Bharathidasan University , Tiruchirappalli, Tamil Nadu

Programme: M.Tech Geoinformatics

Course: Remote Sensing
Unit 3: Remote Sensing Platforms

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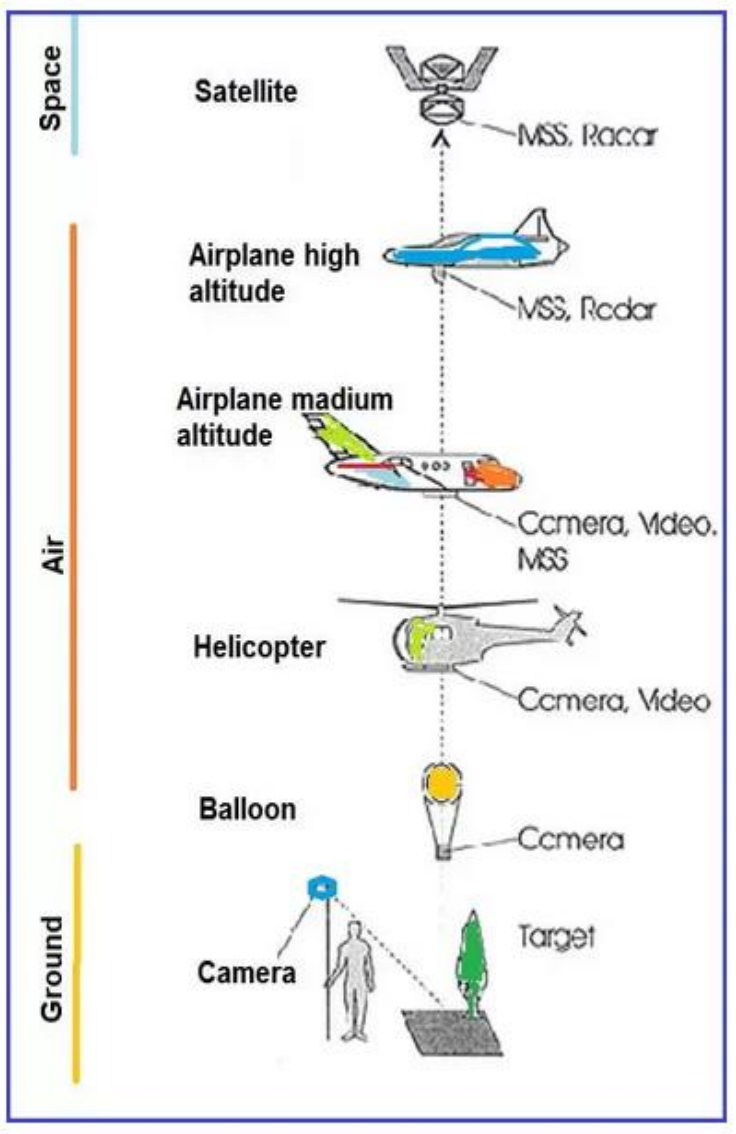
Platform

Figure 1: Remote sensing platforms of satellite, manned aviation and low-altitude UAV.

Published in IEEE Geoscience and Remote Sensing Magazine 2019

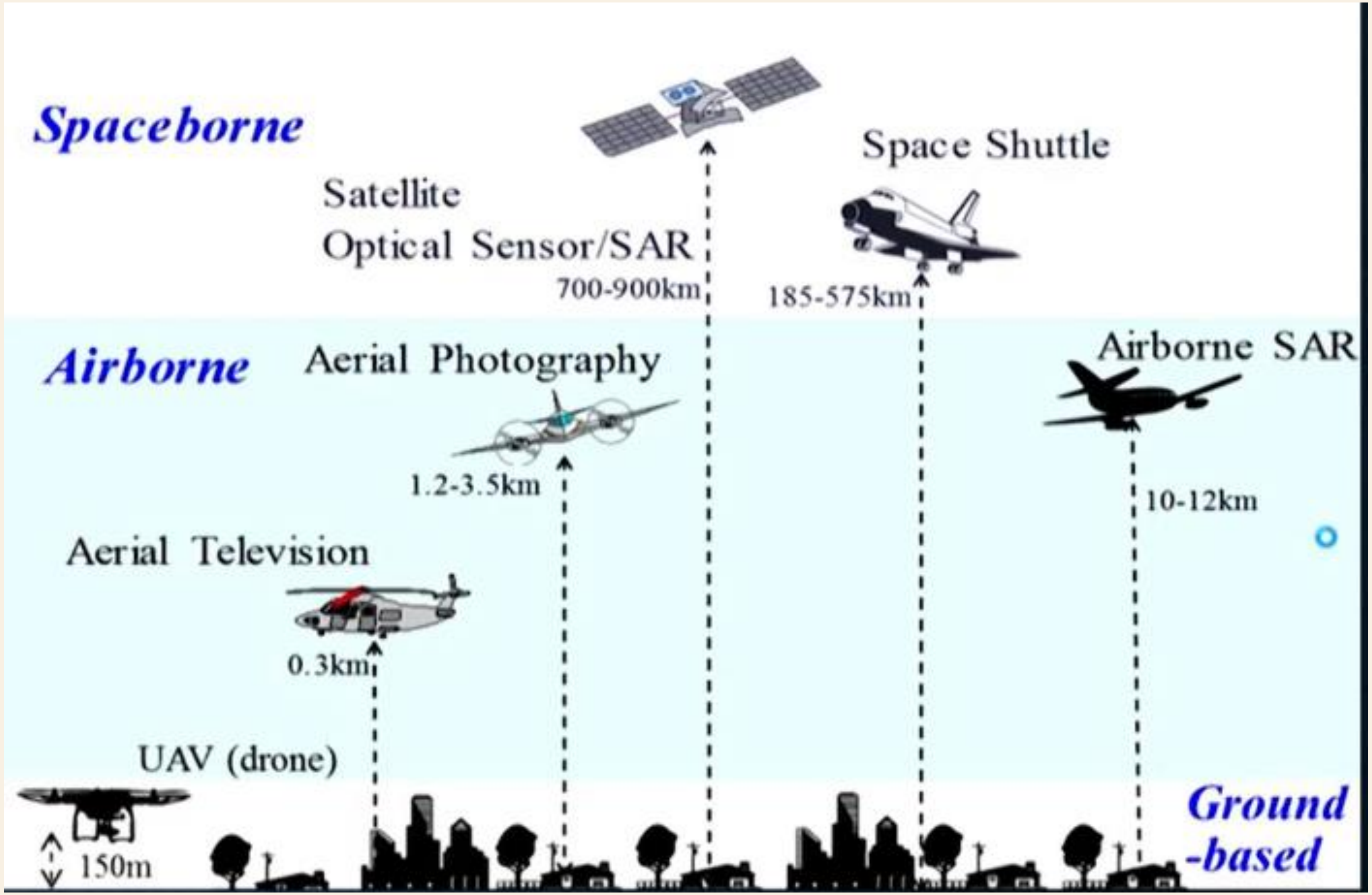
Mini-Unmanned Aerial Vehicle-Based Remote Sensing: Techniques, applications, and prospects

Tianzhu Xiang, Gui-Song Xia, Liang-pei Zhang



https://gisrsstudy.com/remote-sensing-components/

Platform

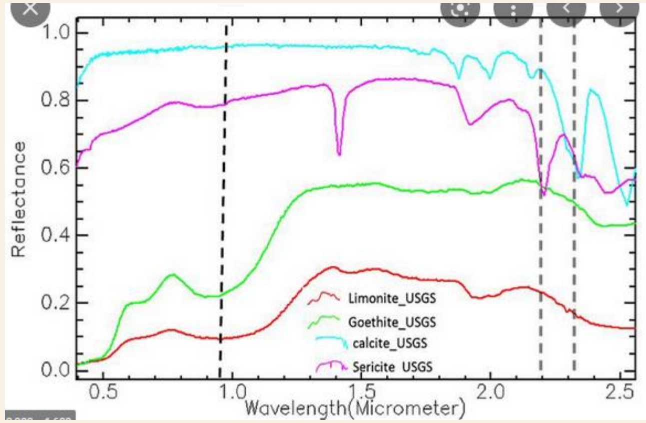


Spaceborne
Satellite
Optical Sensor/SAR
700-900km
Space Shuttle
185-575km
Airborne
Aerial Photography
1.2-3.5km
Airborne SAR
10-12km
Aerial Television
0.3km
UAV (drone)
150m
Ground
-based

Platform

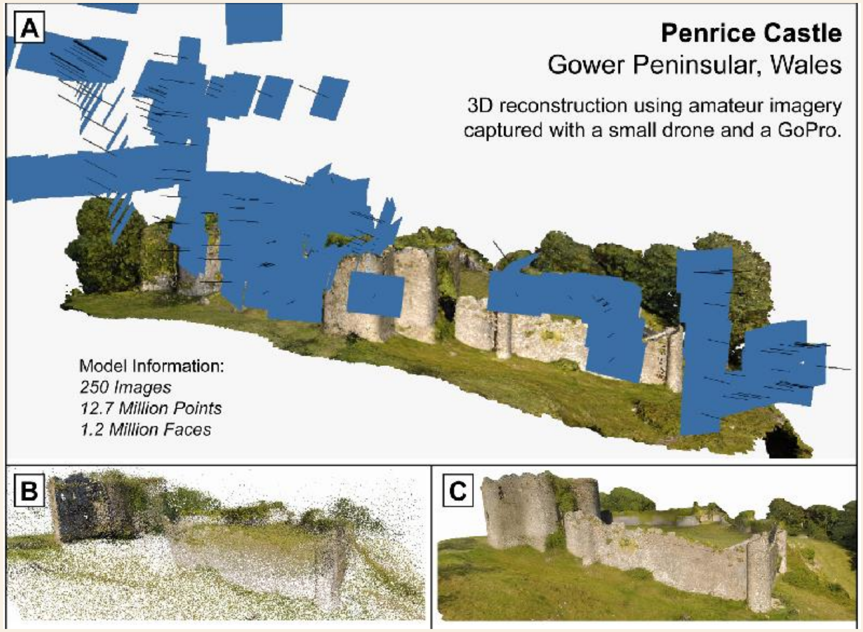
Ground Based Remote Sensing Platforms

- Often used to record detailed information about the surface which is compared with information collected from aircraft or satellite sensors
- Sensors may be placed on a ladder, scaffolding, tall building, crane, etc



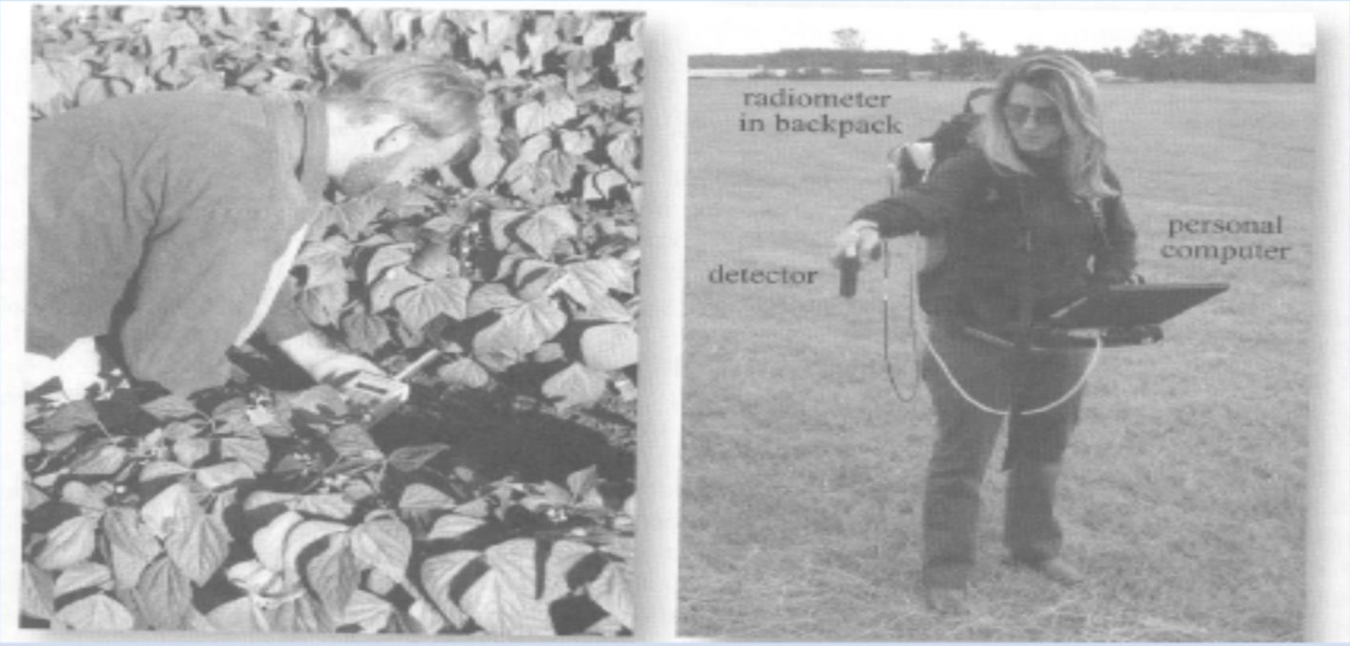
https://www.mdpi.com/2072-4292/13/11/2101/htm

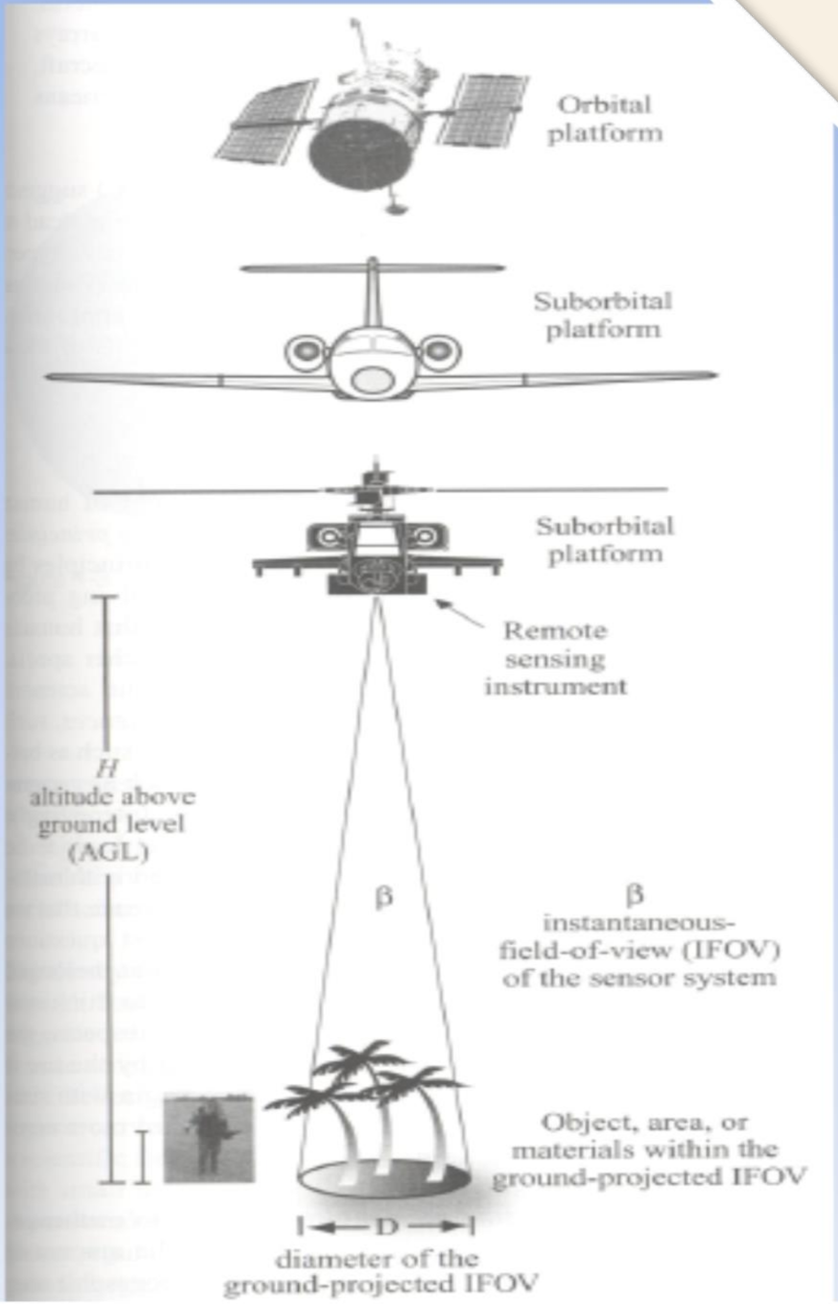
https://www.researchgate.net/figure/Figure-13-Illustrate-the-geometry-of-close-range-photogrammetry-15_fig2_334164581



https://www.elrha.org/project-blog/2d-3d-community-based-use-photogrammetry/

Aerial Photography as a Branch of Remote Sensing





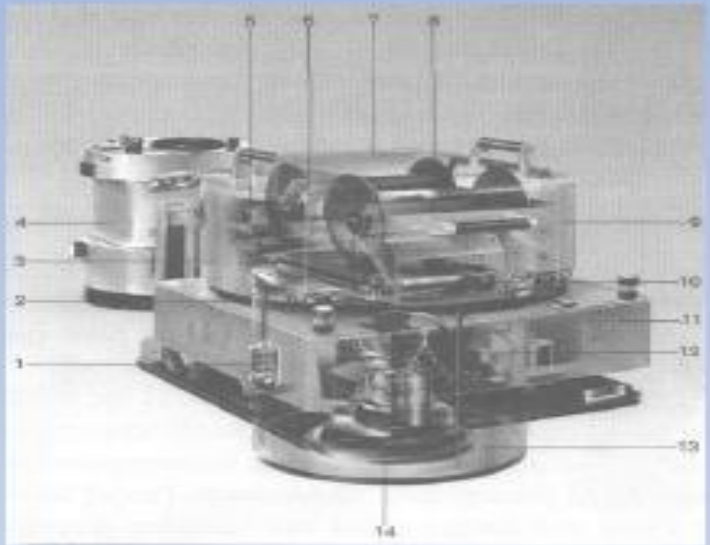
en (2007).

History of Aerial Platforms

Gaspard Felix Tournachon (1820 – 1910), who called himself Nadar, obtained the first aerial photograph, from a balloon, in 1858 near Paris, France, and patented the aerial survey as we now it today.

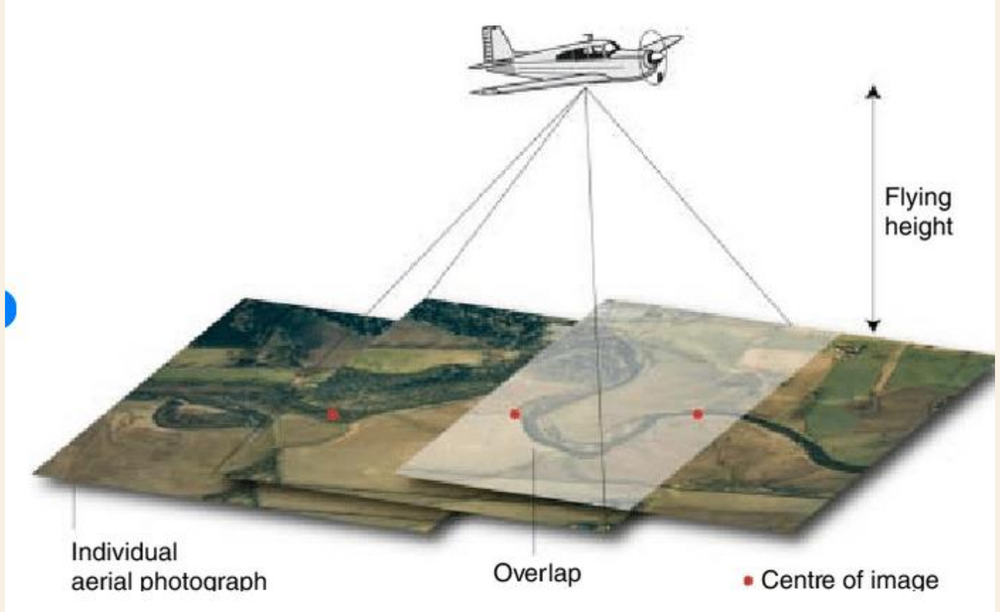
The first successful aerial photograph that there is a record of was taken in 1860, over Boston, USA, from a tethered balloon, by James W. Black, a professional photographer from the firm Black & Bathelder.

Modern Analog Aerial Camera

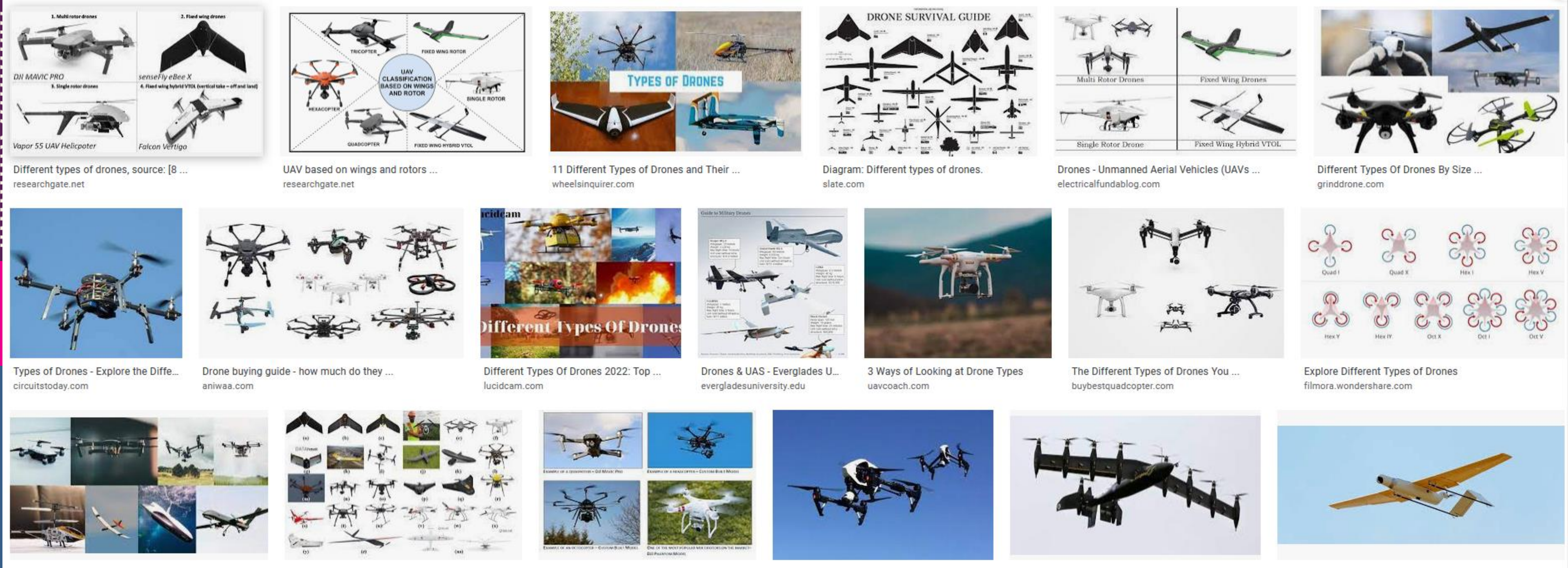


Platform

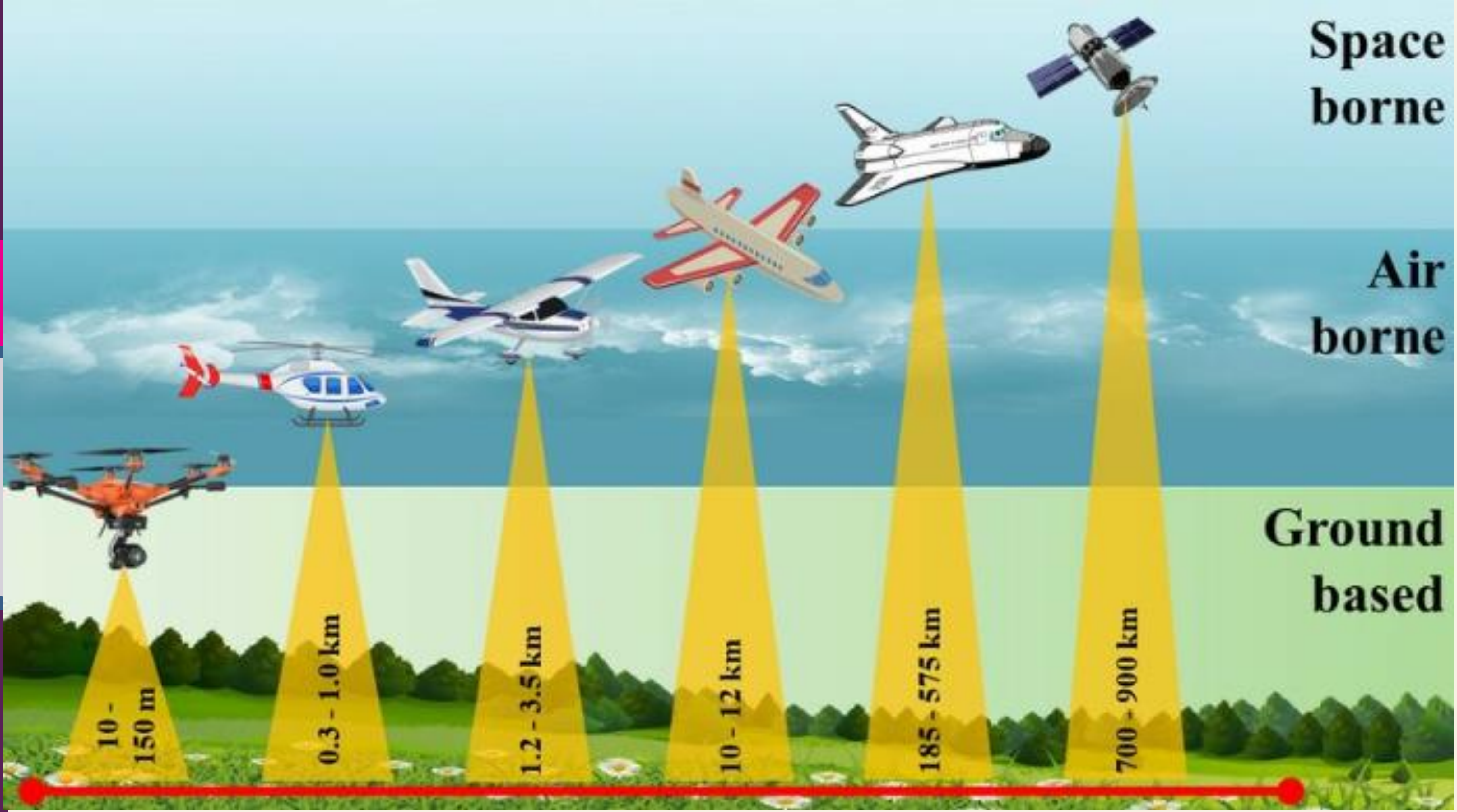
Airborne Remote Sensing Platforms



https://www.researchgate.net/figure/The-principles-of-aerial-photograph-acquisition-from-an-aircraft-to-allow-subsequent_fig9_301611257

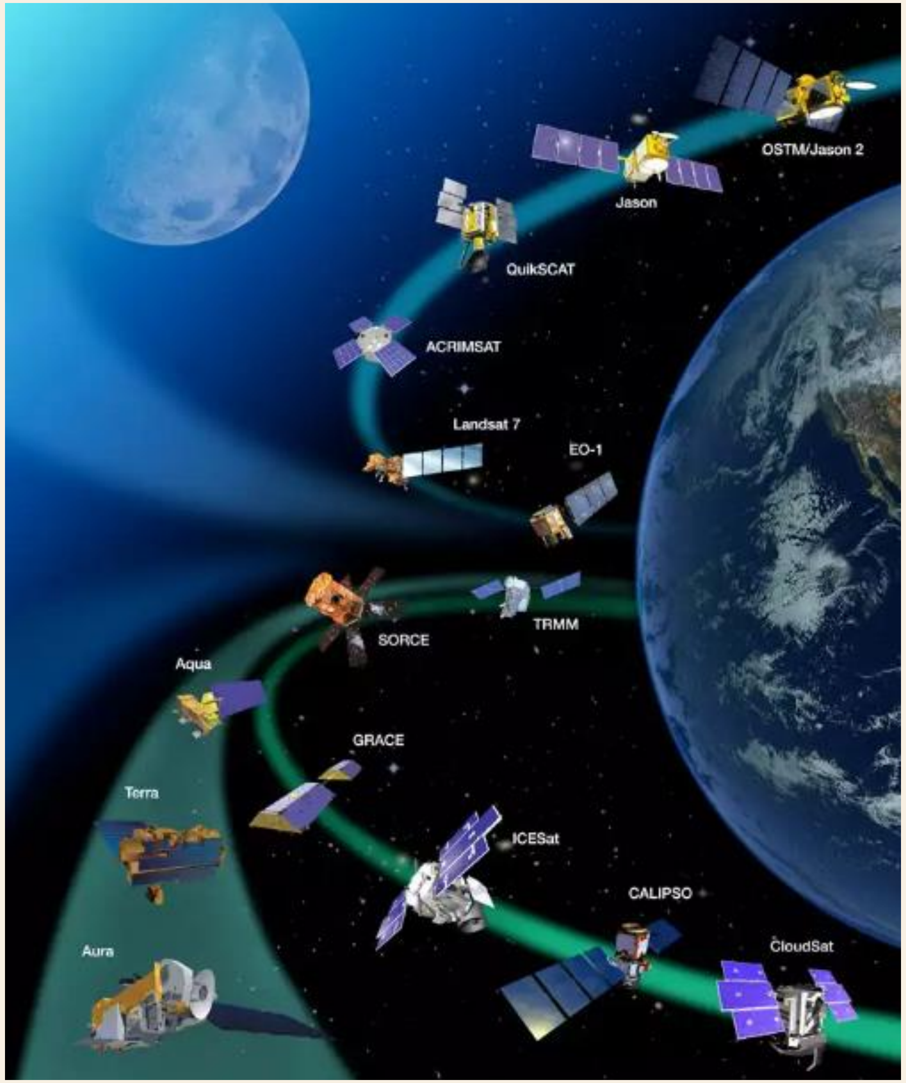


UAV Platform


Space borne
Air borne
Ground based
10 - 150 m
0.3 - 1.0 km
1.2 - 3.5 km
10 - 12 km
185 - 575 km
700 - 900 km

Platform

Space Platforms for Remote Sensing

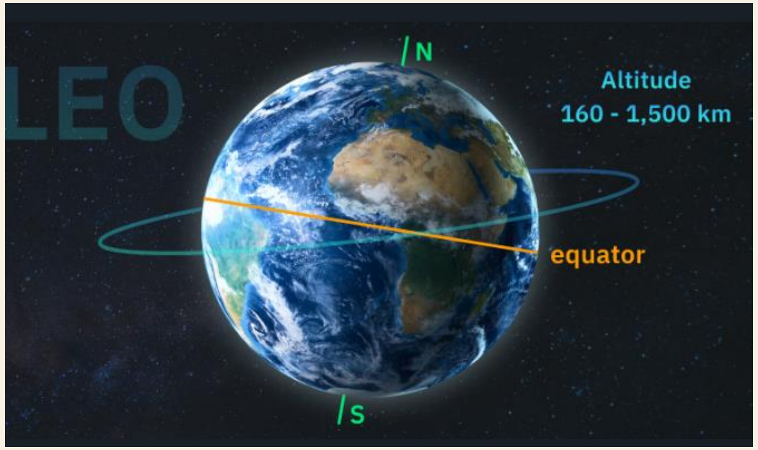


Low Earth Orbit (LEO) Satellites

Low Earth Orbit satellites are moving at an altitude of roughly 160–1,500 kilometers above the Earth's surface. They have a short orbital period, between 90 and 120 minutes, meaning they can travel around the planet up to 16 times a day. This makes them particularly well-suited to all types of remote sensing, high-resolution earth observation, and scientific research, as data can be acquired and transmitted rapidly.

All the types of satellites in LEO can vary the angle of their plane relative to the Earth's surface. Low Earth type of orbit is very common, as it provides more potential paths for spacecraft to take. However, because of their proximity to the Earth, they have a smaller coverage area than other satellite types. Often, groups of LEO spacecraft, known as satellite constellations, are launched together to form some type of net encircling the Earth. This lets them cover huge areas simultaneously by working together.

Starlink Project of SpaceX: Constellations of 4,200 plus satellites are placed in LEO at a distance of 550 km

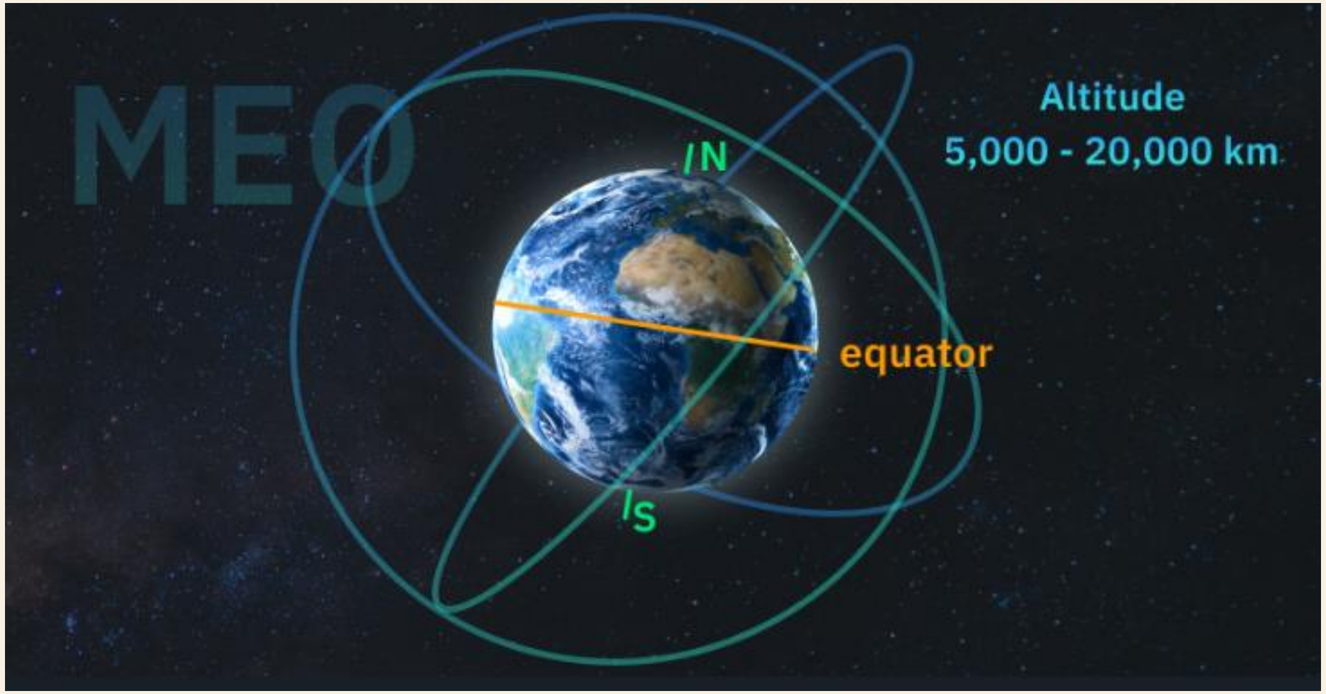


https://eos.com/blog/types-of-satellites/

Medium Earth Orbit (MEO) Satellites

A Medium Earth type of orbit is located between low Earth and geostationary orbits, typically at an **altitude of about 5,000 to 20,000 kilometers**. Positioning and **navigation services, like GPS**, extensively use MEO type of satellites. Recently, high-throughput satellite (HTS) MEO constellations have been put into operation to enable low-latency data communication to service providers, commercial and government organizations.

With their longer orbital period (usually between 2 and 12 hours), this type of satellites offer a happy medium between coverage area and data transmission rates. Compared to low Earth orbit spacecraft, MEO ones require fewer devices to give worldwide coverage, but their time delay is longer and their signals are weaker.

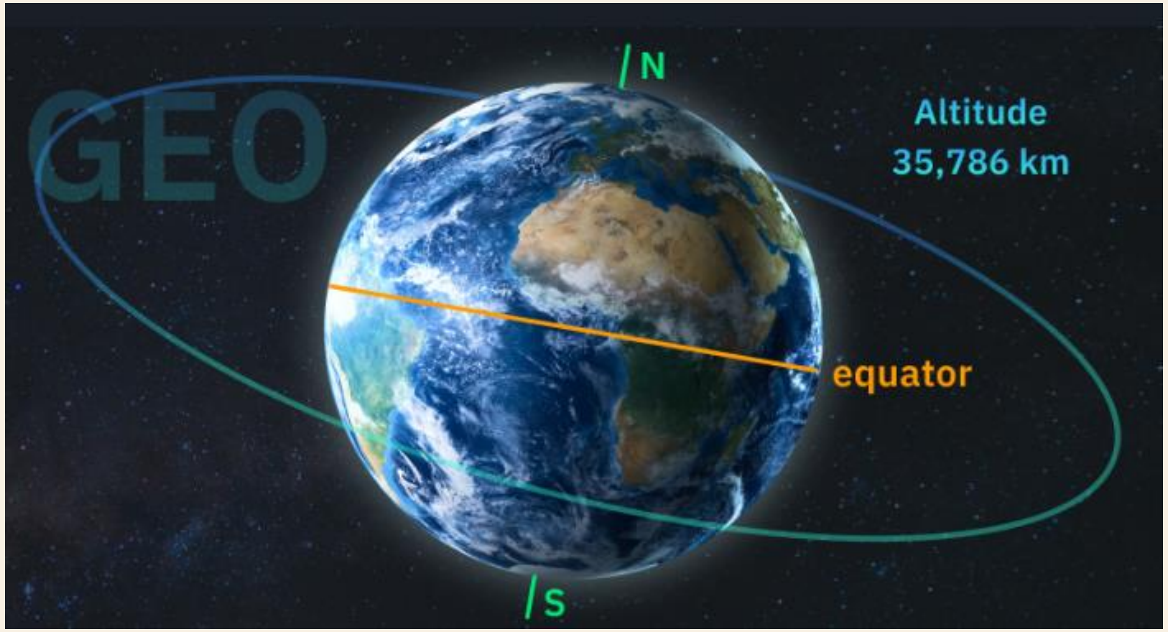


https://eos.com/blog/types-of-satellites/

Geostationary Orbit (GEO) Satellites

Spacecraft in geostationary Earth orbit are positioned **35,786 kilometers** above Earth's surface, precisely over the equator. Three evenly spaced machines in GEO can give nearly worldwide coverage thanks to the huge area they cover on Earth.

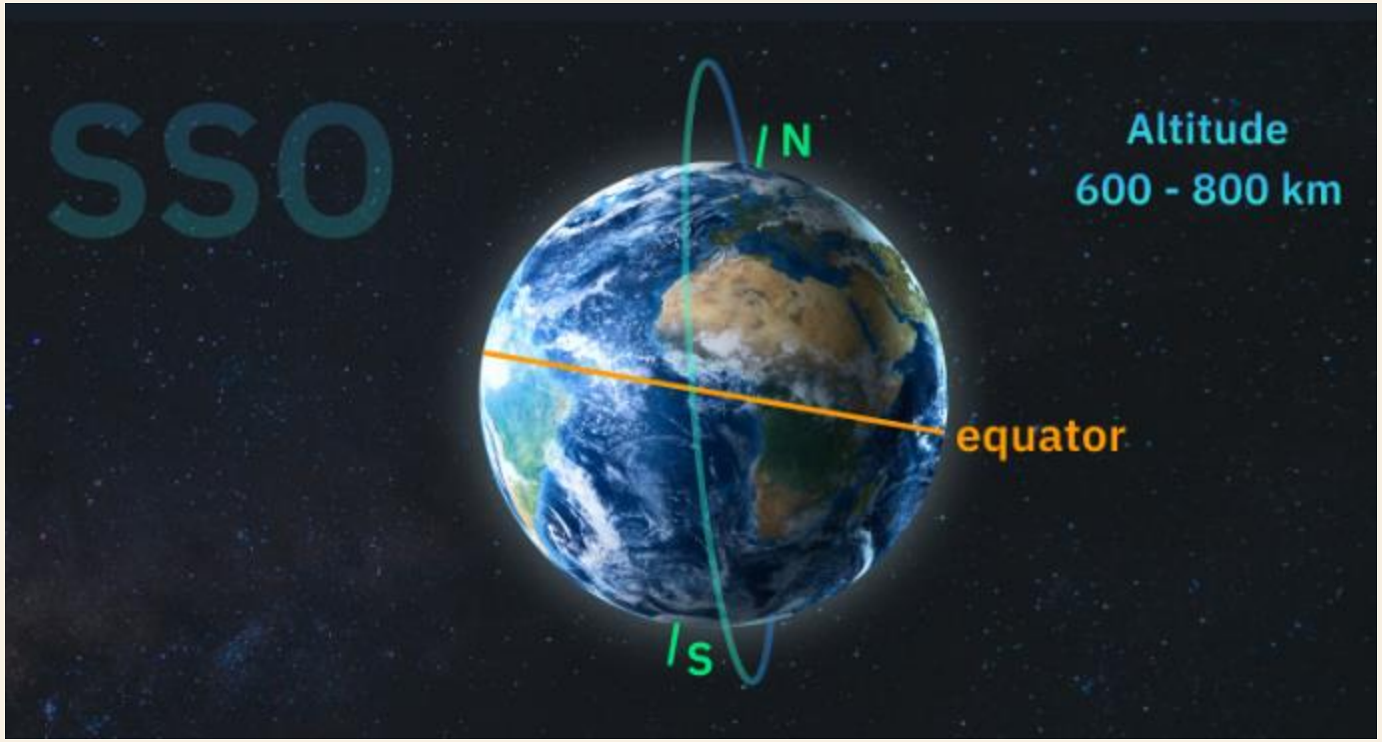
Objects in GEO appear motionless from the ground because their orbital period is identical to Earth's rotation — 23 hours, 56 minutes, and 4 seconds. This allows a terrestrial antenna to always point toward the same device in space. That's why this type of satellites is perfect for **always-on communication services like TV and phones**. Also, this type can be used in meteorology to keep an eye on the weather in particular regions and track the development of local patterns. The downside of GEO type of spacecraft for real-time communication is the longer signal delay caused by their great distance from Earth. **EX: INSAT**



https://eos.com/blog/types-of-satellites/

Sun-Synchronous Orbit (SSO) Satellites

The Sun-synchronous orbit type of satellites goes from north to south across the polar regions at an altitude of 600 to 800 km above the Earth. The orbital inclination and altitude of SSO spacecraft are calibrated so that they always cross any given location at precisely the same local solar time. Thus, the lighting conditions are consistent for imaging, making this type of satellite ideal for earth observation and environmental monitoring.



IRS / Cartosat / Resourcesat/Oceansat
Landsat
SPOT
IKNOS
Geoeye
Worldview

Envisat
Radarsat
Sentinel
Riasat

ICEYE / MAXER/Digital Globe
Planet

https://eos.com/blog/types-of-satellites/

Remote Sensing: Video Imaging Satellites

Jilin-1 Smart Video Satellites (4K HD)

Three (3) Jilin-1 Smart Video Satellites were successfully launched on November 21, 2017, from Jiuquan Satellite Launch Base provides 4K High Definition (HD) imagery in real-time monitoring and can capture live imagery for faster response and action happening on earth. An additional two (2) Jilin-1 Smart Video Satellites were launched on January 1, 2018.

Jilin-1 Smart Video Satellite imagery is usually supports and aids emergency personnel and management to gather information during a natural disaster or crisis to defense and security of our homelands. Jilin-1 provides video resolution of 1.13 meters with a revisit time of 3.3 days in a sun-synchronous orbit with an expected life span of 1 year.

https://www.satimagingcorp.com/satellite-sensors/jilin-1-satellite-sensor-1m/jilin-1-smart-video-satellite/

Thank You