

Satellite Bioclimatology

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Bioclimatology



Branch of climatology that deals with the effects of the physical environment on living organisms over an extended period of time.

-Encyclopedia Britannica

Bioclimatology is the interdisciplinary field of science that studies the interactions between the biosphere and the Earth's atmosphere on time scales of the order of seasons or longer.

-Wikipedia

Tools in vegetation study

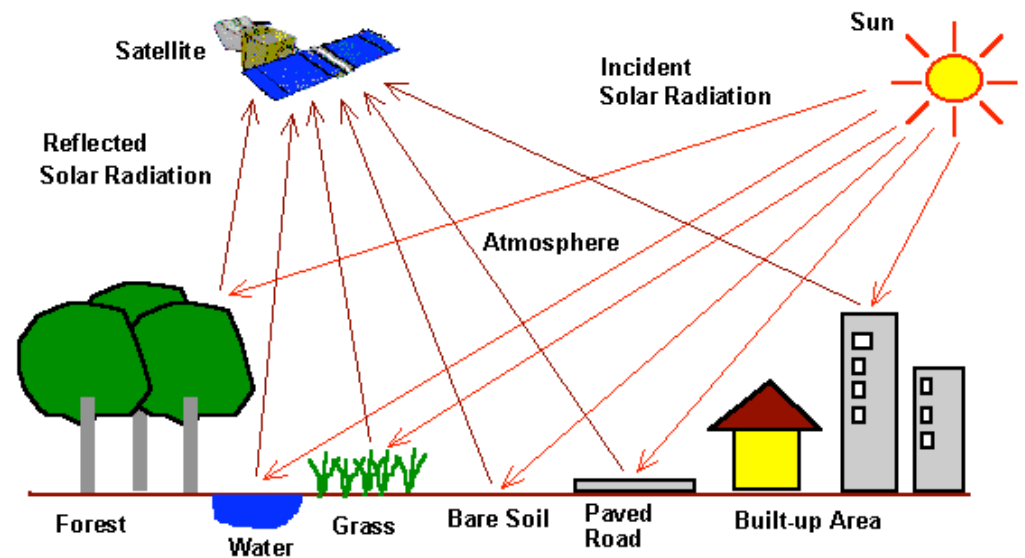
- Aerial/ground photography

Limited quantitative use

- Remote sensing

High temporal resolution

Spatially disaggregated measurements



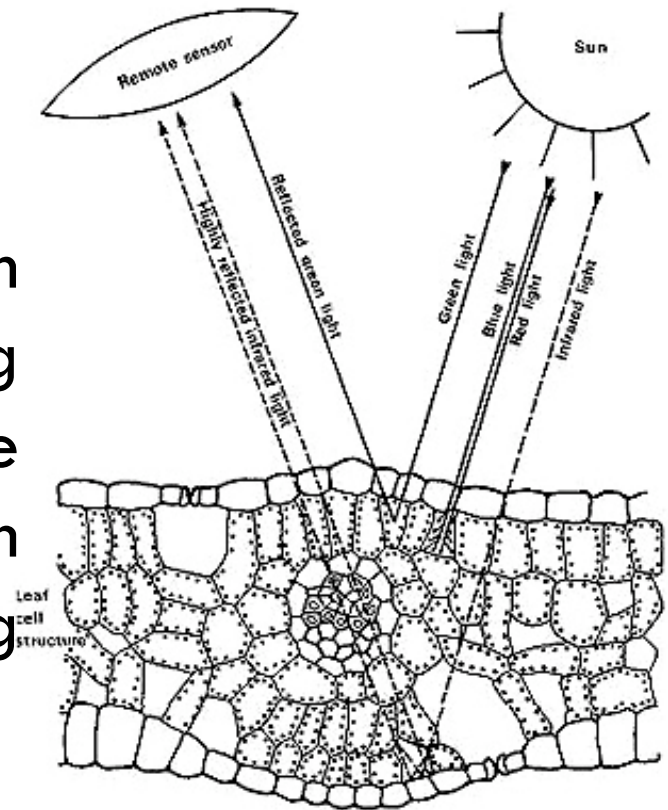
Satellite Bioclimatology



- Remotely sensed observations (Landsat, NOAA satellites) provide long term records vegetation activity eg. vegetation foliar status
 - Presence and magnitude of leaves
 - Pigment types and concentrations in the leaves

Remotely sensed vegetation indices

Chloroplast in the leaf interact with electromagnetic energy during photosynthesis that determine the spectral appearance of leaf when recorded using remote sensing instruments

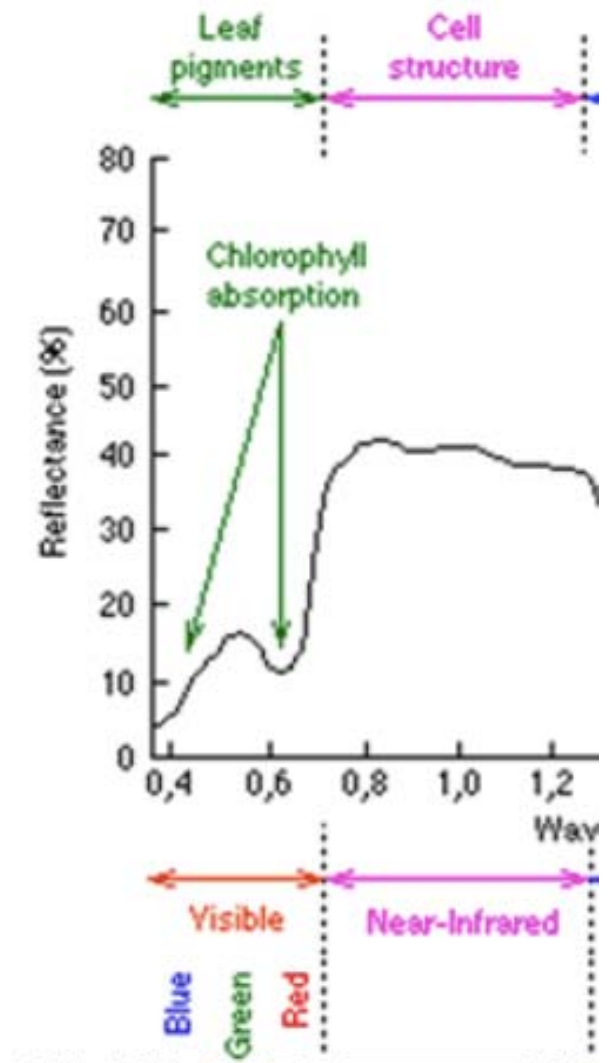


Remote sensed vegetation indices

Vegetation leaves strongly absorb visible light but don't absorb the light in near infrared spectral region.

Difference of visible vs. near infrared reflectance measures the presence of photosynthetically active vegetation surfaces.

It measures the ratio of total incident light which interacted with chloroplast (photosynthetically active element) to the amount of PAR absorbed by these elements

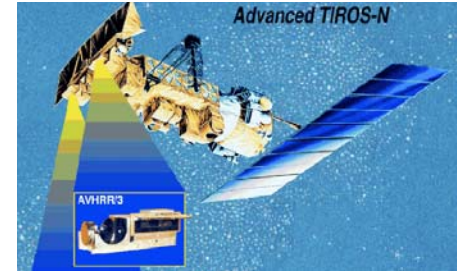


Remote sensed vegetation indices



- Provide a measure of active green foliage.
- Shown seasonal differences in magnitude of green foliage (i.e. green leaf area index, green biomass).
- NDVI and percentage APAR (Absorbed photosynthetically active radiation) appears to be quite stable over space and time.
- The relationship between proportion of incidence photosynthetically active radiation and VNVl is near linear.

AVHRR



- ❑ NOAA polar-orbiting series of meteorological satellite but now use in several other purposes.
- ❑ High temporal resolution (detail observation of global pattern twice daily)
- ❑ Expanded coverage
- ❑ Measure data on visible band (0.58-0.68 μm) and near infrared band (0.73-1.1 μm).
- ❑ Because of the cloud cover, clear sky view data is provided only twice a month

AVHRR



- Can be use for bioclimatic research (geography and seasonality of vegetation cover.
- Global carbon cycle.
- Biome-level net primary productivity.
- Seasonal cycles of temperature and precipitation.
- Annual vegetation productivity rates.
- **Current uses: sea surface temperature, volcanic eruptions, vegetated and non vegetated areas, snow cover mapping, fire monitoring, climate change.**

Beyond VNVI



- Solar spectrum
 - Analysis of lichens
 - Vegetation stress
 - Plant biochemistry
- Thermal infrared
 - Surface energy balance
 - Evapotranspiration
 - Vegetation stress
- Microwave
 - Soil moisture status
 - Surface roughness