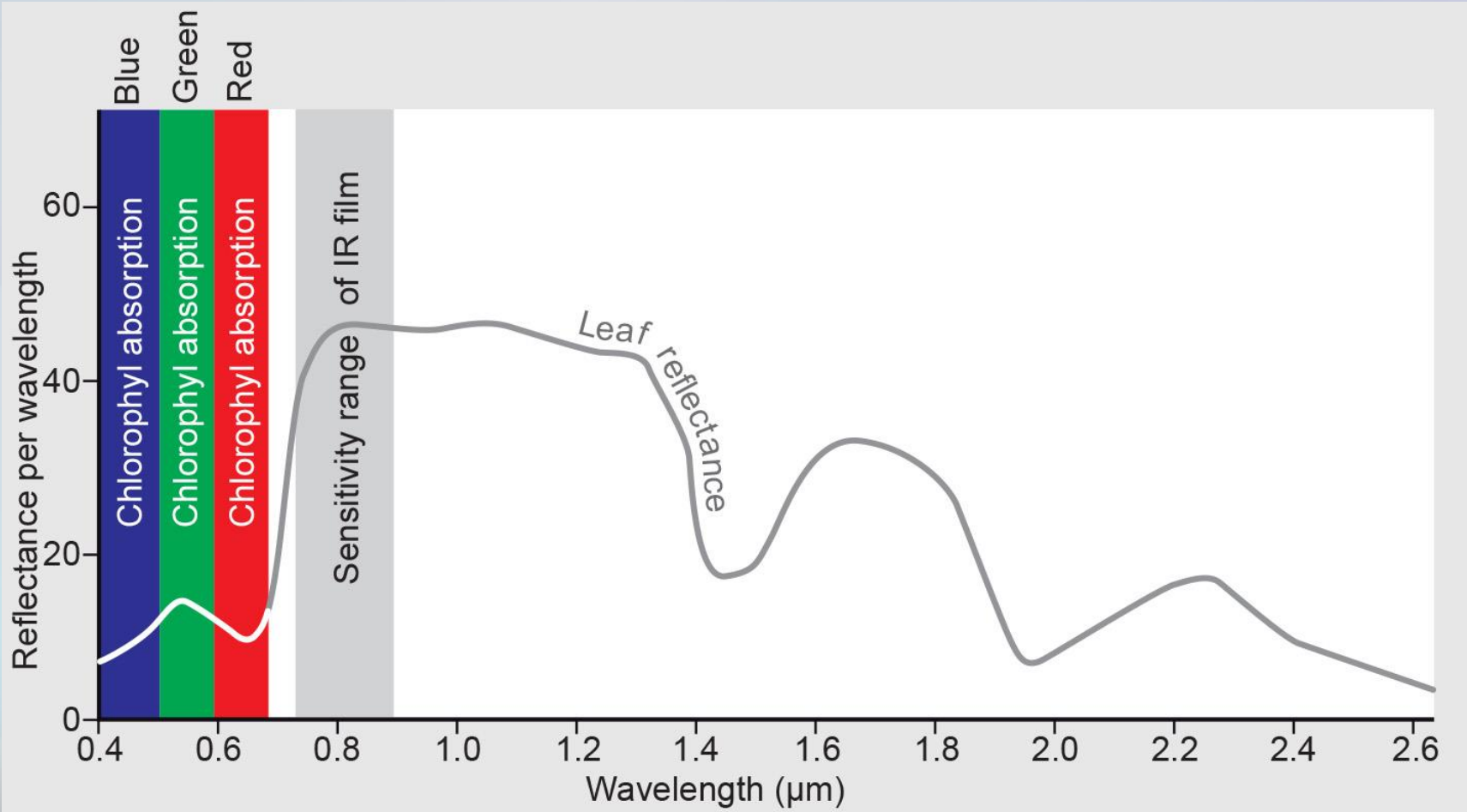
c.  Water vapor



Photon of electromagnetic energy modeled as a wave

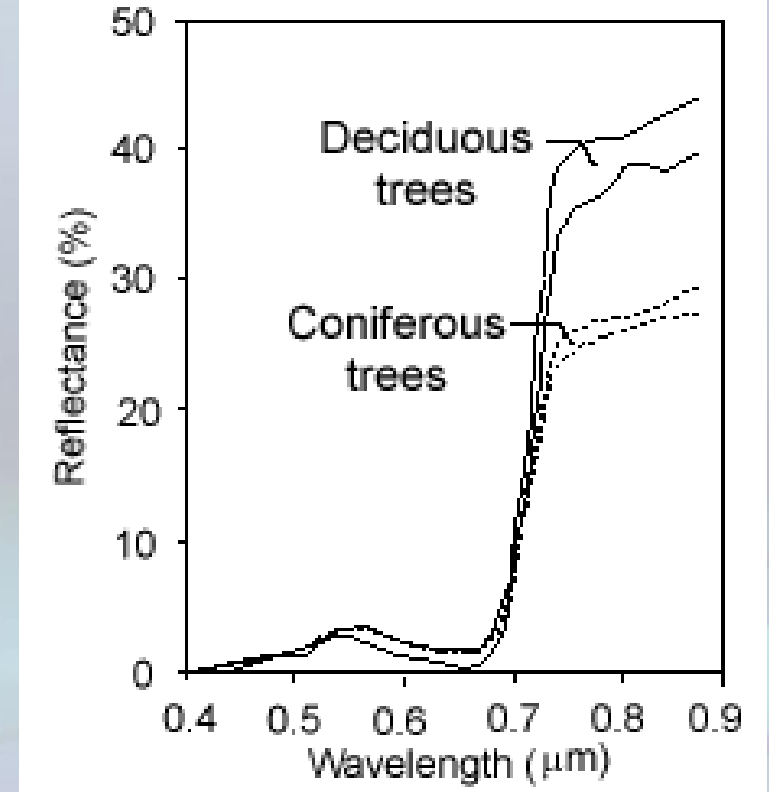
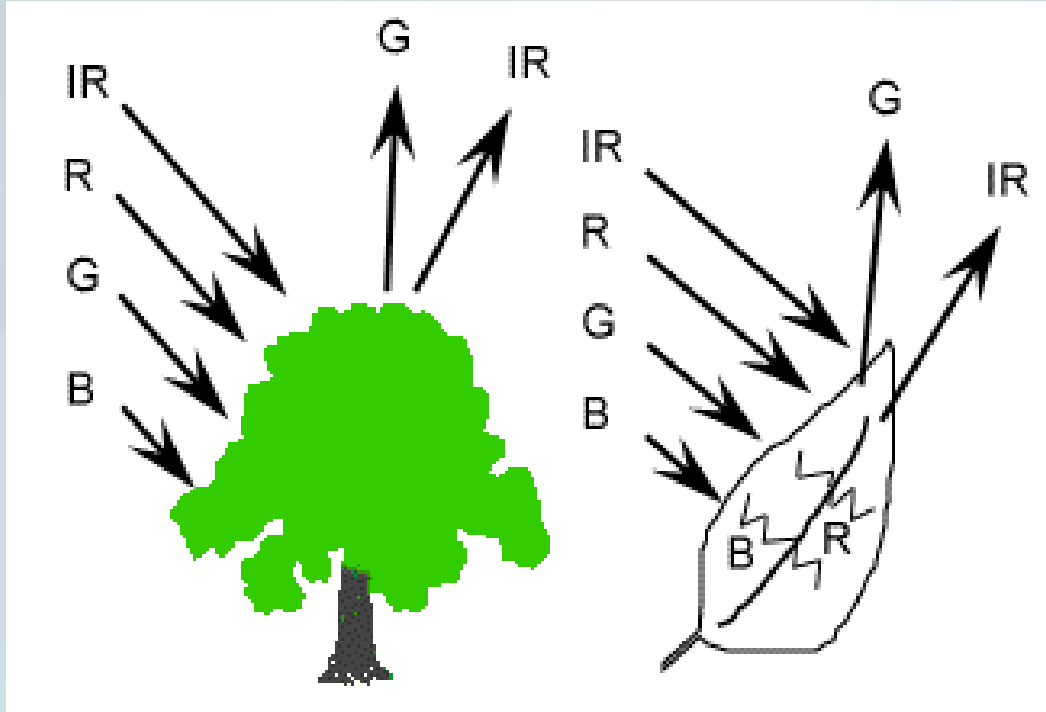
(N₂ ve O₂)

Yansıma (yeşil bitkiler)



<https://ltb.itc.utwente.nl/page/491/concept/79785>

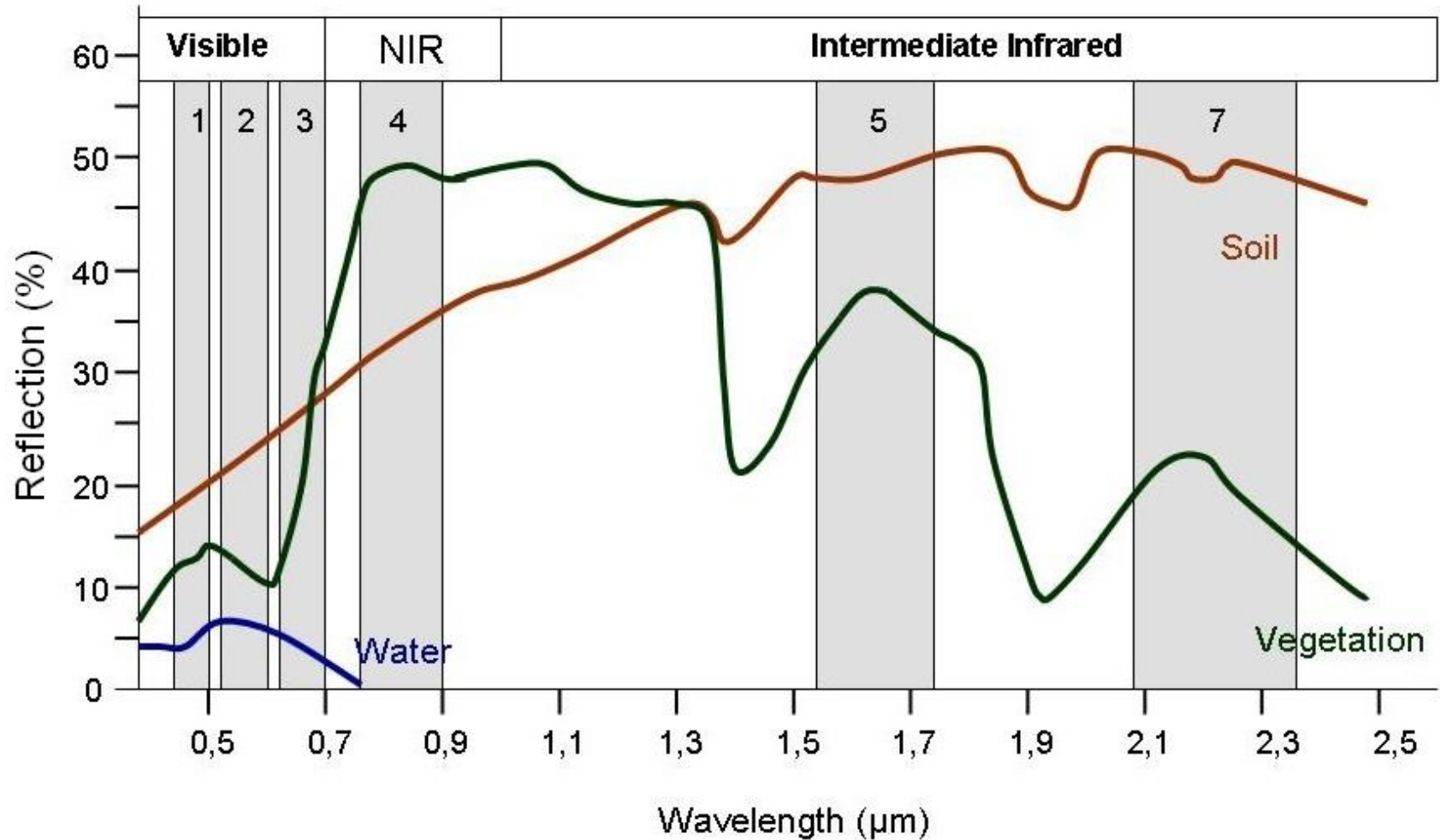
Yeşil Bitkiler ve Yansımaya



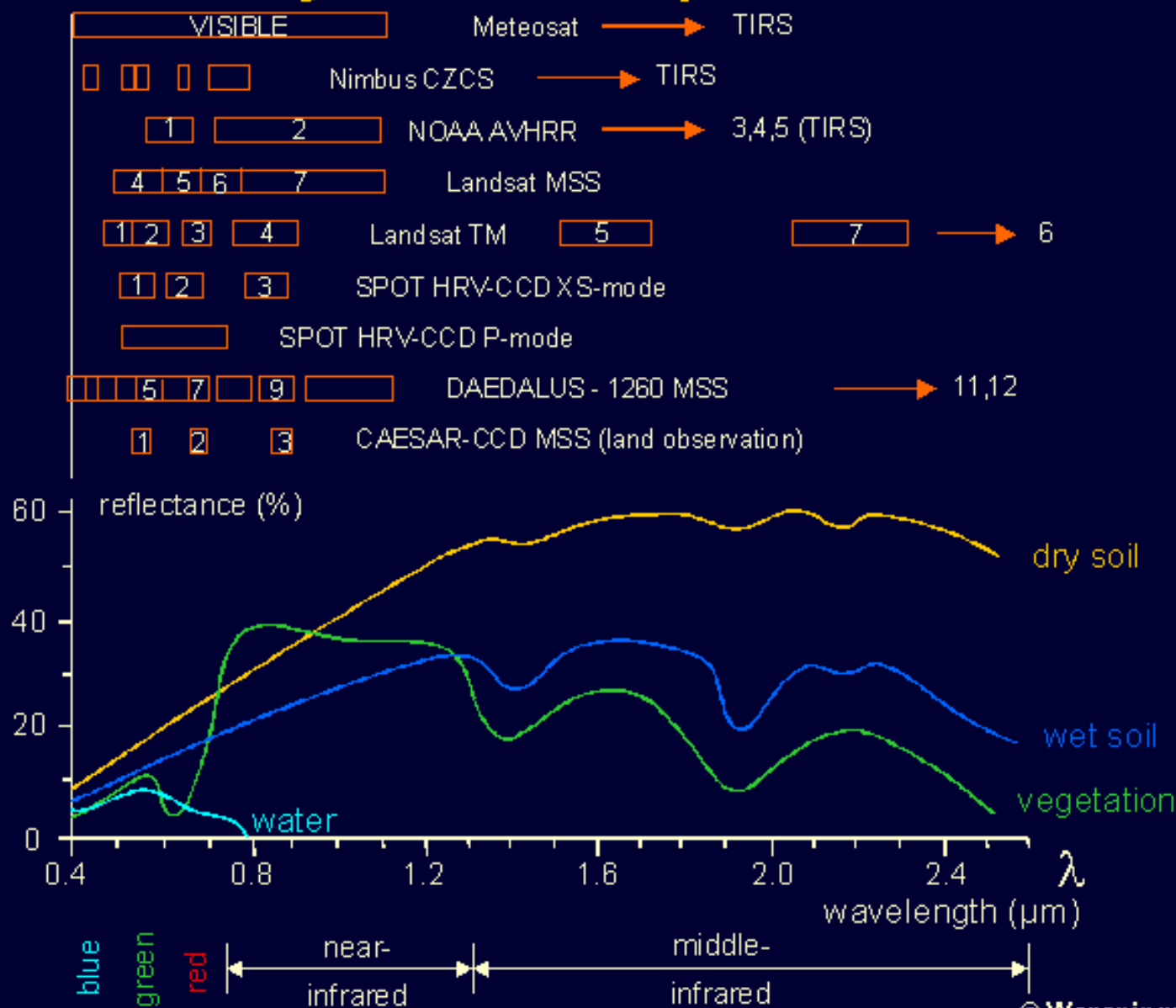
- Klorofil kırmızı ve mavi dalga boyunu absorbe ederken yeşil dalga boyunu yansıtır.

<http://maprabu.blogspot.com.tr/2014/03/remote-sensing.html>

Yansima



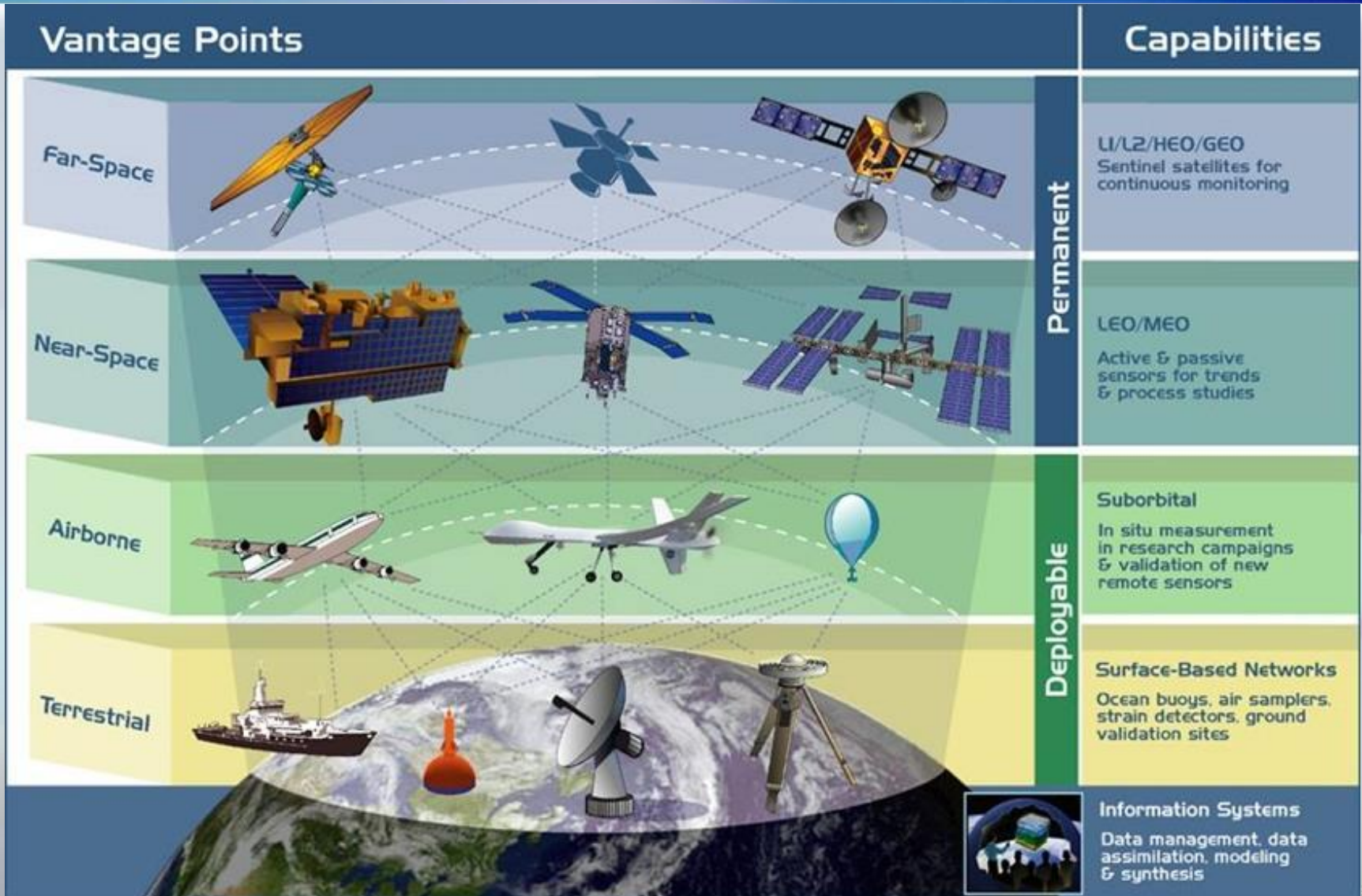
The position of the spectral bands of some Remote Sensing sensor systems in the optical window



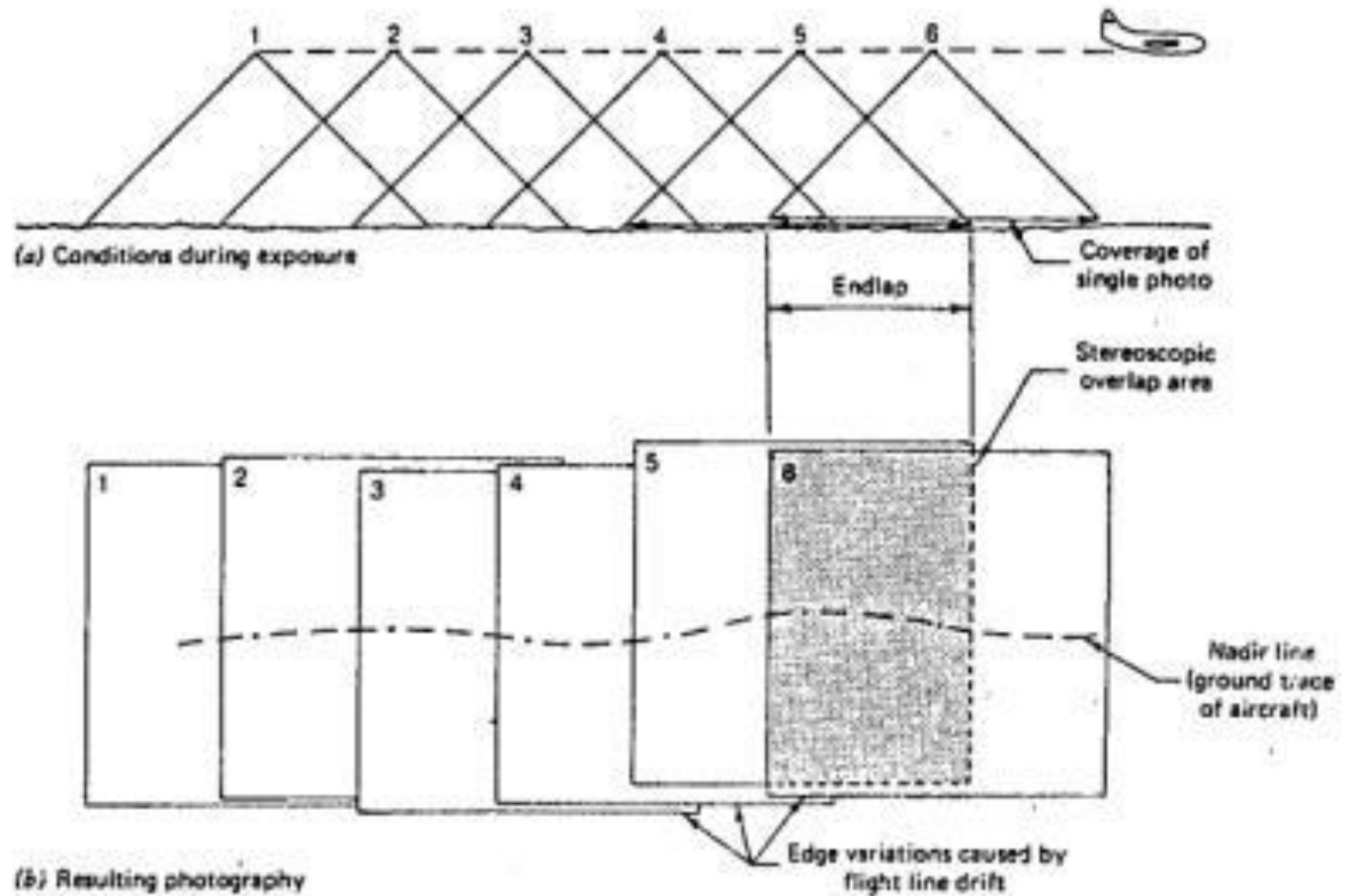
EMR'nin Yüzeylerde Yansımaları

Material	Percent Reflected
Fresh snow	80–95
Old snow	50–60
Thick cloud	70–80
Thin cloud	20–30
Water (sun near horizon)	50–80
Water (sun near zenith)	3–5
Asphalt	5–10
Light soil	25–45
Dark soil	5–15
Dry soil	20–25
Wet soil	15–25
Deciduous forest	15–20
Coniferous forest	10–15
Crops	10–25
Earth system	35

Yüksekliği Göre Uzaktan Algılama Türleri

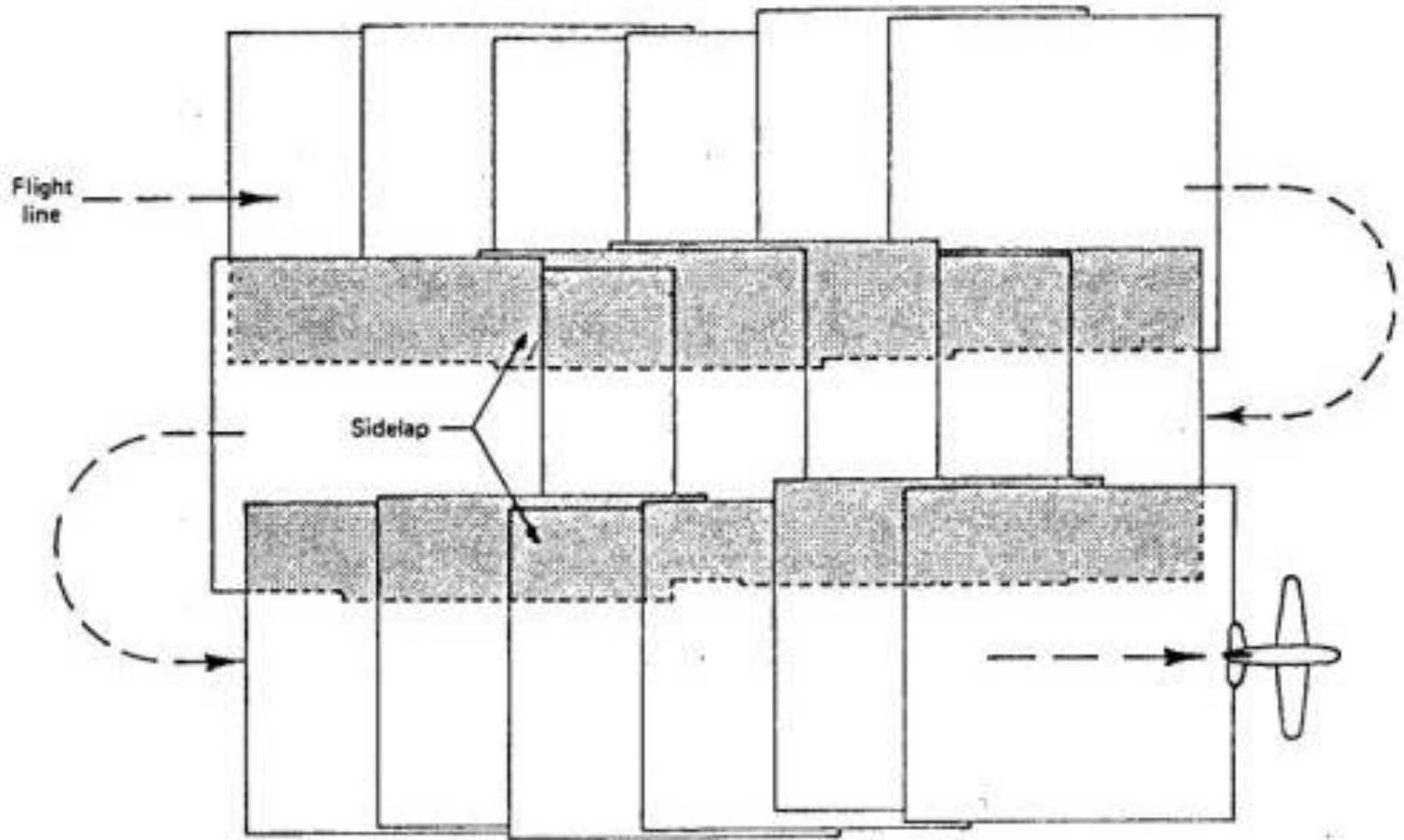


Hava Fotoğrafları



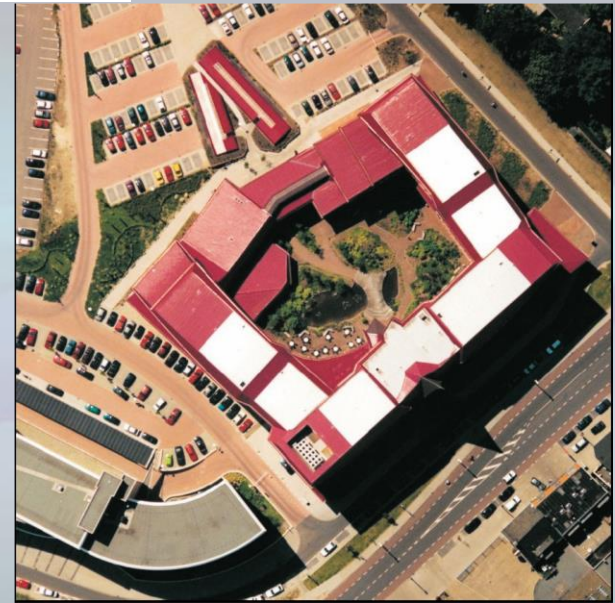
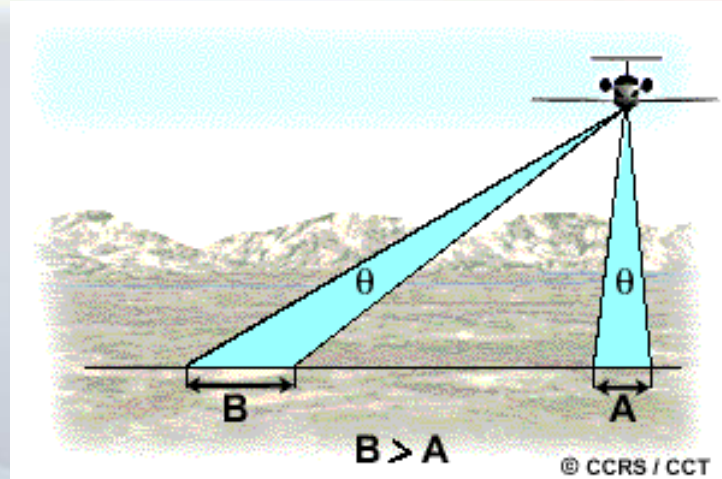
(a) Photographic coverage along a flight strip

Hava Fotoğrafları

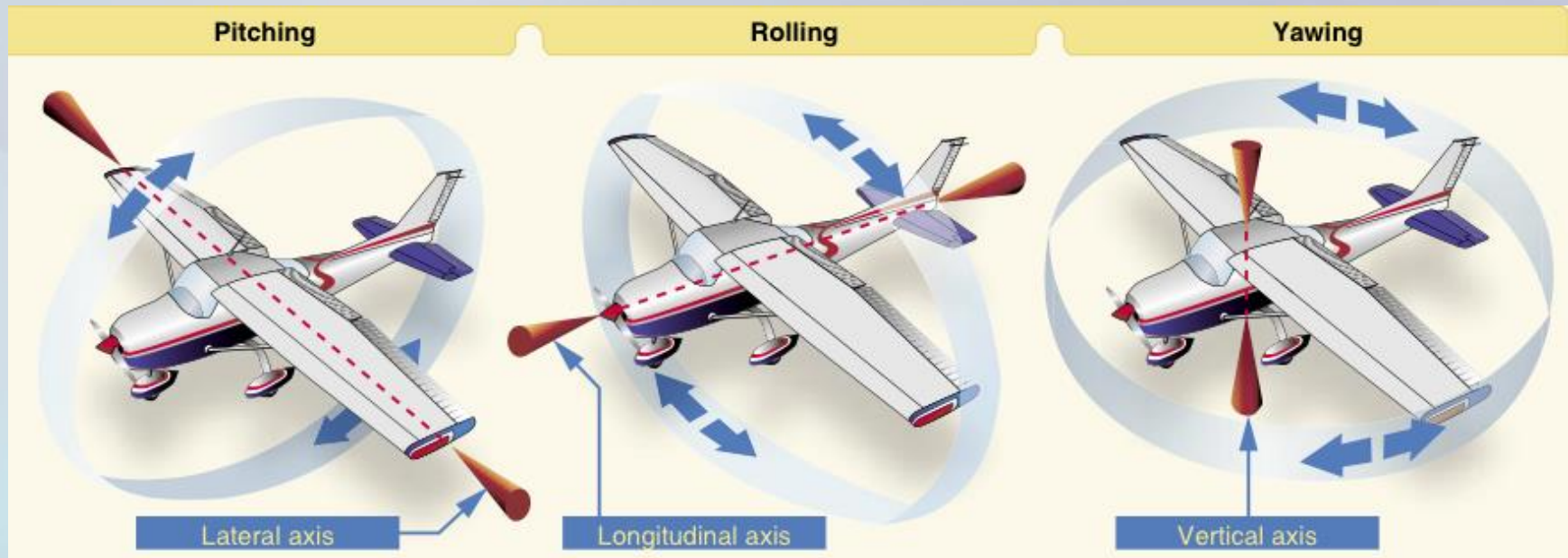


(b) Adjacent flight lines over a project area

Eğik (Oblique) – Dik (Vertical) Görüntüleme

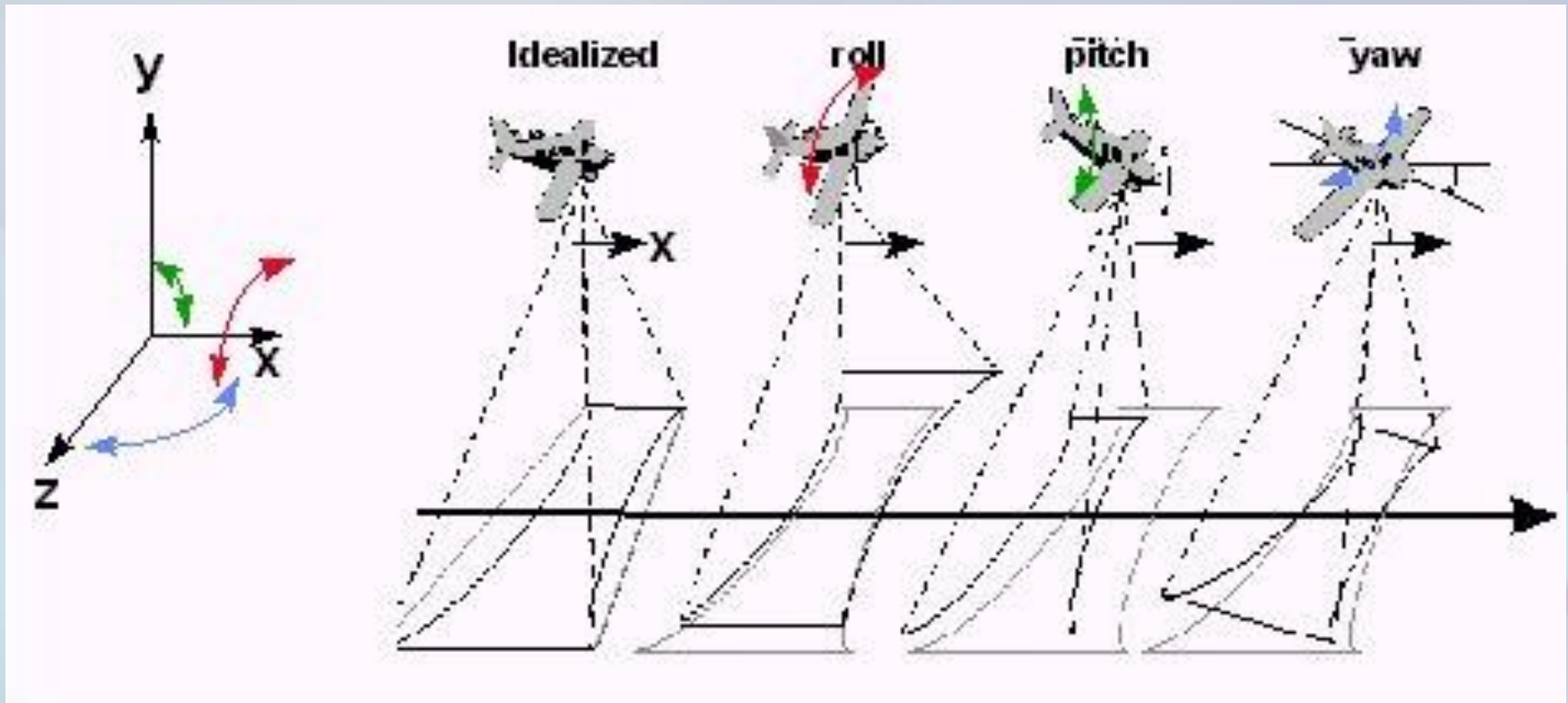


Hava Fotoğraflarında Bozulmalar

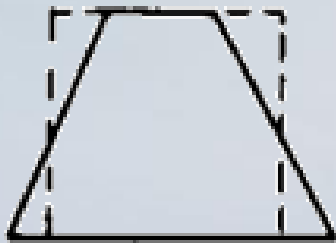


<http://jamiebeckett.com/three-axis-no-waiting/>

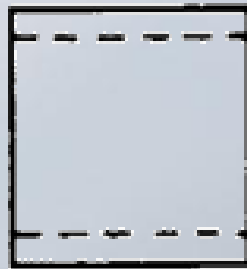
Hava Fotoğraflarında Bozulmeler



Hava Fotoğraflarında Bozulmeler



Altitude variation



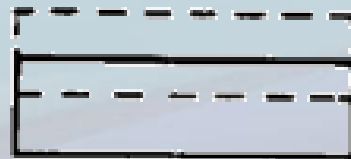
Spacecraft velocity



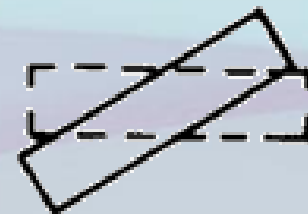
Earth rotation



Roll variation



Pitch variation

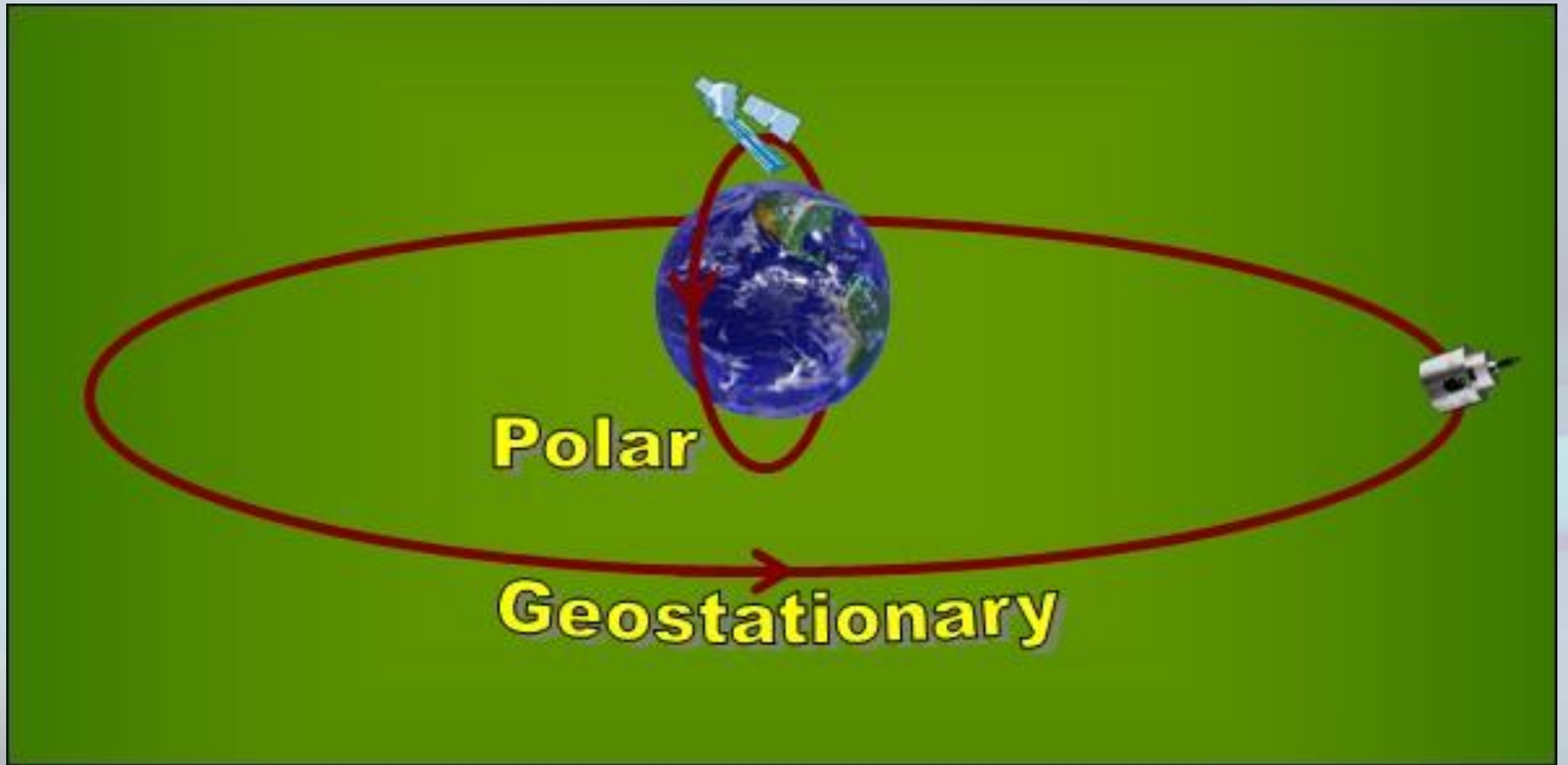


Yaw variation

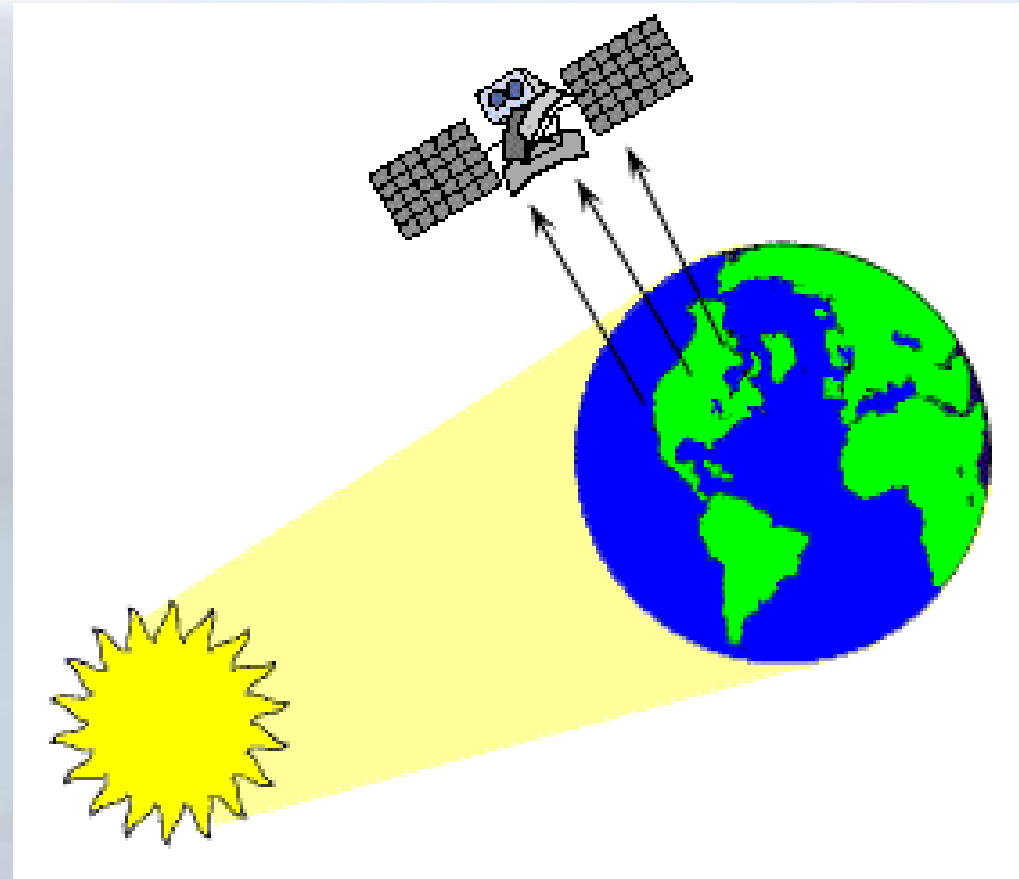
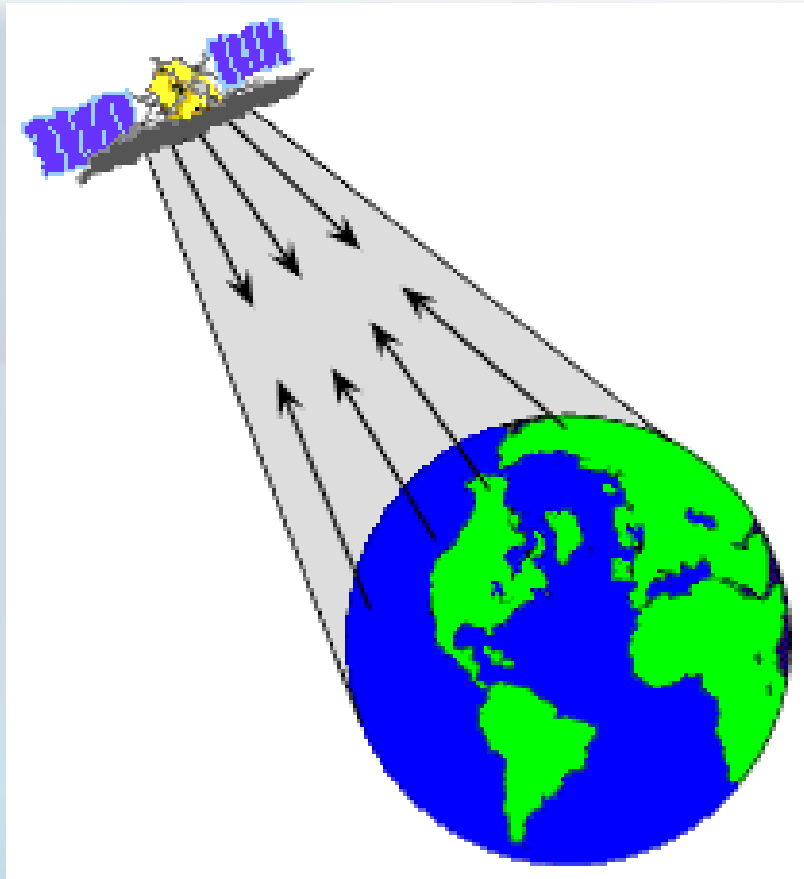
Uydu Yörüngeleri

**Jeostatik Yörünge
(Geostationary Orbit)**

**Kutupsal Yörünge
(Polar Orbit)**



Aktif – Pasif Uzaktan Algılama



Örnek: Radar, Lidar

<http://maprabu.blogspot.com.tr/2014/03/remote-sensing.html>

Aktif – Pasif Sensörler

ACTIVE SENSORS

Laser Fluorosensors

Typical excitation wavelength 355nm

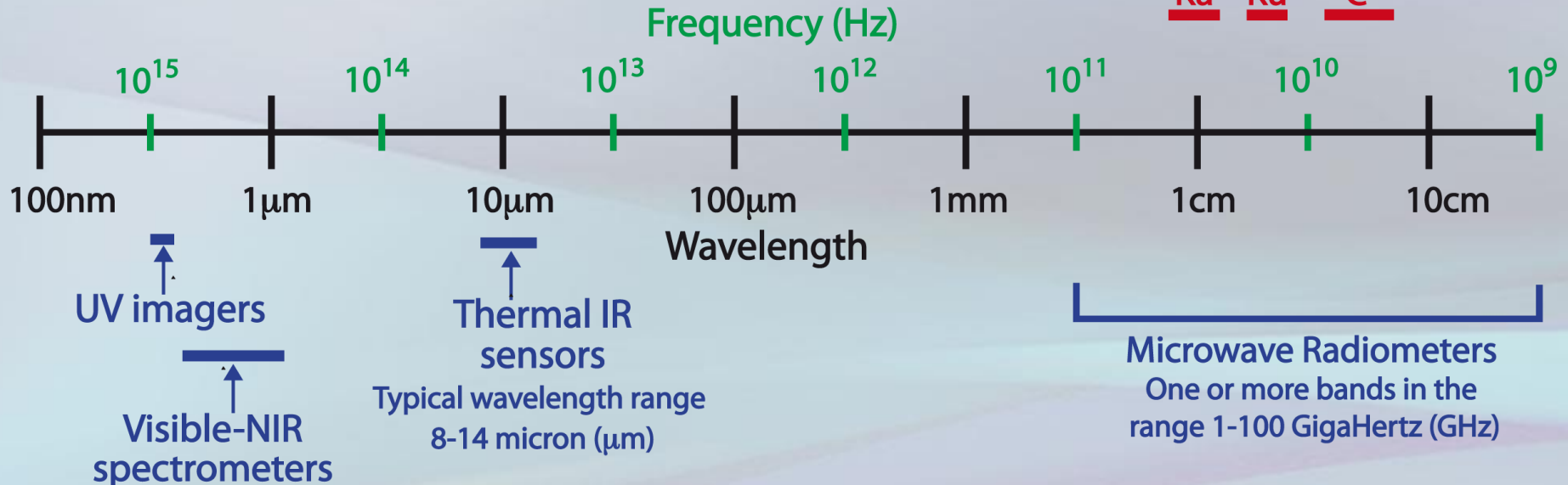
Emission measurements: 430-750nm



← Radar (SAR/SLAR) →

K X S L

Ka Ku C



PASSIVE SENSORS