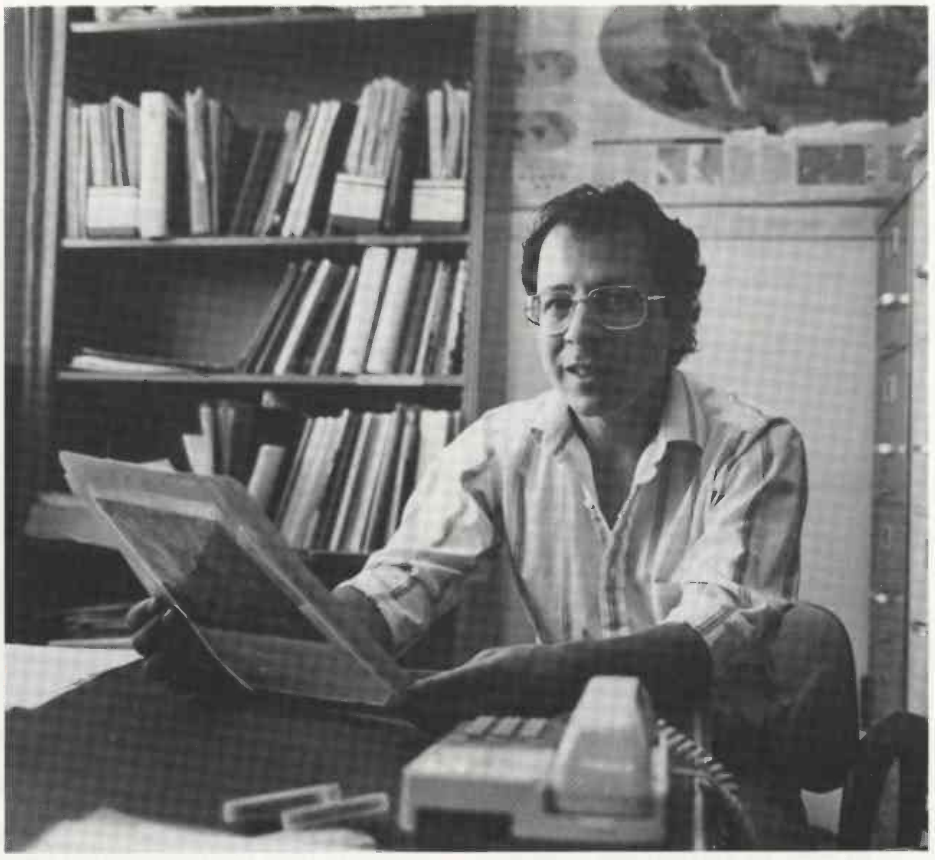

Alfredo Huete

Watching Global Change From Space

Alfredo Huete is one of more than 500 scientists from around the world taking part in a 15-year mission to monitor the Earth's changing environment.

The National Aeronautics and Space Administration selected Huete and six other University of Arizona researchers in March 1989 to participate in the Earth Observing System (Eos) science mission. The project is designed to give scientists from all Earth science disciplines an integrated observing system for continuous studies of the planet's atmosphere, oceans, land surface and geophysical processes.

Eos will produce and analyze data obtained by remote-sensing instruments installed aboard a spacecraft scheduled to be deployed in 1997.

Huete, an associate professor of soil and water science, is principal investigator on a project to develop more accurate and reliable means of interpreting data transmitted by various sensors on four orbiting Eos platforms.

"Images from satellite data are two-dimensional representations of the watts of energy that hit satellite sensors from a particular location on Earth," Huete explains. "The Earth's surface is communicating information constantly in the form of reflected energy from the Sun, or through emitted energy, such as temperature."

Satellite sensors are equipped with filters that allow them to "see" all forms of that communication—the visible, infrared, thermal and microwave portions of the electromagnetic spectrum. The information is digitized, radioed back to Earth in the form of pixels, the tiny elements that make up the image produced by a television camera, and converted into various geophysical maps.

"When you are getting an energy measurement from each of these pixels, it's never just from plants or soil alone," Huete says. "It's a mixed signal from both plants and soil. You want to be able to manipulate the data so that you either extract the vegetation-reflected signal or the soil-reflected signal. If you want to know how much water is being transpired from the vegetation surface, you have to eliminate the soil effect and vice-versa."

His place on the NASA team is due largely to his SAVI.

The Soil-Adjusted Vegetation Index is a refined version of a long-used method of interpreting satellite data to measure vegetation density. He spent about four years showing that the Normalized Difference Vegetation Index, or NDVI, needs to be improved. NDVI provides a distorted image of vegetation activity because it responds to the soil signal as well as that of the vegetation.

This kind of fine-tuning of satellite information will be critical to the efficiency of MODIS, the sensor Huete will be using on the Eos project. MODIS, the Moderate Resolution Imaging Spectrometer, will determine tropical deforestation, the effects of acid rain, the process of land degradation and the distribution of phytoplankton in the oceans. Phytoplankton, the mass of small plant and plant-like organisms that float or drift in water, is a major food source for fish and other marine life.

"When NASA launches its satellites in 1997," Huete says, "all the equations, computer code and programs have to be implemented so, rather than turning raw data over to the scientific community, NASA will be able to produce maps that will indicate vegetation activity on any part of the planet. We're making sure we have all this dirty work completed before the launch."

The Eos project now is in its first year. This "definition period" is spent in meetings with team members, other teams and writing funding proposals. The 551 researchers collaborating on the Eos project come from 168 institutions, universities and laboratories in 32 states and 13 countries.

Huete also is a co-investigator on another Eos project with UA hydrologist, Soroosh Sorooshian. Sorooshian's project will examine the hydrology and climate in arid and semiarid lands.

—By Jan McCoy

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This image of Africa represents the first generation of vegetation indices obtained by remote sensing techniques. The MODIS sensor is expected to provide improved, more accurate imagery of activity on the Earth's surface.

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