ASTRONOMY

Find New Cause of Aurora

Leaks in the radiation belt that encircles the earth may cause the northern and southern auroral lights. Energized particles spray radiation where auroras occur.

➤ LEAKS IN the newly discovered radiation belt encircling the earth may be responsible for the flickering northern and southern auroral lights.

Energized particles in the belt, believed to consist mostly of electrons and protons, collide with constituents of the upper atmosphere and spray radiation into the lower reaches where the auroras occur.

Dr. James A. Van Allen, head of the physics department, Iowa State University, proposed the "leaky bucket" theory during a detailed report on data gathered by the Explorer IV satellite given at the American Physical Society meeting in Chicago.

Although his report is the most comprehensive yet given on Explorer IV, Dr. Van Allen said that only a small number of the some 3,600 "passes" through the belt have been analyzed. Data collected by the satellite are transmitted to tape recorders on the ground.

The Iowa physicist, a member of the technical panel of the earth satellite program of the U.S. National Committee for the International Geophysical Year, said the discovery of the radiation belt by earlier satellites this year has been "confirmed and greatly extended" by Explorer IV reports.

The Explorer IV space reports did not, however, answer all the questions on the radiation belt, such as its origin, spectrum and all the types of radiation.

A feature of the Explorer IV observations was the apparent variability of the composition of the belt's trapped radiation. It would be unwise to attempt a definite statement on the belt's composition, but it is "reasonable" to suppose it is made up principally of electrons and protons, he said.

Various types of detectors aboard Explorer IV, which was launched July 26, found low energy, or "soft" radiation, but in addition, there appears to be a component "considerably more penetrating" than is usually observed at low altitudes in the auroral zone, he said.

Dr. Van Allen said he was not able to offer an appraisal of whether this more penetrating component consists of protons, of electrons or of X-rays, which result from electrons striking the satellite's metal skin and producing a radiation more penetrating than the parent electrons. If such action is the case, it could falsely extend the apparent particle spectrum.

"It appears likely that many important geophysical phenomena are intimately related to the reservoir of charged particles found to be trapped in the outer reaches of the earth's magnetic field," Dr. Van Allen said.

There is a systematic drift of the trapped particles in the belt, he explained, as the electrons move east and the protons west, both "corkscrewing" back and forth from the Northern to Southern hemisphere.

The main loss of electrons from the belt is caused by atmospheric scattering, and most protons are lost by their collisions with atmospheric constituents, Dr. Van Allen said. But there is also a leakage of the "soft radiation" into the auroral zone.

Dr. Van Allen suggested that this "leaky bucket" is the direct cause of the northern and southern lights. A steady leakage of energetic particles may also contribute to the general heating of the atmosphere at all latitudes, he said.

He believes that the plasma surrounding the sun occasionally replenishes this reservoir with particles that work their way into the outer reaches of the earth's magnetic field and then are trapped.

It appears that radiation leakage from the reservoir is favored at the higher latitudes, producing "outward projecting horns" of constant radiation intensity.

The radiation belt may well be the seat of a distributed "ring" of electrical current encircling the earth and disturbances of the belt, due to the arrival of solar plasma, may be directly responsible for magnetic storms, Dr. Van Allen said.

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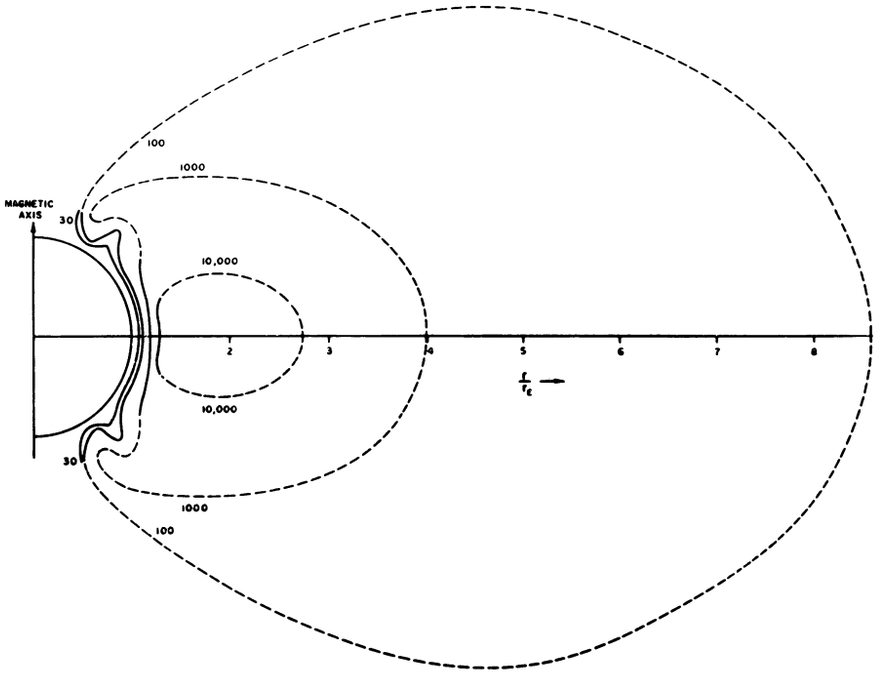

RADIATION BELT—Solid lines indicate contours of constant radiation intensity; dashed lines are a speculative extension, tentatively confirmed by Pioneer. The numbers specify the radiation intensities.

ROCKETS AND MISSILES

'Project Discoverer' Aims At Satellite Probes

➤ THE DEFENSE Department has announced a new long-range satellite program that may eventually succeed in putting into orbit a man-made moon weighing 10,000 pounds. The immediate objective is the launching of a 1,300-pound satellite.

Labelled "Project Discoverer," it will be carried out by the Air Force under the direction of the Advanced Research Projects Agency.

The project will extend over an indefinite period and will involve at least a dozen launching attempts, according to ARPA's director, Roy W. Johnson. Its purpose is to test various aspects of satellite hardware, re-entry and, ultimately, recovery.

Launchings, aimed toward the South Pole, will be from Vandenberg Air Force Base, California.

The vehicle for the first launching, expected to be made late this year or early next year, will be a Thor IRBM with a special new second-stage vehicle having Bell-Hustler engines.

The first launching will be primarily to test the vehicle itself, especially its guidance and propulsion. The initial recovery attempt will probably be made sometime in early 1959.

Mr. Johnson disclosed that mice will certainly be included in some of the satellites and that a primate may be used in one of them. He did not specify which primate was being considered but said it was definitely not man. However, he said, ARPA is working with the National Aeronautics and Space Administration on a program which has as its sole purpose to put a man into orbit and return him safely.

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