Magnetotail electric field seen

Where the solar wind rushes past the earth's magnetic field, it drags the field lines out into an extended magnetotail, many of whose lines are "open." This means the charged particles flowing along the lines escape the earth's influence to become part of the interplanetary magnetic field. Some of the lines, however, are necessarily closed; otherwise, the earth would have no trapped particle population at all. It has been theorized, but not proven, that it is an electric field perpendicular to the magnetotail that influences these lines to close, by convecting them in towards the neutral sheet that bisects the tail.

Now a team of researchers has reported the first direct observations of this electric field, in data from the small "subsatellites" launched by Apollos 15 and 16 into orbits around the moon. Using the moon itself as their probe, James E. McCoy of the NASA Johnson Space Center in Texas and colleagues from the Space Sciences Laboratory of the University of California at Berkeley measured the field by detecting the drift displacement of low-energy electrons at the lunar limbs as the subsatellites passed in and out of the "shadow" caused by the moon's absorption of incoming interplanetary electrons.

The field ranges in magnitude from the lower detection limit of the subsatellite instrumentation, about 0.02 millivolts per meter, up to about 2 mV/m, with a median value of about 0.15 mV/m. The corresponding convection velocities—the speeds with which the electrons move in towards the neutral sheet—range from about 5 to 190 kilometers per second, with a median of 15, assuming a 10-gamma magnetic field in the tail. The direction of the field is almost always from "dawn" to "dusk" relative to earth's rotating magnetosphere, with magnitude variations as short as hours or even minutes.

These measurements also allow calculation of the total energy in the tail—2.6×10^{23} ergs—as well as the energy input from the solar wind, about 1.5×10^{19} ergs. "This energy input," the team reports in the Aug. 1 JOURNAL OF GEOPHYSICAL RESEARCH, "can power all known magnetospheric phenomena," including the dissipation effects perceived as auroras.

Second-guessing a lightning bolt

Ever since a lightning bolt temporarily affected instruments aboard Apollo 12 as the spacecraft was launched on Nov. 14, 1969, NASA has been pointedly cognizant of the potential hazard in the lightning-prone area of Florida's Kennedy Space Center. Its concern was particularly strong during preparations for the Apollo-Soyuz rendezvous mission in July, when the tight timing needed to coordinate two launchings from different countries could ill afford weather delays. Now two researchers from the Naval Research Laboratory, one of several organizations that were jointly investigating the problem before the ASTP flight, report that results of the study have made it possible to predict lightning hazards up to several minutes before the time of a launch.

Airborne surveys involving scientists from NRL, NASA, the National Oceanic and Atmospheric Administration and New Mexico Institute of Technology have made it possible to track potentially dangerous electric fields in clouds from ground-based observations, according to Lothar H. Ruhnke, head of the NRL Applied Physics Branch and project scientist Wolf Kasemir. This is because the research made it possible to relate ground-based instrument readings to conditions overhead.

A dangerous cloud, they report, turns out to be one containing an electric field of 15 kilovolts per meter or more. The clouds to watch—apparently the only ones capable of developing such a field—seem to be those with temperatures below minus five degrees C. at their upper levels.

Besides aiding the space shuttle in the 1980's, such an insight on lightning can also be of value to unmanned launches. In addition, the NRL team says, an expanded research effort could result in better evaluation of the hazard to aircraft, forests and commerce.

The astronaut exodus

With four years to go until the space shuttle gets into orbit and no other manned flights in sight, U.S. astronauts are beginning to depart for greener pastures.

Thomas P. Stafford, who flew on Gemini 6 and commanded the Gemini 9 earth-orbit, Apollo 10 moon-orbit and Apollo-Soyuz rendezvous missions, will leave the astronaut corps on Nov. 1 to assume command of the U.S. Air Force Flight Test Center at Edwards Air Force Base in California.

William R. Pogue, who spent a record 84 days in space as part of the last Skylab crew, left NASA on Sept. 1. He has become a vice president of the High Flight Foundation, an evangelistic organization in Colorado Springs founded by another former astronaut, James B. Irwin, who left the corps in 1972.

Another High Flight veep, former Apollo 15 command pilot Alfred M. Worden, left the agency on Sept. 5 to accept the job, as well as to go on the lecture circuit and to write a book.

The agency's most prominent "scientist-astronaut" was geologist Harrison "Jack" Schmidt, lunar module pilot for Apollo 17 in 1972, although he has not been on active flight status since Feb. 1, 1974. Schmidt departed from NASA on Aug. 30 to run for a U.S. Senate seat in New Mexico.

Japanese space agency flies No. 1

The Japanese government has put its first satellite into orbit—yet it is the country's seventh. The previous six were launched by the University of Tokyo, which has struggled along on a small fraction of the country's space budget while the official National Space Development Agency has been working out a rocket capable of carrying larger probes such as communications satellites.

On Sept. 9, the so-called "N" rocket, built largely to designs licensed from U.S. companies, made its maiden flight carrying an 85-kilogram satellite named "Kiku" (chrysanthemum), intended primarily to verify the rocket's ability to get it into a desired orbit. It came close: The probe achieved its planned 47-degree inclination, ranging from 977 to 1,104 kilometers above the earth compared with an intended 1,000-kilometer circle.

The next test for the booster, which uses U.S.-designed first and third stages and "strap-on" auxiliaries, is set for next February, when it will carry a small ionospheric sounding satellite. A year or so later it will attempt a Japanese space milestone: the first launch of a satellite (a 130-kilogram test probe) into geosynchronous orbit, more than 35,000 kilometers above the earth.

Moonrocks on the move

Early in 1976, the National Aeronautics and Space Administration will move 10 to 20 percent of the Apollo lunar samples from Johnson Space Center in Houston to Brooks Air Force Base in San Antonio for storage. The move is a safety measure, lest damage to the present facility imperil "a priceless national resource." The samples, to be stored in dry nitrogen gas, will include a generalized cross section of lunar material: highland and maria material, soil and breccias, and core samples.