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A severe disturbance of the Earth's magnetic field, caused by temporary changes in solar activity, began on Tuesday night, threatening electric utility equipment and communication systems, Government scientists said yesterday.

The storm, which produced displays of the northern lights as far south as Pennsylvania on Tuesday, is expected to persist for several days and may intensify.

Utility managers around the country were notified yesterday to remain on alert, because such storms can interrupt electrical transmissions and damage transformers at generating stations. Some officials have questioned whether explosions and a fire last month at the Maine Yankee nuclear plant in Wiscasset may have been caused by such a storm.

The current storm did not immediately threaten the crew of the space shuttle Columbia, launched early yesterday, but it might subject the astronauts to unusual levels of radiation later this week, one expert said. The dose would be too low to cause immediate health effects, he said, but could exceed Federal safety limits set for people who work with radiation.

Airline passengers might also experience a heightened dose, especially those flying near the poles. Some experts have said that on flights over the poles, the doses in such storms could be of concern for pregnant women.

Possible Satellite Problems

The storm is also exposing some satellites to abnormally high levels of radiation, which may cause them to malfunction at least briefly.

The National Oceanic and Atmospheric Administration, a part of the Department of Commerce, reported yesterday that the storm was the most severe since 1989 and said that the northern lights, or aurora borealis, might be visible last night "as far south as a line extending from New York City through Indianapois and Denver, to northern California."

Interference with high-frequency radio transmission, including shortwave, citizens' band and AM radio waves, was "spotty," said Chris Balch, duty forecaster at the Space Environment Services Center, in Boulder, Colo.

Electric utilities in the northern United States and in Canada are concerned because the solar activity changes the shape of the earth's magnetic field. As the magnetic field moves, it creates electric current in the ground, and these currents can jump into power lines, overheating lines and traveling along them to the transformers at generating stations, overheating them, too.

Unusual Currents

In Valley Forge, Pa., Charles B. Woodward, the operations manager at the utility consortium that serves most of Pennsylvania, New Jersey and Maryland, said that monitors had detected unusual intermittent electric currents in the earth and that if the currents became sustained the utilities would reduce long-distance transmission of electricity.

Satellites and electrical power lines may be damaged.

In March, 1989, such a storm is believed to have caused the destruction of two transformers at the Salem nuclear plant in southern New Jersey. The Nuclear Regulatory Commission and the National Oceanic and Atmospheric Administration recently began a study of whether such storms have caused numerous transformer failures that have gone unexplained over the years. The transformers at nuclear plants are no more vulnerable than those at conventional stations, and the plants are designed to withstand their destruction, but the agency would like to avoid more costly damage.

Some utility experts have proposed launching a space probe to monitor solar activity, to give advance warning of such storms, because if a storm occured when power lines were fully loaded and several lines were to fail, blackouts could result. Presumably, after a warning from the probe, utilities would try to reduce demand and send less power over long distances, relying more on local generators.

John Kappenman, an engineer at the Minnesota Power and Light Company, has been seeking support among utilities for a probe that would be launched from a high-flying aircraft and propelled by rocket into an orbit around the sun. But other utilities have expressed skepticism that the probe could be launched for the price estimated by Mr. Kappenman, $30 million, or that it would be useful.

The craft could not orbit the earth, because in normal conditions, a satellite in earth orbit would be shielded from the sun's magnetic effects by the earth's own magentic field.

But yesterday, the earth's magentic field, which usually extends to a distance equal to 10 times the earth's radius, or about 40,000 miles, had been compressed to 6 times the radius, said Dr. Mario H. Acuña of the International Solar Terrestrial Physics Program at the Goddard Space Flight Center. He called the storm "really severe."

The sun emits a continuous flow of charged subatomic particles, or solar wind. Geosynchronous satellites, which orbit at about 22,300 miles above earth and stay over the same spot on the earth's surface, are normally protected from this "wind" by the earth's magnetic field but are now exposed to the wind because the field has contracted. Dr. Acuña said that while most of the satellites could handle that radiation the subatomic particles would be caught on the dark side of the Earth and would bombard the satellites there, possibly causing malfunctions.

The flow of particles is expected to intensify by this weekend. Thus far the storm is only "moderate," said Gary R. Heckman, of the National Oceanic and Atmospheric Administration's Space Environment Laboratory. One region of the sun is emitting an abnormally high number of the charged particles, he said, but this part of the sun is currently facing away from earth. But the sun rotates, and by this weekend it will face us, he said.

If the emissions continue, he said, the shower could increase the radiation dose to the Shuttle astronauts.