FRENCH
P79-10116

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 755-8370

For Release:
IMMEDIATE

Dick McCormack
Headquarters, Washington, D.C.
(Phone: 202/755-4321)

Donald E. Witten
Goddard Space Flight Center, Greenbelt, Md.
(Phone: 301/344-5565)

RELEASE NO: 79-117

NASA LASER SYSTEMS TO STUDY EARTH'S CRUSTAL MOVEMENTS

NASA is deploying seven laser satellite-tracking systems in the United States and the Pacific Ocean as part of a continuing global effort to use space technology over the next decade to study the strain building up in the Earth's crust and to increase understanding of the causes of earthquakes.

Lasers are being installed on Tutuila Island, American Samoa; on Roi-Namur, Kwajalein Atoll in the Marshall Islands; and at Yaragadee in Western Australia. Four mobile lasers are being located in the United States at sites near the Haystack Observatory, north of Boston, Mass.; the Owens Valley Radio Observatory, Goldstone, Calif.; and Ft. Davis, Texas.

-more-

September 14, 1979

These lasers, expected to be in full operation in October, will join an expanding international network of lasers and microwave facilities which will complement and extend conventional methods of measuring the Earth's crustal movements.

With lasers and microwave methods which use signals from radio stars -- such as quasars -- it is possible to measure movements of the Earth's crust and thereby analyze conditions under which pent-up strain may be released and cause earthquakes.

Satellite laser systems are in operation in France, Spain, Germany, Greece, Egypt, the Netherlands and England. The United States operates, through the Smithsonian Astrophysical Observatory, laser systems in Arequipa, Peru; Natal, Brazil; and Orroral Valley in eastern Australia. With the addition of the new mobile NASA lasers there will be seven satellite tracking lasers in operation in the United States, including a system at the Goddard Space Flight Center, Greenbelt, Md., and a laser operated by the Air Force in Florida.

Other laser systems, which use corner cube reflectors placed on the Moon by the United States and Russia, are in operation in Texas, Australia and West Germany.

The Earth's crust is believed to contain about a dozen large and almost rigid "plates" which are in constant motion and whose jagged edges continually grind against each other. It is believed that an earthquake occurs when the crustal rocks near the plate boundaries become locked together and are strained beyond their breaking point. The largest number of earthquakes around the globe occur at plate boundaries.

Scientists using historical geological data have been able to infer the average movement of these huge plates over the past few million years. Some plates, like the Africa plate, are believed to be stationary or moving slowly at about one centimeter per year. The Nazca plate off the western coast of South America may be moving at 15 cm (6 inches) per year as it thrusts under the South American plate.

A long-term NASA project involving California's earthquake prone San Andreas Fault already is producing interesting results for evaluating the use of satellite laser tracking for the measurement of strain build-up in the Earth's crust.

In California, the North American and Pacific plates are butted together at the San Andreas Fault. As the Pacific plates slide northward, portions of the fault appear to be locked.

The tracking of laser-reflecting satellites in known orbits permits scientists to pinpoint the location of their tracking systems to within three to five cm (about two in. or less).

The laser system flashes a narrow column of light pulses to the overflying satellite. Special reflectors on the satellite collect and return this light directly to its source. It is the precise measurement of the laser beam's roundtrip transmission time -- at a speed of 300,000 kilometers (186,000 miles) a second -- to the satellite and back that provides the essential information for locating the position of the ground unit.

Six satellites with laser corner cube reflectors are currently being used. The latest of these, the U.S. Laser Geodynamics Satellite, was specifically designed to be a reference point in space for ground lasers.

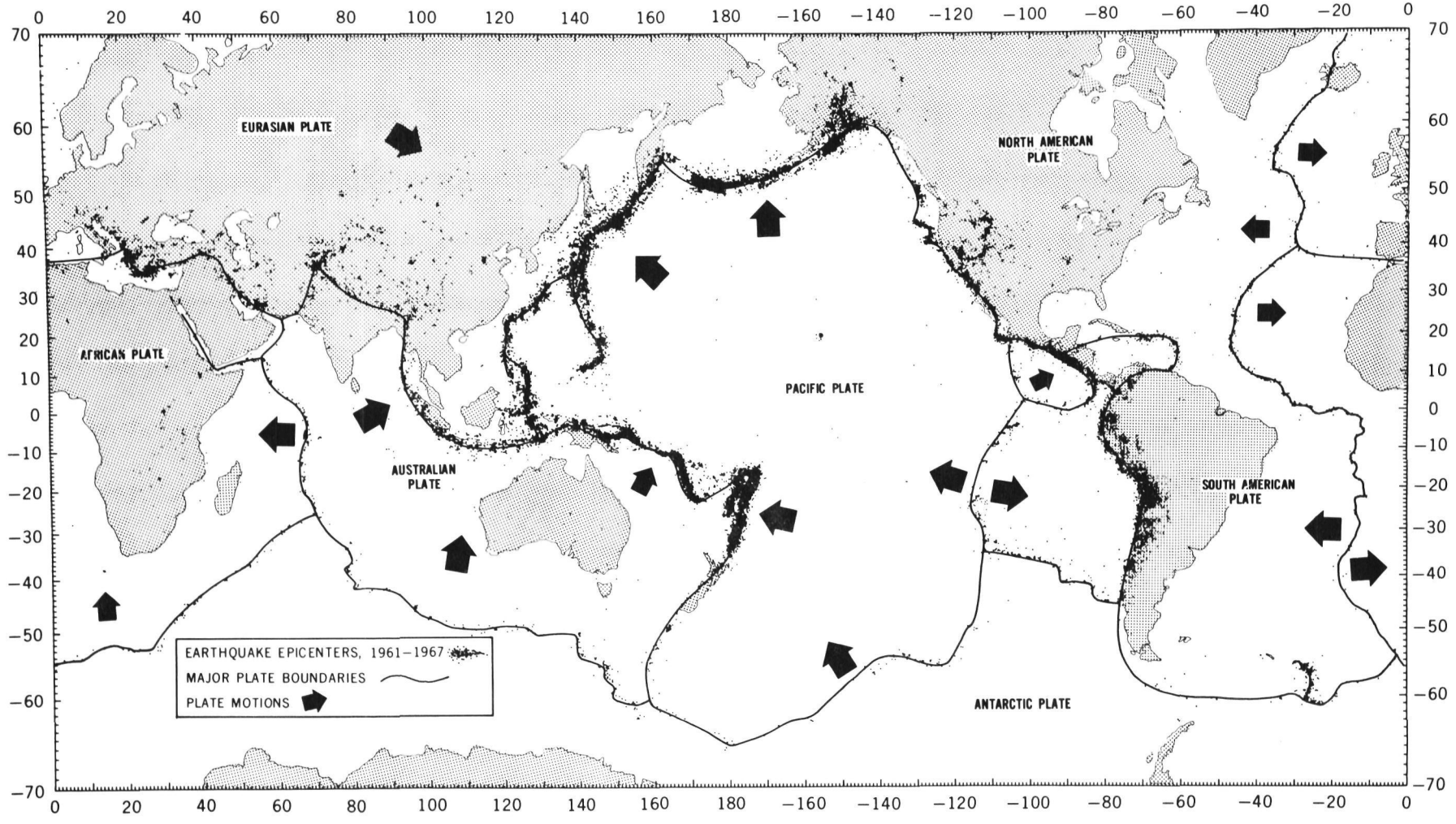
Corner cube reflectors were placed on the Moon by the Apollo 11, 14 and 15 astronauts. A French-built reflector was implanted by the Russian Luna spacecraft. Lunar laser systems at the McDonald Observatory, Texas; at Haleakala, Hawaii; Australia; and in Wetzel, Germany; have been used to range to the Moon. Other countries, namely Russia and Japan, have been developing similar systems.

Within the United States, the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, the National Science Foundation, the Defense Mapping Agency and NASA are participating in a joint program to apply this space technology to a better scientific understanding of the Earth's dynamic processes, including those related to earthquakes.

The NASA portion of this joint program is conducted through the Crustal Dynamics Project at its Goddard center.

The coordinated five-agency program is intended to support the national program authorized by the "Earthquake Hazard Reduction Act of 1977." Under this act, Congress initiated a broad research program whose goal it is to reduce the hazards of earthquakes and develop, if possible, the capability to predict earthquakes and possibly to control them.

-end-



MAJOR TECTONIC PLATES