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Satellite Remote Sensing of the Earth System

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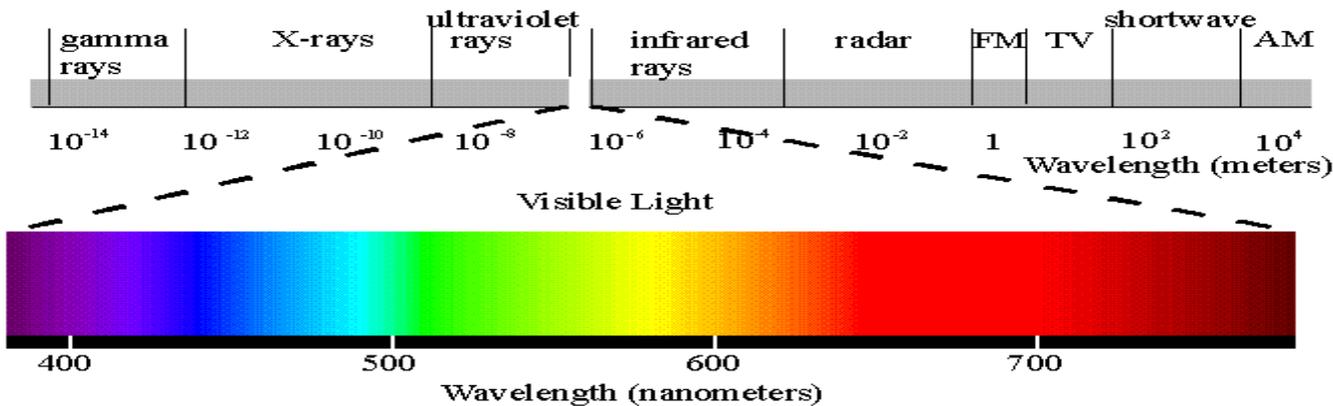
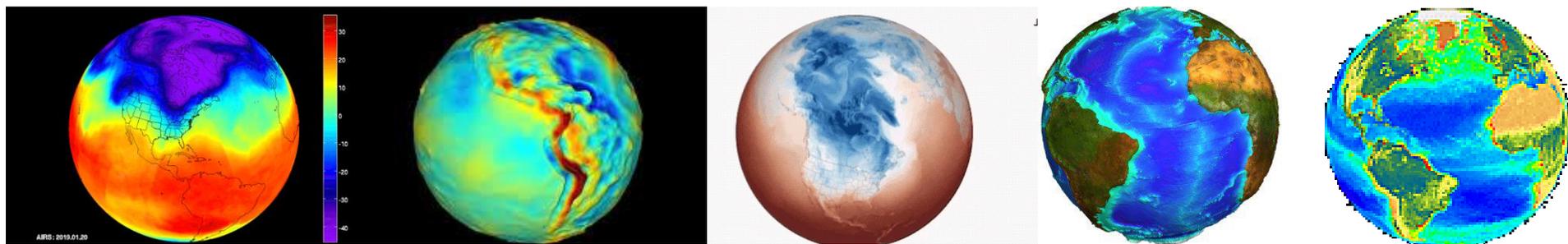
What is Remote Sensing?

Remote Sensing



https://www.esa.int/ESA_Multimedia/Images/2019/12/NASA_s_suite_of_operational_Earth_science_missions

Monitoring the Earth System



Monitoring the Earth System

The OCEAN...

*a driving force
for weather and
climate...*

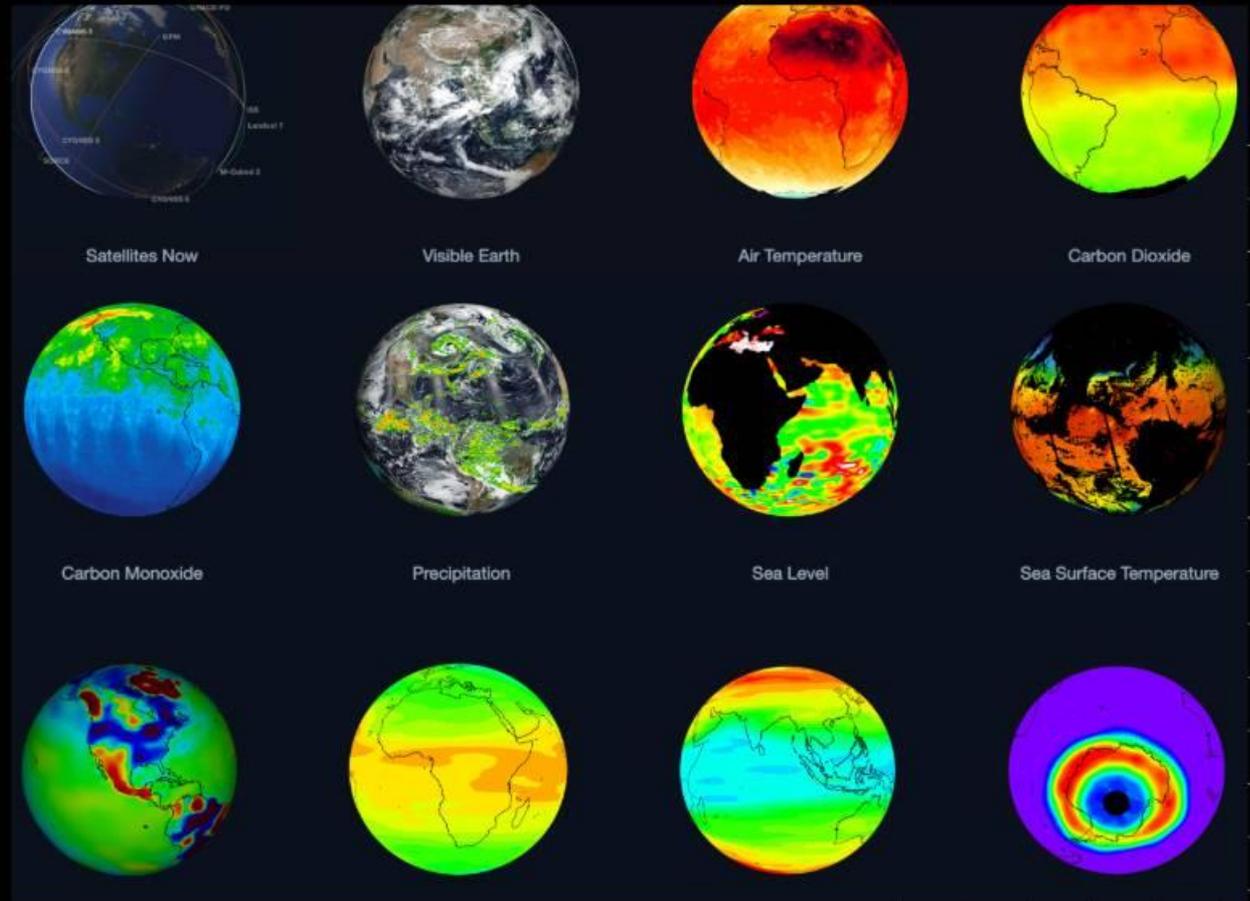


Earth is the water planet.

<https://www.youtube.com/watch?v=6vgvTeuoDWY>



NASA's Eyes on the Earth



- **More specific...**



<https://www.aviso.altimetry.fr/>



Oceanographic Applications



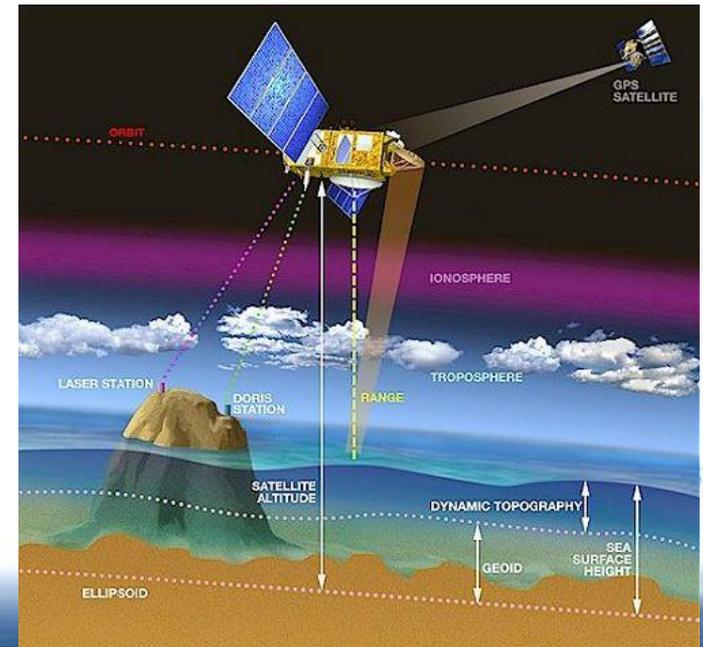
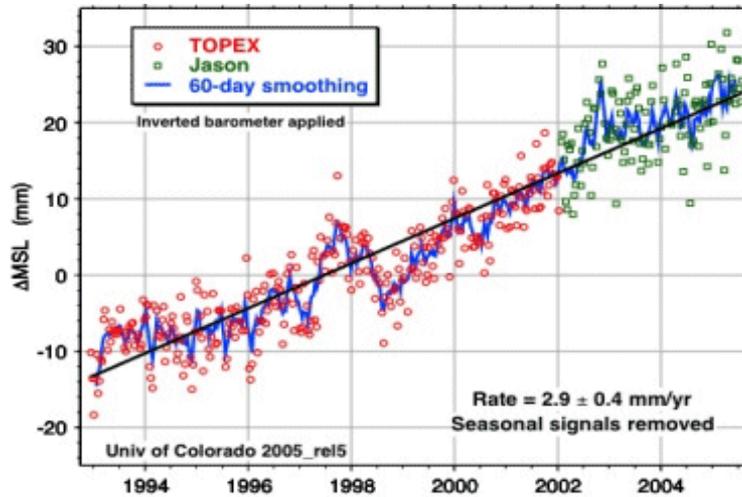
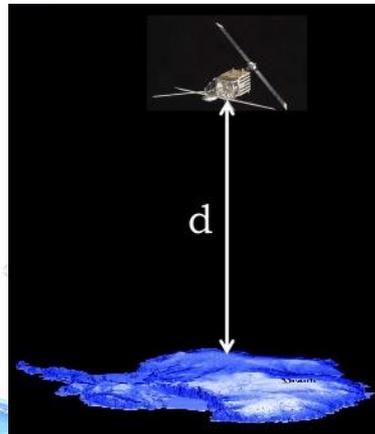
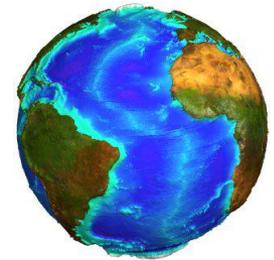
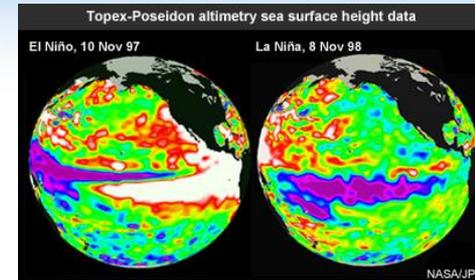
- *Sea Surface Height, SSH*
- *Sea Surface Temperature, SST*
- *Ocean Color, OC*
- *Sea Surface Winds, SSW*
- *Sea Surface Salinity, SSS*



Satellite Altimetry

Global change
ENSO
Circulations
Eddies, Fronts
Tides

Tsunamis
Significant wave height
Wind speed
Geodesy and bathymetry
Ice sheets



SST

- Important geophysical parameter

- *Heat flux* at the air-sea interface

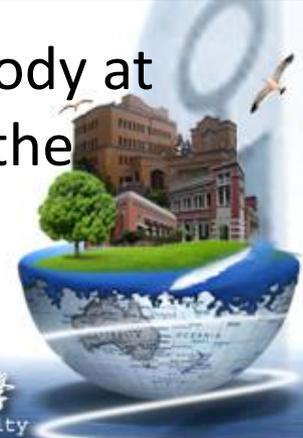
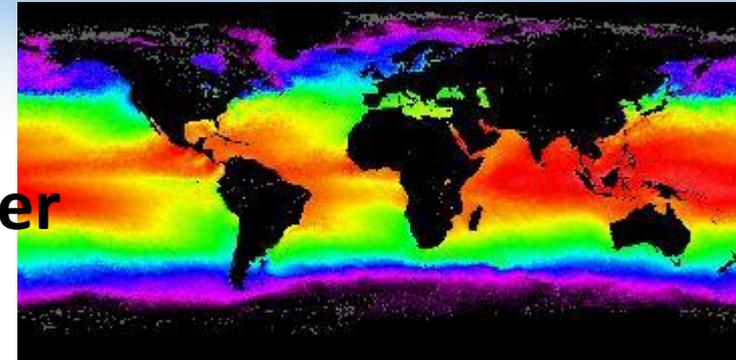
- Heat balance

- Biological productivity

- Planck's radiation can be described thus:

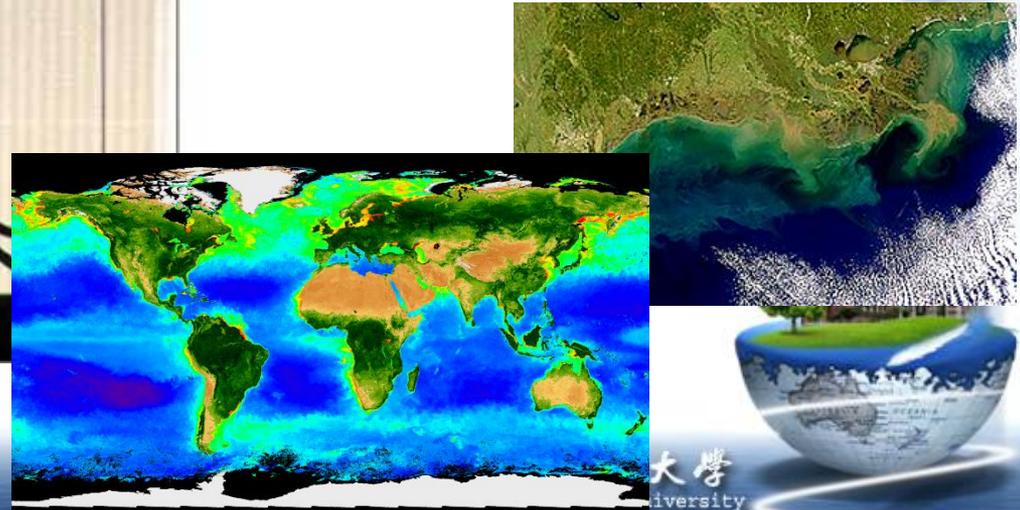
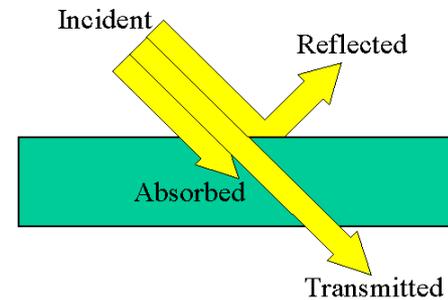
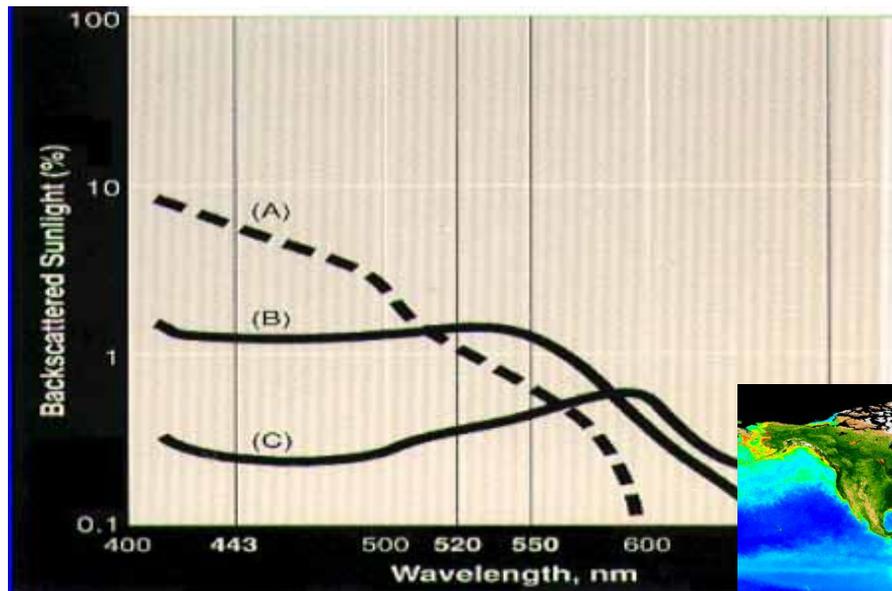
$$Radiance = \frac{2hc^2\nu^3}{e^{hc\nu/kT} - 1}$$

This is the Planck equation for radiance from a black body at an absolute temperature T , h is Planck's constant, c is the speed of light, k is Boltzmann's constant and ν is the wavenumber of the radiation



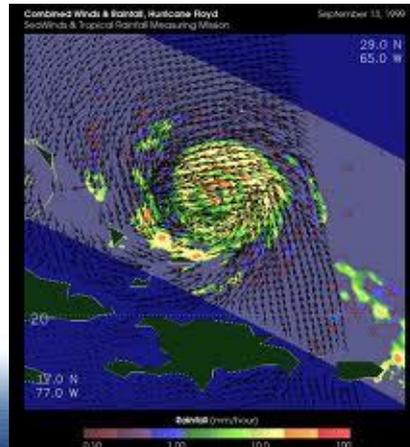
Ocean Color

- Phytoplankton cells contain **chlorophyll** that absorbs other wavelengths and contributes **green color** to ocean water



Sea Surface Winds

- Determine **air-sea interaction mechanisms** on various spatial and temporal scales.
- Better understand the mechanisms of **global climate change** and **weather** patterns.
- Improve **weather forecasts near coastlines** by using wind data in numerical weather models.

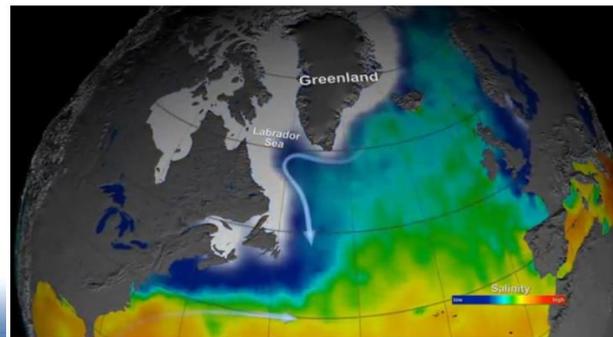
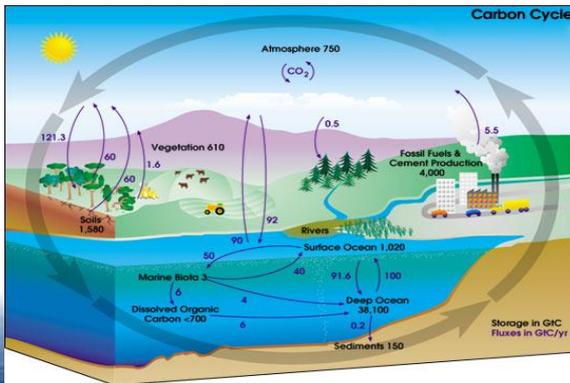
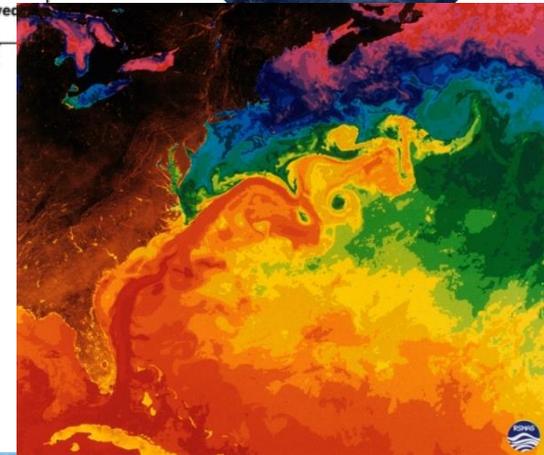
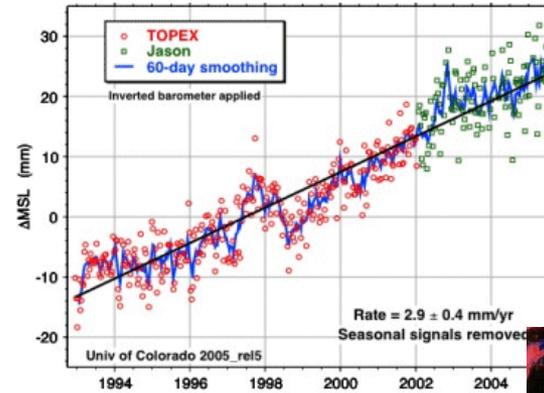


- **What's your plan?**



Scientific targets...

- *Sea level rise?*
- *Global warming?*
- *Ocean color*
- *Kuroshio variations?*
- *Sea Surface Winds*
- *Sea Surface Salinity*



References

- <https://podaac.jpl.nasa.gov/>
- <https://www.aviso.altimetry.fr/en/home.html>
- https://natural-resources.canada.ca/sites/nrcan/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf



Thank you!

思考中.....

