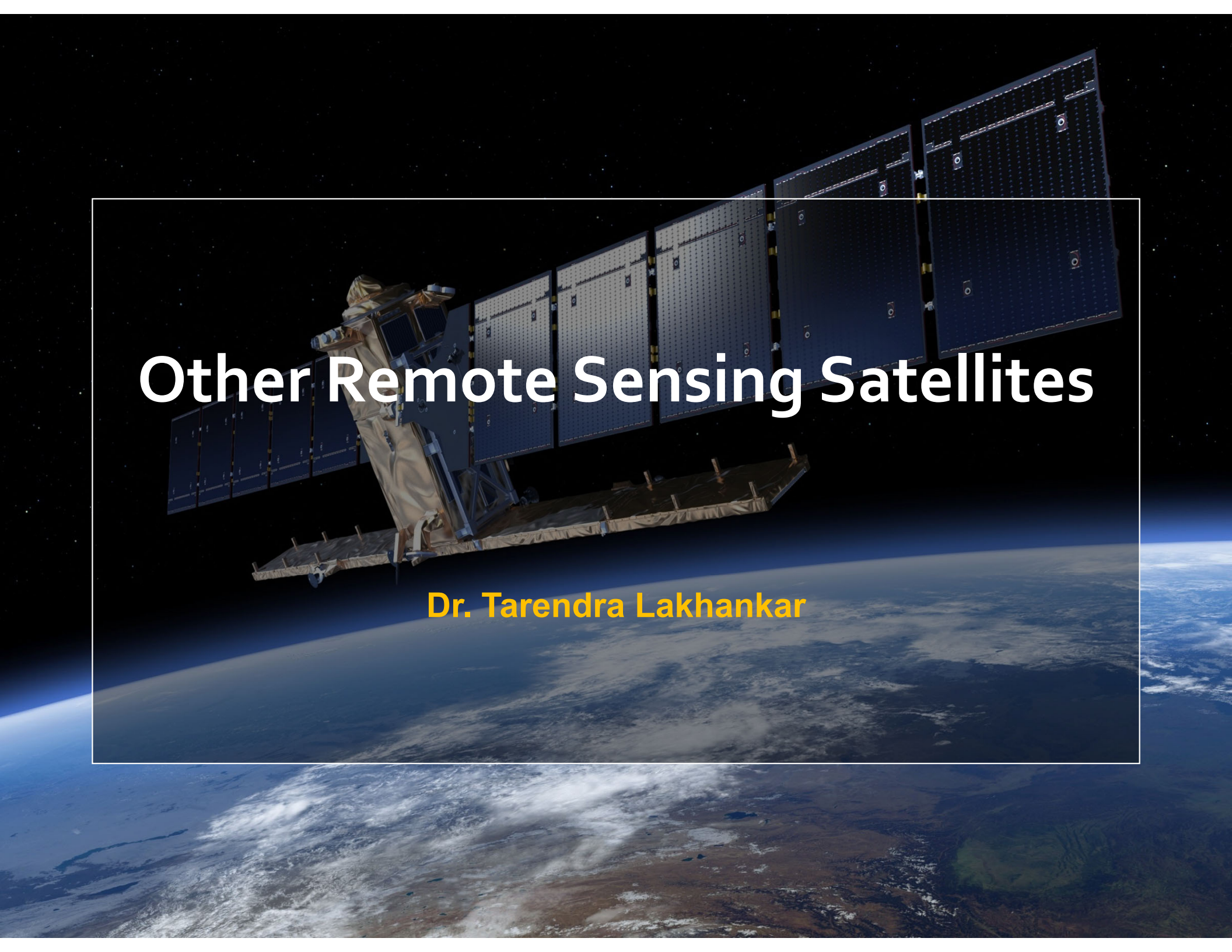
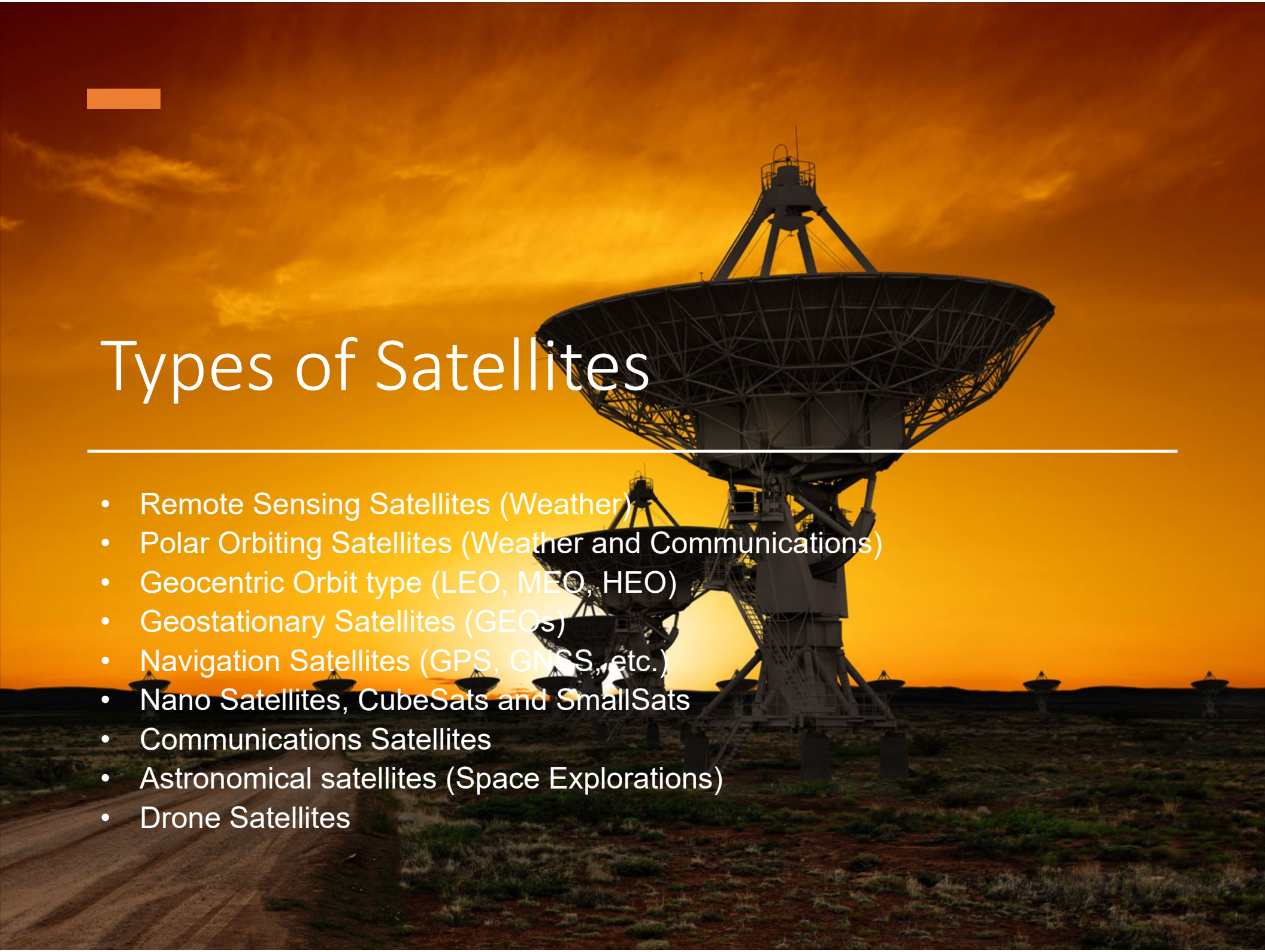


Other Remote Sensing Satellites

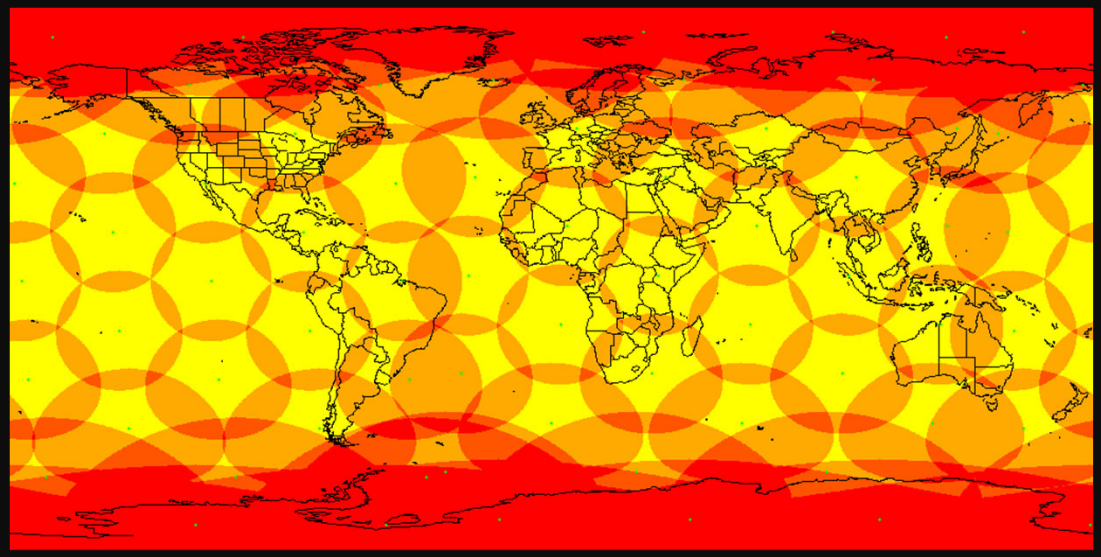
Dr. Tarendra Lakhankar



Types of Satellites

- Remote Sensing Satellites (Weather)
- Polar Orbiting Satellites (Weather and Communications)
- Geocentric Orbit type (LEO, MEO, HEO)
- Geostationary Satellites (GEOs)
- Navigation Satellites (GPS, GNSS, etc.)
- Nano Satellites, CubeSats and SmallSats
- Communications Satellites
- Astronomical satellites (Space Explorations)
- Drone Satellites

Communications Satellite



- An artificial satellite that relays and amplifies radio telecommunications signals via a transponder; it creates a communication channel between a source transmitter and a receiver at different locations on Earth.
- Many are in geostationary orbit 22,236 miles (35,785 km) above the equator, so that the satellite appears stationary at the same point in the sky, so the satellite dish antennas of ground stations can be aimed permanently at that spot and do not have to move to track it.
- There are about 2,000 communications satellites in Earth's orbit, used by both private and government organizations.
- Communications satellites are used for television, telephone, radio, internet, and military applications.

Coverage of Earth by the Iridium satellites, which are arranged in 6 orbits of 11 satellites each. Animation shows approximately 10 minutes.

Orbits for Communications satellites

- Geostationary satellites have a geostationary orbit (GEO), which is 22,000 miles from Earth's surface.
- Medium Earth orbit (MEO) satellites are closer to Earth. Orbital altitudes range from 1,200 to 22,000 miles above Earth.
- The region below medium orbits is referred to as low Earth orbit (LEO), and is about 99 to 1,200 miles above Earth.

Communication frequencies

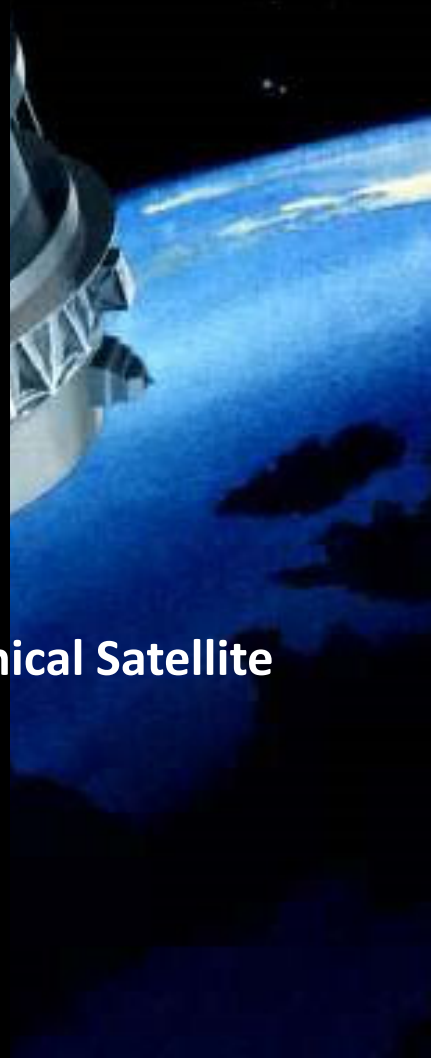
- Microwave band terminology
  - L band 800 MHz - 2 GHz
  - S band 2-3 GHz
  - C band 3-6 GHz
  - X band 7-9 GHz
  - Ku band 10-17 GHz
  - Ka band 18-22 GHz

The ITU coordinates the shared global use of the radio spectrum, promotes international cooperation in assigning satellite orbits, works to improve telecommunication infrastructure in the developing world, and assists in the development and coordination of worldwide technical standards.

The ITU is also active in the areas of broadband Internet, latest-generation wireless technologies, aeronautical and maritime navigation, radio astronomy, satellite-based meteorology, convergence in fixed-mobile phone, Internet access, data, voice, TV broadcasting, and next-generation networks.

Astronomical satellites

- An astronomy satellite is basically a big telescope floating in space.
- Because it is in orbit above the Earth, the satellite's vision is not clouded by the gases that make up the Earth's atmosphere, and its infrared imaging equipment is not confused by the heat of the Earth.
- Astronomy satellites, therefore, can "see" into space up to ten times better than a telescope of similar strength on Earth.

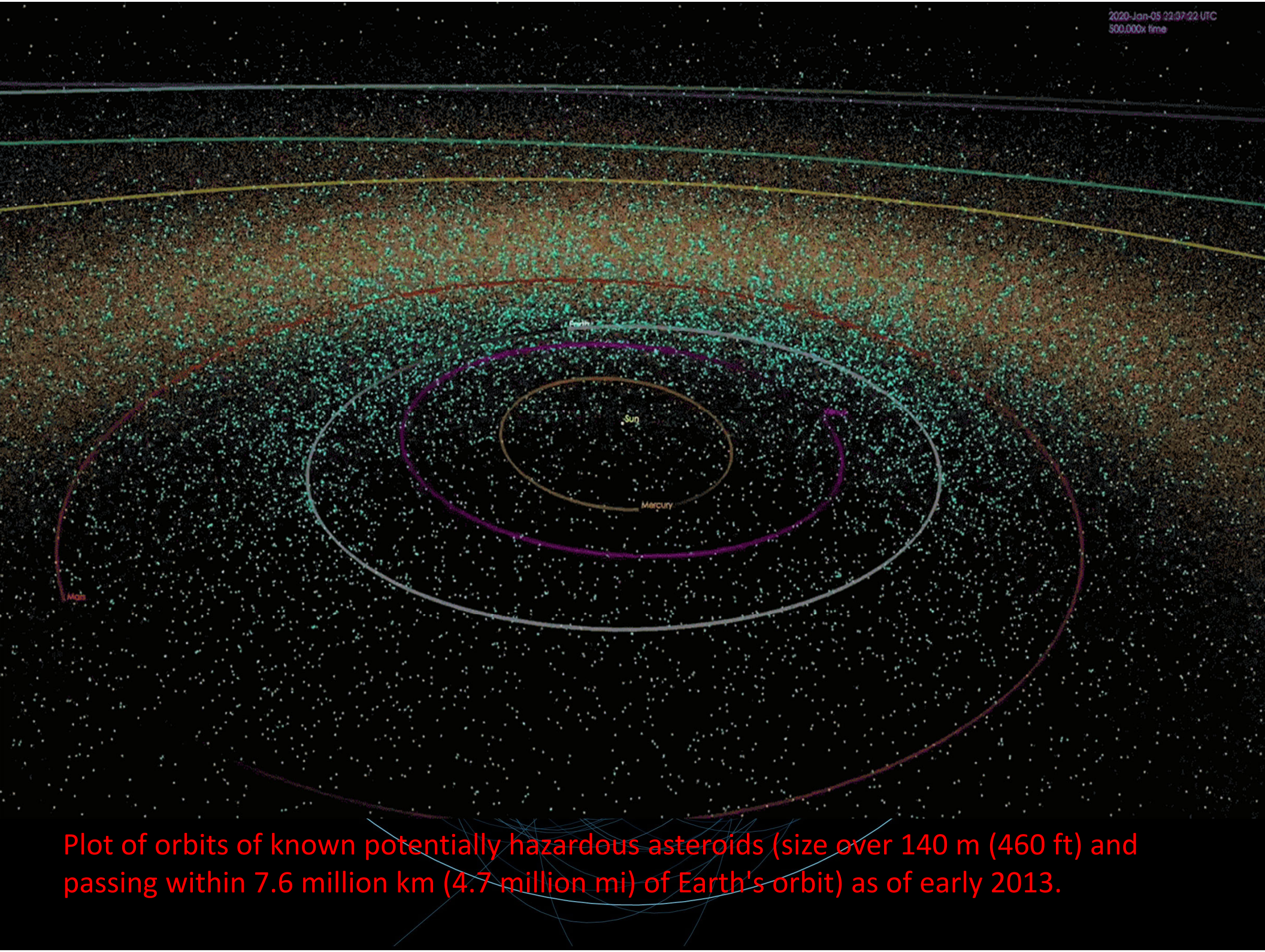


Infrared Astronomical Satellite

Astronomical satellites

Applications

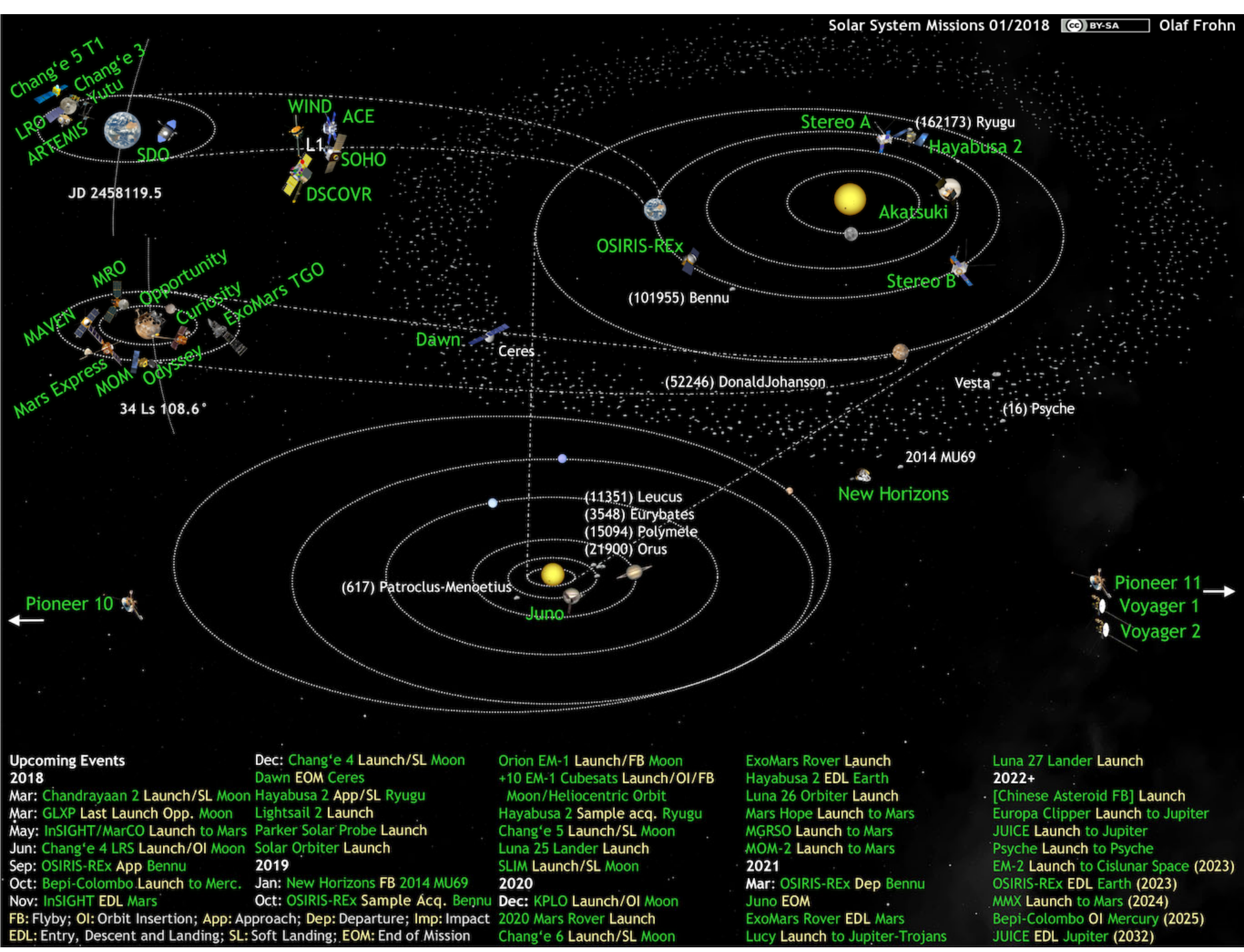
- To make star maps
- To study mysterious phenomena such as black holes and quasars
- Take pictures of the planets in the solar system
- Make maps of different planetary surfaces



Plot of orbits of known potentially hazardous asteroids (size over 140 m (460 ft) and passing within 7.6 million km (4.7 million mi) of Earth's orbit) as of early 2013.

Space exploration missions

- International Space Station
- Chandrayaan-2 (ISRO)
- Chang'e 4 (CNSA)
- Mars Odyssey (NASA)
- Mars Express – ESA satellite orbiting Mars
- Mars Reconnaissance Orbiter (NASA)
- Mars Science Laboratory – NASA rover to Mars
- MAVEN – NASA satellite orbiting Mars
- Mars Orbiter Mission (ISRO) – satellite orbiting Mars
- ExoMars (ESA / Roscosmos) – Mars mission
- InSight (NASA)
- Akatsuki – JAXA satellite orbiting Venus
- BepiColombo (ESA / JAXA)
- Parker Solar Probe – NASA probe to Sun
- Hayabusa2 (JAXA) – sample return mission to asteroid Ryugu
- OSIRIS-REx (NASA) – sample return mission to asteroid Bennu
- Juno – NASA satellite orbiting Jupiter
- *New Horizons* – probe to Pluto
- Voyager (NASA) – probe to outer Solar System and interstellar space



Upcoming Events

2018

Mar: Chandrayaan 2 Launch/SL Moon
Mar: GLXP Last Launch Opp. Moon
May: InSIGHT/MarCO Launch to Mars
Jun: Chang'e 4 LRS Launch/OI Moon
Sep: OSIRIS-REx App Bennu
Oct: Bepi-Colombo Launch to Merc.
Nov: InSIGHT EDL Mars
Dec: Chang'e 4 Launch/SL Moon
Dawn EOM Ceres
Hayabusa 2 App/SL Ryugu
Lightsail 2 Launch
Parker Solar Probe Launch
Solar Orbiter Launch

2019

Jan: New Horizons FB 2014 MU69
Oct: OSIRIS-REx Sample Acq. Bennu
Orion EM-1 Launch/FB Moon
+10 EM-1 Cubesats Launch/OI/FB Moon/Heliocentric Orbit
Hayabusa 2 Sample acq. Ryugu
Chang'e 5 Launch/SL Moon
Luna 25 Lander Launch
SLIM Launch/SL Moon

2020

Dec: KPLO Launch/OI Moon
2020 Mars Rover Launch
Chang'e 6 Launch/SL Moon
ExoMars Rover Launch
Hayabusa 2 EDL Earth
Luna 26 Orbiter Launch
Mars Hope Launch to Mars
MGRSO Launch to Mars
MOM-2 Launch to Mars

2021

Mar: OSIRIS-REx Dep Bennu
Juno EOM
ExoMars Rover EDL Mars
Lucy Launch to Jupiter-Trojans
Luna 27 Lander Launch

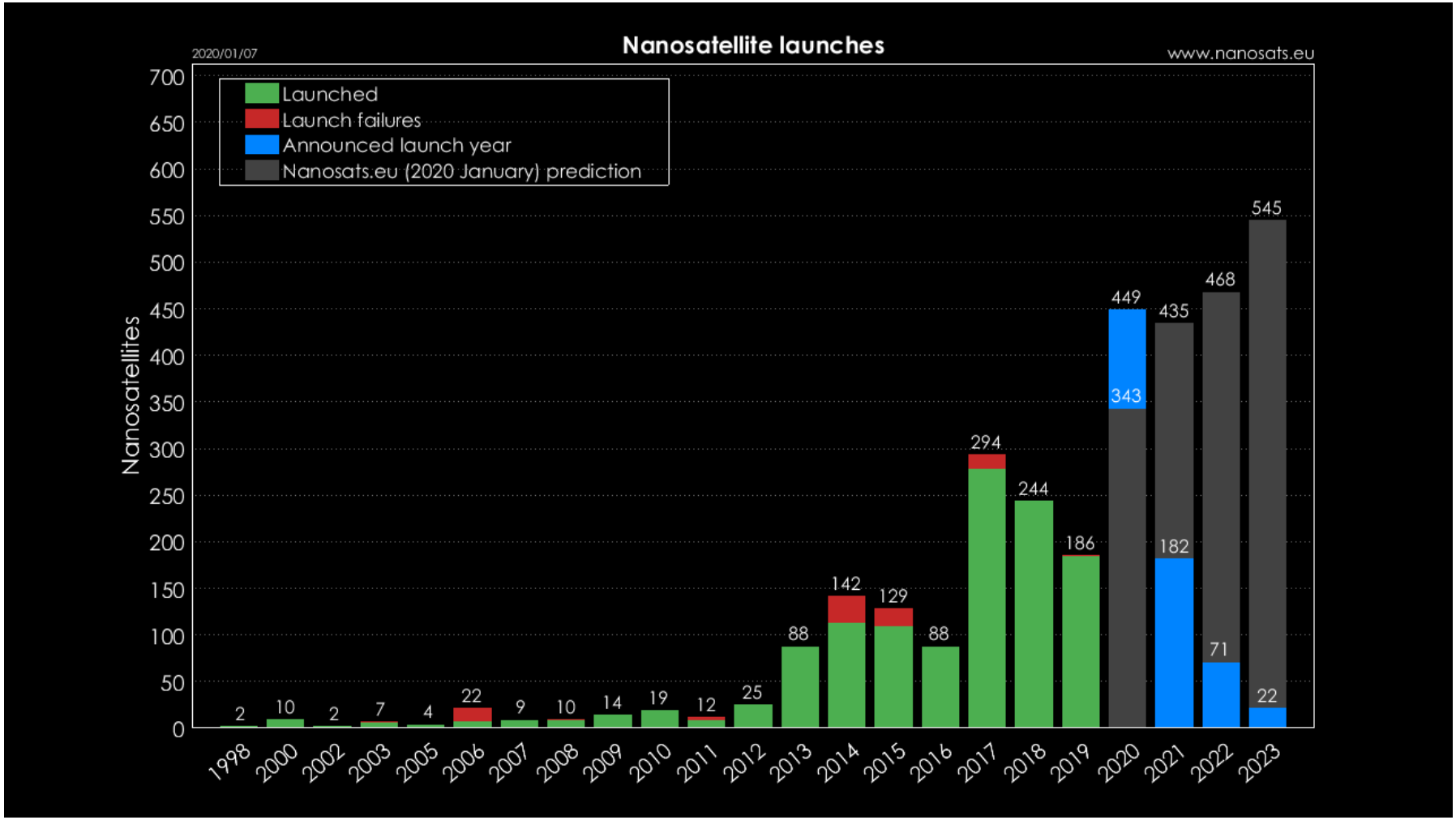
2022+

[Chinese Asteroid FB] Launch
Europa Clipper Launch to Jupiter
JUICE Launch to Jupiter
Psyche Launch to Psyche
EM-2 Launch to Cislunar Space (2023)
OSIRIS-REx EDL Earth (2023)
MMX Launch to Mars (2024)
Bepi-Colombo OI Mercury (2025)
JUICE EDL Jupiter (2032)

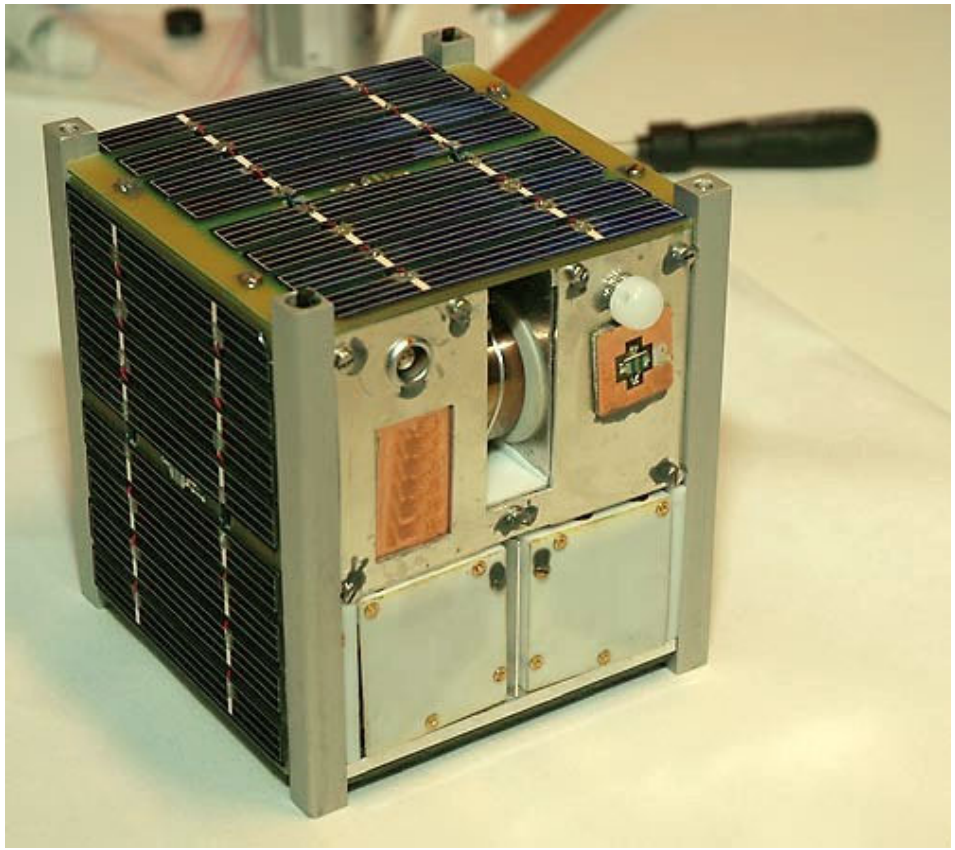
FB: Flyby; OI: Orbit Insertion; App: Approach; Dep: Departure; Imp: Impact
EDL: Entry, Descent and Landing; SL: Soft Landing; EOM: End of Mission

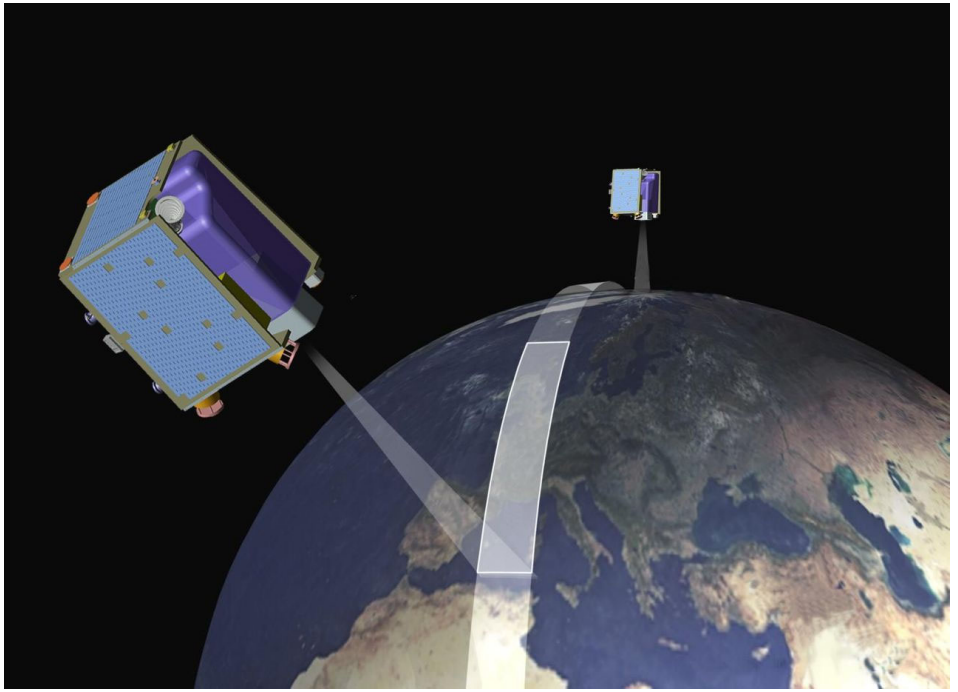
Small satellites

Group name[1]	Mass (kg)
Large satellite	>1000
Medium satellite	500 to 1000
Mini satellite	100 to 500
Micro satellite	10 to 100
Nano satellite	1 to 10
Pico satellite	0.1 to 1
Femto satellite	<0.1

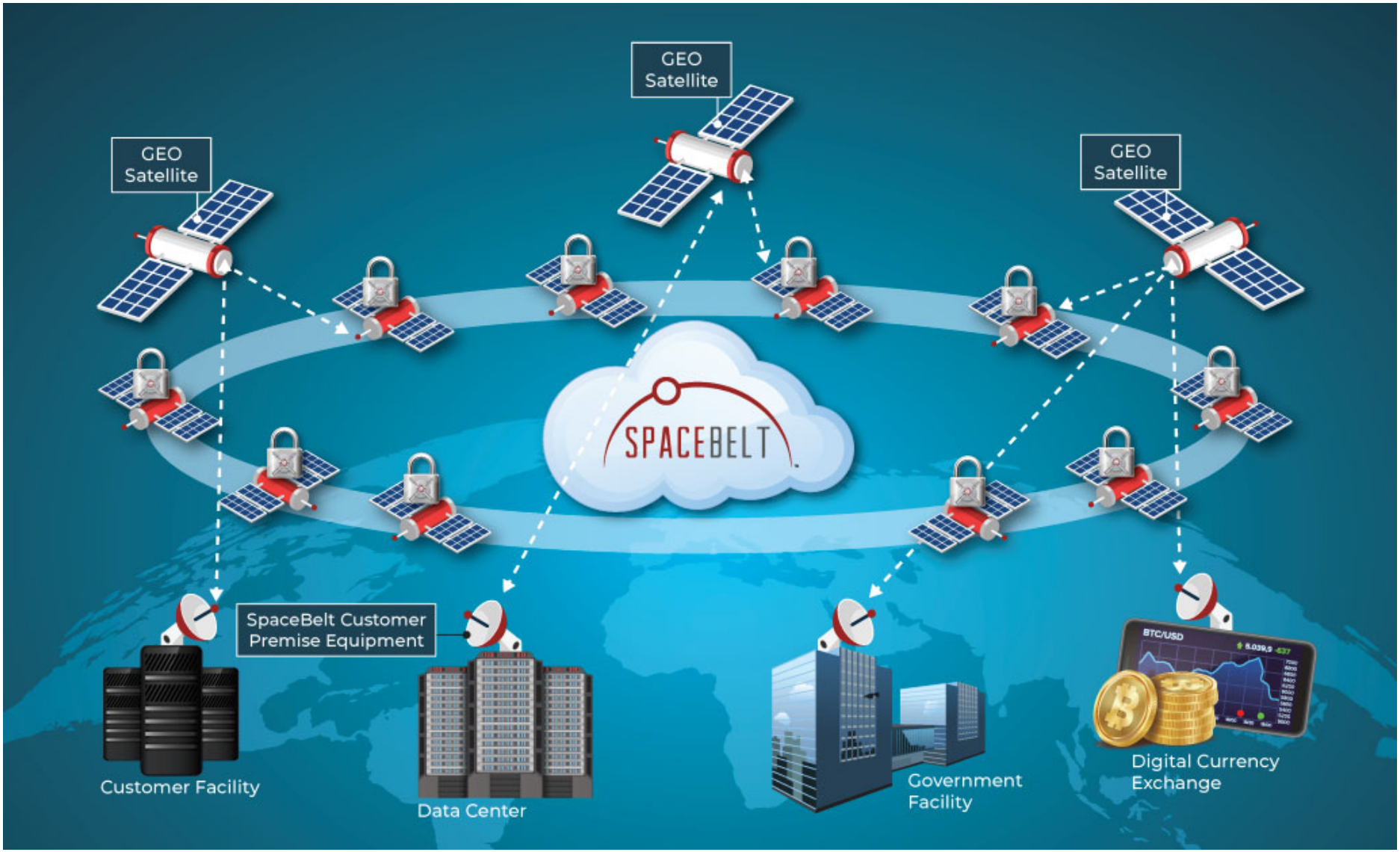


Examples of Small Satellites





SpaceBelt Data Security as a Service



A network of 10 Low Earth Orbit (LEO) satellites for the purpose of offering space-based secure cloud data storage and global connectivity services