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Discovery and Evaluation of Resources

Slowly mankind is fashioning means to facilitate better management of the earth. An important tool that has not received appropriate recognition is the Earth Resources Technology Satellite (ERTS). Its imaging systems furnish information concerning agricultural and forest resources, mineral and land resources, water resources, marine resources, and land use. This satellite, which has been in orbit for about 6 months, has already provided tens of thousands of photo-images of all regions of the globe.

ERTS flies 920 kilometers above the earth in a circular orbit that is nearly polar. It orbits the earth 14 times per day: each pass covers a region 185 km wide, and there is some overlap among them. After 18 days the satellite returns to the same position, having covered the entire globe. In its sun-synchronous orbit, ERTS crosses the equator on each southward pass at 9:42 a.m. Eastern Standard Time.

Most of the data from the satellite have come from a multispectral scanner subsystem that views an area 185 by 185 km in four wavelength bands. These are the green [500 to 600 nanometers (nm)], red (600 to 700 nm), near infrared (700 to 800 nm), and a second infrared (800 to 1100 nm). Various objects and materials tend to behave quite differently in the various bands. For example, water is relatively transparent in the green, but appears black in the infrared. In contrast, vegetation reflects extremely well in the infrared and is as bright in that wavelength region as snow is in the visible region. The brightness of vegetation in the infrared depends on the type of vegetation (for example, big leaves or small ones). It also depends on the health of the plants—healthy crops appear much brighter than does diseased vegetation.

The images obtained in the various wavelength regions are transmitted directly to earth when the satellite is over the United States. At other times, the images are stored on magnetic tapes for readout when in range of U.S. stations. Subsequently, the individual images can be combined to form artificial color composites. Investigators have become skilled in interpreting these composites and can recognize different kinds of vegetation and terrains.

Repetition of the imaging every 18 days is a particularly valuable feature, for comparisons of succeeding images can reveal highly significant changes. There are disadvantages and benefits in imaging a large area. Resolution is limited to about 100 meters, and the image as received is somewhat distorted. However, most of the distortion can be compensated for. An important advantage of portraying a sizable portion of the earth in one picture is that geologists have been able to identify features that previously had escaped detection.

A large number of investigators are now studying the images. Their studies were selected from among 600 research proposals. Of the 335 accepted, 70 were from scientists of foreign nations. Policy with respect to distribution of pictures is one of complete openness. Nationals of any country are free to purchase them at a nominal cost. Browse files have been established at many offices around the United States, with a major distribution center at Sioux Falls, South Dakota.

Many countries have displayed enthusiasm for the ERTS images. Canada is operating its own receivers. Brazil, Mexico, and Venezuela are moving toward establishing their ground stations. The Brazilians are particularly enthusiastic about ERTS, for it is giving them a first look at much of the Amazon valley. Their enthusiasm is likely to be contagious, and other developing countries will find ERTS a valuable source of many kinds of information.—PHILIP H. ABELSON