Geotail-bound—and perhaps to a comet

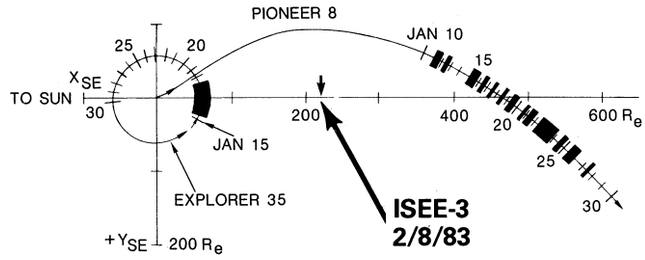
In the summer of 1978, a satellite named ISEE-3 was sent into a most unusual orbit, circling not the earth itself but an imaginary point, about 1.5 million kilometers sunward of the earth, where the gravitational forces of the sun and earth are balanced. This "Lagrangian point" in effect provided an anchor by which ISEE-3 (the third International Sun-Earth Explorer) could stay on the earth's sunlit side, far enough away to be outside the "bow shock" formed where the planet's magnetic field holds off the onrushing solar wind. Thus tethered, ISEE-3 became a full-time monitor of the sun's earthbound outpourings in their "raw" state, for comparison with data from other satellites that were already studying the solar wind's effects closer to the planet.

Now, after some three and a half years on its unique duty station, the probe has been sent off on another mission On June 10, a radioed command from the NASA Goddard Space Flight Center in Maryland triggered the craft's engine to send it away from its sun-facing anchor point on a path that would carry it to the opposite side of the earth and far down into the extended "tail" produced where the geomagnetic field is stretched out by the solar wind.

Even after its departure, however, it was undetermined whether ISEE-3 would be allowed to reach its destination.

To some researchers, the mission is a natural. Some past satellites, such as Explorer 35, have found that the earth's geomagnetic tail seems smooth and stable out to distances as great as the moon's (Explorer 35 was in circumlunar orbit), about 60 times the radius of the earth (60 R_e). Much farther away, however, rare geotail measurements by such probes as Pioneer 8, which crossed the tail at about 500 R_e, have indicated it to be what TRW Inc.'s Frederick L. Scarf describes as "either moving violently or completely disordered." What's missing are data from the tail's intervening region — the "middle depths" — where its change of character begins. ISEE-3's new trajectory will send it as far as 221 R_e "down-tail" by next summer, and even set up the possibility of a later, smaller excursion to 135 R_e. The frosting on this cake is that the probe is already paid for, requiring nothing but the funds to track it.

Other parties, however, would like ISEE-3 to stick with its original duty station (another engine firing next month could send it back). Some cosmic-ray researchers, for example, would like it kept out of the tail, where most cosmic rays are filtered out. Other scientists want to keep the raw solar-wind data coming for as much of an 11-year solar cycle as possible. Even the Defense Department, which has no direct connection with ISEE-3 at all, has taken sides, citing its use of the satellite's solar high-energy proton measurements in forecasting disturbances to communications, radar and navigation.



Earth's magnetic tail appeared smooth to Explorer 35, 60 earth-radii (R_e) from the planet, while Pioneer 8 found it irregular at 500 R_e. ISEE-3 may probe the intervening region to see how the tail changed.

Meetings on the controversy have been taking place this week at NASA headquarters, as well as at the National Science Foundation, which has been asked to conduct an evaluation of the scientific possibilities and options. But there is more at stake than a trip down earth's tail. After the tail excursion, several researchers propose, ISEE-3 could be sent off to a September 1985 encounter with a comet named Giacobini-Zinner, just six days after the comet's closest approach to the sun. Smaller than Halley, it would nonetheless put the U.S. in the comet-mission game, and although ISEE-3 has no cameras, it could provide detailed data on the comet's interactions with the solar wind. Later on, in fact, it might be in position to study solar-wind streams bound for Halley.

—J. Eberhart

PCBs: Chapter two of the regulation rewrite

More rules about a once-popular class of industrial chemicals called PCBs have been proposed. These latest Environmental Protection Agency rules—published in the June 8 FEDERAL REGISTER — already have met with opposition because they virtually leave it up to industry to regulate itself when it comes to levels of PCBs — polychlorinated biphenyls — that are incidentally produced during the manufacture or processing of other chemicals.

PCBs — oily or waxy substances that some scientists believe are potential health hazards (SN: 5/29/82, p. 361)—were manufactured in the United States from 1929 to 1977. They were used — and continue to be used in some cases — as cooling liquids in electrical equipment, heat transfer fluids, dye carriers, additives in paint and pesticide extenders. EPA years ago banned the manufacture, processing, distribution and use of these chemicals unless they are in relatively contained systems such as electrical transformers or in concentrations less than 50 parts per million. The 50 ppm exemption allows industries — including those making certain organic chemicals, pigments and dyes — to use processes that inadvertently produce PCBs as a byproduct.

But on Oct. 30, 1980, the U.S. Court of Appeals for the District of Columbia Circuit — responding to a petition filed by the Environmental Defense Fund — ruled that EPA would have to gather more information and then rewrite these exemptions to the PCB ban. Earlier this year, the agency issued its new proposal to govern PCB-containing transformers, capacitors and other electrical equipment (SN: 5/29/82, p. 359).

The June 8 proposal would replace the 50 ppm cutoff. This time, instead of establishing a numerical cutoff, the agency proposes to exempt from the ban industrial processes that inadvertently produce PCBs as long as a certain analytical procedure could not detect any of the chemicals in the products or the wastes released in air and water. That proposed analytical procedure involves a glass capillary column — a long, column-shaped structure filled with specific material that can separate chemicals — through which a to-be-analyzed sample is pushed by a gas.

This technique can reliably detect individual PCB structures — each at levels as low as about 1 ppm. There are 209 individual PCB structures; different processes produce different combinations of these structures. Therefore, if a process inadvertently produces a mixture of 70 individual PCB structures, for example, each at concentrations slightly below 1 ppm, the process would be allowed even though up to 70 ppm PCBs could be released. EPA believes that specifying an analytical procedure for regulating PCBs would be less variable than specifying a numerical cutoff. With the numerical regulation, for example, a company might be able to show that a given PCB-producing process falls below that cutoff merely by choosing a less precise analytical method.

Attorney Jacqueline Warren — who supervised the EDF suit and now is with the Natural Resources Defense Council in New York City — agrees that specifying an analytical procedure is "a more reasonable approach." However, Warren is concerned because the rules also propose industry self-certification, with only occasional checks by EPA. "The companies should have to report directly to the agency," Warren says. "If companies have to tell EPA the results of their analyses," she says, "there is more incentive not to cheat."

—L. Garmon