Science & Technology

Space Shuttle finds a new Yukon in Mexico

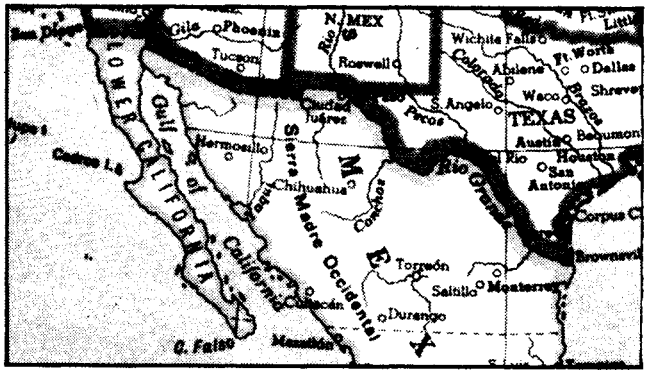
by Marsha Freeman

In a dramatic example of what space technology could do for the developing nations of the world, scientists at the Jet Propulsion Laboratory in California have recently announced that data collected on the second flight of the Space Shuttle orbiter Columbia have helped locate a previously unprospected region containing mineral resources in Mexico. Scientists from the Secretario de Patrimonio y Fomento Industrial in Mexico are now working with the U.S. National Aeronautics and Space Administration to begin exploration leading to development of this new site.

The new results were obtained by the Shuttle Multispectral Infrared Radiometer (SMIRR), flown as an experiment on the November 1981 Shuttle flight. The SMIRR, which was developed at the Jet Propulsion Laboratory, identified the minerals by their reflectance in the infrared portion of the electromagnetic spectrum. Scientists hope that future generations of operational remote-sensing satellites will incorporate the more sophisticated SMIRR technology and help open up whole new areas of the world for industrial development.

The simplest kind of remote sensing is to take photographs of an areas from far away—either in an airplane or from space. There are many characteristics of our globe, however, that cannot be seen in visible light, but can be detected in non-visible wavelengths, such as the infrared.

From the Shuttle's payload bay, the SMIRR sampled 50,000 miles of the Earth in swaths 300 feet wide. By chance, it passed over Baja California in Mexico, a desert area that has no roads and has never been investigated for natural resources.



One of the land characteristics that can be "seen" in the infrared is the presence of hydroxyl molecules (OH). The wavelength which detects whether these molecules are present, which is determined by the crystal structure of the materials, is not covered in the Landsat operational remote sensing satellites that we now use.

The presence of these hydroxyl molecules indicated to the JPL scientists that iron oxide, kaolinite clay, and possibly alunite (a potassium aluminum sulfate) were present in the region. These minerals are indicators of past hydrothermal activity, and were probably formed at this site when volcanic rocks were subjected to hot circulating acidic waters and changed to clays, alunite, and secondary quartz.

Areas in the United States of similar composition and history have been found to contain deposits of gold, silver, copper, lead, and zinc. Therefore, this area is being considered a priority region for further exploration.

The identification made by the Shuttle-borne instrument was verified at the site by U.S. and Mexican scientists. Helicopters were needed to reach this remote undeveloped region.

Resources for the future

The experimental SMIRR carried on the Shuttle was designed in 1976 and cost $1.6 million. Dr. Alexander Goetz for JPL has plans to update this infrared equipment and add a new capability to the U.S. remote-sensing program.

According to Dr. Goetz, the technology used in SMIRR has been surpassed by more recent developments. The data from SMIRR cannot be processed into an image, but is transmitted as a radiometer profile. On the ground, instruments called imaging spectrometers give a continuous reading in 128 different wavelengths at the same time.

If this technology could be applied to space-borne instruments, a scientist could produce an image of a piece of the Earth in all spectral bands on a continuous basis. By comparision, Landsat 4, now in orbit, produces images from only seven spectral bands.

This development would require advancements in data handling technology on the ground. At the present time, the capability does not exist to even process the mass of data that reaches us daily from Landsat.

The potential pay-back of further developing this remote sensing technology can not even be estimated. Whole inhospitable regions of the Earth that have not been, and could not be assessed from the ground, could be surveyed for raw materials and minerals.

NASA has not received sufficient funding to develop the next generations of remote sensing technologies. Perhaps developing nations should contact the U.S. administration and the Congress, and tell them that rather than wasting their aid money on debt refinancing and "appropriate technologies," they should give NASA the money to make available space-age techniques that could help bring them into the industrial age.