
NASA
esa

3 SPACE OBSERVATORIES

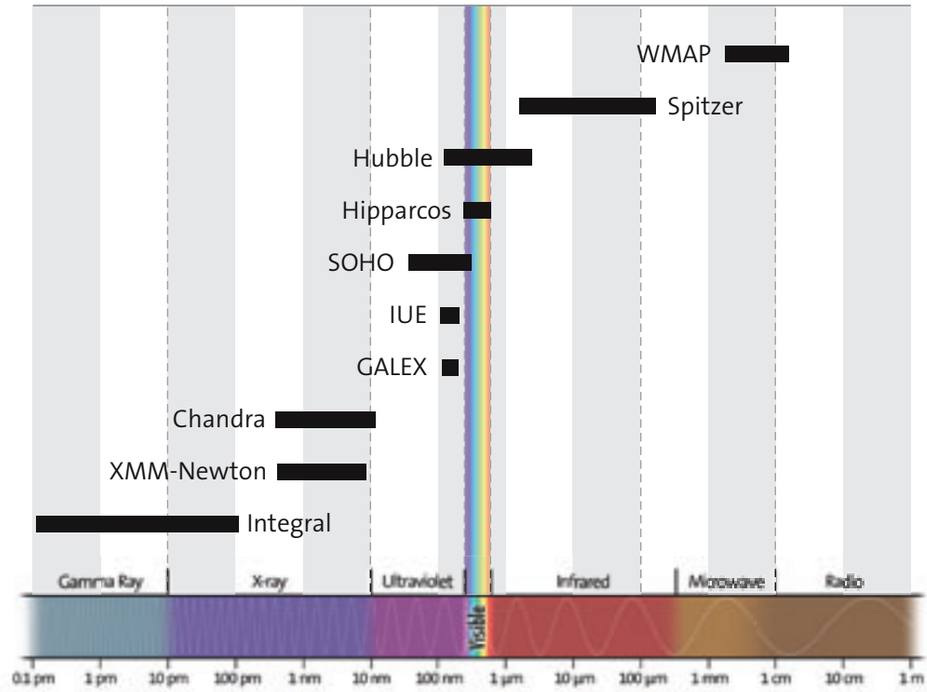
FIGURE 17: HUBBLE, THE BEST-KNOWN SPACE OBSERVATORY

This illustration shows the NASA/ESA Hubble Space Telescope in its high orbit, 600 kilometres above Earth.

Astronomical observatories in space have revolutionised our knowledge of the Universe. They are one amongst the many types of satellites launched since the beginning of the space age, devoted to a great variety of applications including Earth observation, communication and broadcasting, navigation and military, right up to fully habitable space stations. Space observatories give access to light that is not visible from the ground and provide an undisturbed view of the star- and galaxy-studded sky. Expensive yes, but unbeatable in the search for the elusive photons from the hidden Universe.

FIGURE 18: TEN EXAMPLES OF PAST AND CURRENT SPACE OBSERVATORIES

Some of the most important astronomical observatories in space and the part of the electromagnetic spectrum where they function. Short wavelengths (X-ray, ultraviolet etc.) are on the left, long wavelengths are on the right.



The space age began with the launch of Sputnik by the Soviet Union in 1957. Only five years later, in 1962, NASA launched the first true astronomical research satellite, OSO-1. Since those first steps, more than 100 different astronomical observatories have been launched — some better known than others. They have contributed a wealth of information in many new fields of astronomy.

Most astronomical satellites orbit the Earth but, for some purposes, there are advantages to choosing other locations and orbits. Some instruments are affected by the radiation belts associated with the Earth's magnetic field, which can affect sensitive detectors and electronic circuits, while other spacecraft need to keep well away from the heat radiated into space by our home planet.

A sort of "half-way-house" between the ground and space can be provided by high altitude balloons such as BOOMERanG, which is a cosmic microwave background observatory, or SOFIA, an infrared telescope flown in a converted Boeing 747 aircraft. Such experiments avoid many of the disadvantages of being on the ground while being considerably less expensive than spacecraft.

“More than 100 different astronomical observatories have been launched into space”

As mentioned in Chapter 2 there are several compelling reasons for launching telescopes into space, the most important being the escape from the absorption, emission and turbulence associated with the atmosphere. The elevated vantage point gives access to light that is not visible from the ground and provides an undisturbed view of the star- and galaxy-studded sky. What hinders our exploitation of the ideal space environment? High (often referred to as “astronomical”) cost is one factor, but the long lead times associated with the development of these complex and remotely controlled devices and the risk that is taken when they are blasted into space atop a rocket are also significant considerations.

These are some of the reasons why observatories are still being built on the ground. On Earth it is easier to upgrade to the latest technology and to build larger telescopes that gather more light. In general space and ground-based telescopes are complementary, but with important synergies between them. For that reason, research teams frequently make use of both space and ground-based instruments to investigate a particular phenomenon.

Reliability

When launching an observatory into space on a mission that may last years or even decades, the reliability of its component parts looms large in the thoughts of the designers. With the notable exception of Hubble, which is serviced by teams of astronauts flown on the Space Shuttle, most spacecraft become inaccessible after launch.