History and Future of remote sensing Applications

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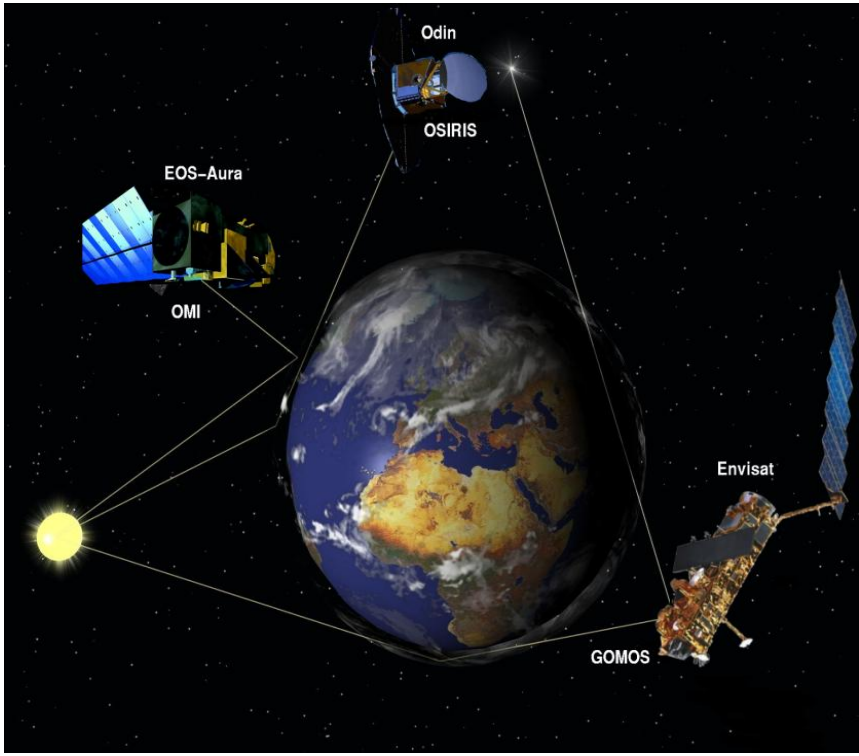
Definition

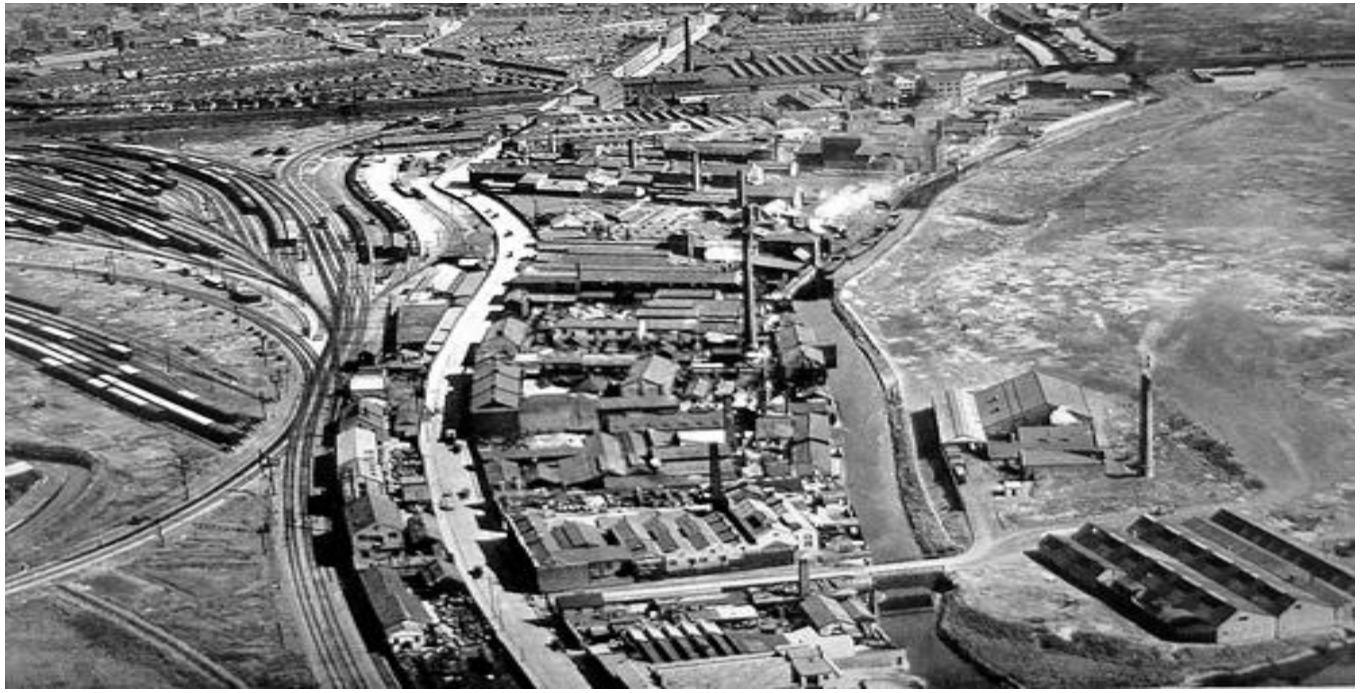
Remote sensing is

an acquisition of information of an object or phenomenon, by the use of sensing device(s) that are not in physical contact with the object, usually by Electromagnatic radiation sensor carried by an aircraft, spacecraft or satellite



RS applications - history

Applications of aerial photography slow to ‘take-off’ as seen as hobby for aristocrats in early 20th Century



RS applications - history

WW1 and WW2 saw applications development in mapping enemy positions and first uses of stereo aerial mapping to produce topographic information

RS applications - history

The first practical radar system was invented in 1935

RS applications - history

By 1940s, majority of all topographic maps produced by aerial photography in UK

Generally limited to mapping; ‘primitive’ local land cover and land use due to poor spectral resolution

RS applications - history

Durig1960s,Cold war induced space race which required development of meteorological satellites

- large areal coverage applications demands derived the intention towards the geostationary satellite platforms

- Geostationary satellite experiment began in 1966 with the launch of the first satellite of the Applications Technology Satellite (ATS) series. ATS-1, launched on December 7, 1966

RS applications - history

Commercial use of Polar Satellites started when Earth Resources Technology Satellite (ERTS-1) later called (Landsat 1) Launched on July 23, 1972 which provided wider application.

Current in Orbit (Landsat 5 & 7)

RS applications - history

- 17th May 1974 – The Launch of the Synchronous Meteorological Satellite (SMS), the first geosynchronous weather satellites.

- Successful launch of two experimental SMS satellites, SMS-1 and SMS-2, leaded to the Geostationary Operational Environmental Satellite (GOES) program formally began in 1975 as a joint effort of NOAA and NASA.

Currently GOES 12, 13, 14, 15 in Orbit

RS applications - history

- Meteosat-1, launched in 1977

Meteosat -9

- 1978, The Launch of NOAA polar-orbiting satellites with the instrument the Advanced Very High Resolution Radiometer (AVHRR). The Operational data archiving of AVHRR started in 1981

NOAA -19

To be replace by new series : *Joint Polar Satellite System* *(JPSS)*
JPSS -1 will be launched in November 2016

RS Applications-How

Since 1970s, environmental remote sensing applications has move from the category of:

- 1st order ecological questions (i.e. what is where)

To the applications category of :

- 2nd order ecological questions (i.e. what is the status of what is there)

1st order ecological questions

Some of the earliest applications of remote sensing and still the most popular

- What is where, e.g.
  - Weather systems
  - Land cover / land use mapping
  - Cartography
  - Disaster relief / media use of r.s. images
  - Geological prospecting
  - Deforestation

2nd order ecological questions

- What is the state / status of what is on seen, e.g.
  - Cloud Properties, Rainfall Estimate ,Wind Estimate
  - Estimation of biochemical properties
  - Estimating crop yield / plant health / biomass
  - Estimating sea surface temperature
  - Estimating soil and vegetation moisture

Requires a greater degree of understanding of EM / Earth surface interactions

That what we are going to do over the next few days !!

Future of Satellite systems

Example : NASA's Earth Science Enterprise Research Strategy for 2007 – 2016

1. Understand and improve predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition
2. Enable improved predictive capability for weather and extreme weather events
3. Quantify global land cover change and terrestrial and marine productivity and improve carbon cycle and ecosystem models

Future of Satellite Applications

Example : NASA's Earth Science Enterprise Research Strategy for 2007 – 2016

4. Quantify the key reservoirs and fluxes in the global water cycle and improve models of water cycle change and fresh water availability
5. Understand the role of oceans, atmosphere, and ice in the climate system and improve predictive capability for its future evolution
6. Characterize and understand Earth surface changes and variability of Earth's gravitational and magnetic fields
7. Expand and accelerate the realization of societal benefits from Earth system science

Earth system modelling

- Modelling all of these themes requires observations for calibrating and validating our understanding, from micro to global scales.

- Often remote sensing from space is the only economical tool with which we can acquire such data in large scale.

Conclusion: Remote sensing has a huge future potential role!!

Summary

- Remote Sensing applications Science is less than 100 year old.

- Remote sensing has a huge future potential role
- An understanding of Earth surface / EM radiation interactions is required to adequately interpret remotely sensed data