

HYPERSENSPECTRAL IMAGING SATELLITE (HysIS)

Why In News?

ISRO's PSLV C43 launched India's first full-fledged Hyperspectral Imaging Satellite (HysIS) along with 30 foreign satellites from Satish Dhawan Space Centre, Sriharikota.

HysIS is an earth observation satellite built around ISRO's Mini Satellite-2 (IMS-2) bus.

About the Hyperspectral Imaging Technology

It combines the power of digital imaging and spectroscopy to attain both spatial and spectral information from an object

This result can be then used to identify, measure and locate different materials and their chemical and physical properties. Every pixel in the image contains a continuous spectrum (in radiance or reflectance) and can be used to characterize the objects in the scene with great precision & detail.

Hyperspectral images provide much more detailed information about the scene by dividing the spectrum into many more bands than a normal color camera, which only acquires three different spectral channels corresponding to the visual primary colors red, green and blue.

It was first tried by ISRO in an experimental satellite in May 2008 and later on Chandrayaan-1 mission for mapping lunar mineral resources, this is the first time a full-fledged hyperspectral imaging satellite has been launched.

Application

Hyperspectral remote sensing is used for a range of applications like agriculture, forestry, soil survey, geology, coastal zones, in land water studies, environmental studies, detection of pollution from industries & the military for surveillance or anti-terror operations.

Other utilities include online industrial monitoring/sorting/classification to laboratory measurements, clinical instruments for medical diagnostic & airborne and satellite based remote sensing tools.

Spectral Imaging

It is imaging that uses multiple bands across the electromagnetic spectrum like using infrared, the visible spectrum, the ultraviolet, x-rays, or some combination of the above. It is different from a normal color camera which only acquires three different spectral channels corresponding to the visual primary colors red, green and blue.

HYPERSENSPECTRAL IMAGING VS MULTI SPECTRAL IMAGING

The main difference between multispectral and hyperspectral is the number of bands and how narrow the bands are.

Hyperspectral imaging (HSI) uses continuous and contiguous ranges of wavelengths (e.g. 400 - 1100 nm in steps of 0.1 nm) whilst multispectral imaging (MSI) uses a subset of targeted wavelengths at chosen locations (e.g. 400 - 1100 nm in steps of 20 nm).

Hyperspectral imagery consists of much narrower bands (10-20nm). A hyperspectral image could have hundreds or thousands of bands. In general, it comes from an imaging spectrometer.

ISRO'S PSLV-C43

LIFTS OFF WITH 31 SATELLITES

Riding along with one micro & 29 nano satellites from eight different countries, including the US, Australia and Canada.

It carries two payloads: one to capture images in the visible near-infrared (VNIR) range of the light spectrum, & another in the shortwave infrared (SWIR) range.

PSLV-C43 placed country's earth observation satellite Hyperspectral Imaging Satellite (HysIS) into 636 km-polar sun synchronous orbit

HysIS can provide imaging capabilities for a variety of purposes, including agriculture and forestry

Challenges

This technology is accompanied with high cost and complexity. There is a need for fast processing of data (fast computers), sensitive detectors & large data storage capacities for hyperspectral data.

