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Introduction to Remote Sensing: Remote Sensing Satellites

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EROS A & B

EROS (Earth Remote Observation System) A1 was launched in December 2000 as the first constellation of eight high-resolution imaging satellites to be launched between year 2001 and 2005. EROS satellites are high performance, low cost, light, and agile and have been designed for low earth orbit (LEO). The satellites are owned and operated by ImageSat International. This Cyprus-based company was established in 1997 by a consortium of leading satellite, sensor and information management companies and information producers around the world.

In February 2001, a couple of months after EROS A1 was launched, ImageSat decided to forgo the production and launch of its planned EROS A2 satellite. The company cited EROS B series' better performance and longer life span as the main reasons. EROS B series will have higher resolution imaging sensors than the company's first satellite. ELOP, the manufacturer of EROS sensors and cameras, has designed EROS B series camera to carry a device that enables synchronous imaging of Earth under weak lighting conditions.

All EROS satellites will go into polar orbit and are sun-synchronous so all images photographed by a given satellite will be taken at the same local time, no matter the day, month, or year. The orbital period (time taken for one revolution around the Earth) of each satellite is 90 minutes or 16 revolutions of the Earth in 24 hours. EROS satellites are unrivaled in their ability to acquire numerous specific images of the ground due to a high-resolution camera aboard the satellite. The camera has a focal plane of CCD (Charge Coupled Device) detectors with 7,800 pixels per line and produces a panchromatic image with a resolution of 1.8-m pixel spacing. EROS remotely sensed data is used by scholars, engineers, land managers, and policy makers worldwide conducting studies on a wide range of natural hazards, global environmental change, land use planning and landscape transformation, and economic development and conservation issues. Spatial resolutions images are used for different applications.

ASTER

ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) is an imaging instrument that is flying on Terra, a satellite launched in December 1999 as part of NASA's Earth Observing System (EOS). ASTER was built in Japan for the Ministry of Economy Trade and Industry (METI). It is a result of a cooperative effort between METI, NASA, and the Earth Remote Sensing Data Analysis Center (ERSDAC). The ASTER team consists of scientists from the United States, Japan, France, and Australia, and managed by the Japan Resources Observation System Organization (JAROS).

The main objective of ASTER mission is to obtain global, regional, and local images of the Earth in 14 different wavelengths of the electromagnetic spectrum (spectral bands), ranging from visible to thermal infrared light. ASTER is the only

high spatial resolution instrument on Terra that is important for change detection, calibration and/or validation, and land surface studies. It can obtain detailed maps of land surface temperature, emissivity, reflectance and elevation to study glaciology, urban change, evaporation/surface fluxes, hydrology, volcanology, and geology.

There are three separate subsystems that make up the ASTER instrument. Each subsystem operates in a different spectral region, has its own telescope(s), and built by 3 different Japanese companies: NEC Corporation, Mitsubishi Electric Company (MELCO), and Fujitsu Ltd. The telescopes are VNIR (Visible Near Infrared, a backward looking telescope which is only used to acquire a stereo pair image), SWIR (Short Wave Infrared, a single fixed aspheric refracting telescope), and TIR (Thermal Infrared). ASTER high-resolution sensor is capable of producing stereoscopic (three-dimensional) images and detailed terrain height models. Unlike other instruments on Terra, ASTER can be scheduled based on on-demand data acquisition requests, collecting an average of 8 minutes of data per 98-minute orbit. ASTER needs roughly 5 years to assemble a global data set of Earth surface in a very detailed digital elevation map at resolutions of up to 15 meters per pixel.