GEOPHYSICS

Solar Storm Affects Radar

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See Front Cover

➤ A GIANT SOLAR STORM disrupted international communications and interfered with radar detection of missiles.

Even if the storm's results did not affect certain radars, long-distance communication of what a radar screen shows is seriously impaired, or even cut off, when the sun hurls high-energy particles earthward.

Such disruption is worse at the high latitudes near the arctic circle where the radar screens that form the core of the United States early warning system are located.

Any detection system working at high frequencies or using the lower part of the very high frequency spectrum, up to about 30 or 40 megacycles, would be affected by a large solar storm.

The particles causing a magnetic storm and a blackout of radio communications are protons (the cores, or nuclei, of hydrogen atoms) thrown out by giant flares from a solar sunspot.

The mid-November magnetic storm was the most severe in a decade. The huge sunspots, from which erupted the solar flares causing the magnetic storm, can be seen on the cover of this week's SCIENCE NEWS LETTER.

The spots travel across the sun's surface from east to west (left to right) as the sun rotates. The photograph was taken on Nov. 14 by astronomer Irving W. Lindenblad with the 30-foot photoheliograph of the U. S. Naval Observatory, Washington, D. C.

Not only are long-distance shortwave communications seriously upset following large solar storms, but the orbital time of all satellites within about 300 miles of earth is slowed, due to expansion of the earth's atmosphere.

Scientists believe that the following events occur when giant sunspots erupt on the sun:

Clouds of ionized particles, mostly protons, speeding spaceward from the sun are trapped in the earth's magnetic field. (Ionized particles are atoms stripped of electrons.) Electrons may also be present in such clouds, but they are very difficult to detect because their effects are so very much smaller.

The particles are guided to two belts of the earth's high atmosphere by the magnetic field, one belt about 23 degrees from the North Pole and one the same distance from the South Pole.

The high-speed incoming particles are believed to fill up the Van Allen belts, the earth's natural radiation regions hundreds of miles up encircling the earth beyond the ionosphere. These then overflow and spill their contents earthward, resulting in auroras.

Instruments in satellites and studies of their motions are helping scientists build up a better picture of the interactions between solar particles and the earth's magnetic field.

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ASTRONOMY

"Tourist" Maps of Moon

➤ FRENCH ASTRONOMERS, working with English specialists, are planning to make a "tourist" map of the moon, in order to supply astronauts who land on the earth's satellite with a detailed guide.

A complete new set of moon photographs will be taken to make up this selenographic map, because the scale of existing pictures is too small.

In addition, existing photographs do not fit together very well, since most of them have been taken by individual and isolated photographers.

The new photographs will be taken at the observatory on the Pic du Midi de Bigorre, in the Pyrenees.

The final map of the entire moon will have the form of a circle 11.8 feet in diameter, which will be divided into sheets for more convenient handling.

Extraordinary photographs of Mars, taken from the Pic du Midi by astronomers with a 15-inch lens, have shown what can be done.

The unusual quality of the Mars photographs was due to the method of using superimposed pictures snapped at short intervals.

In this way it was possible to eliminate the difficulties caused by the earth's atmosphere, which varies from one instant to the next.

A new telescope under construction for the moon study will be 39.4 inches in diameter. It will be capable of magnifying objects 1,500 times and will, optically speaking, bring the moon to a distance of 155 miles from the earth, making it possible to pick out objects measuring 1,000 feet.

About a hundred large-scale photographs will be needed to cover the whole moon. Several photographs will be made of the same area, using different lighting to take advantage of the oblique light that throws objects into relief.

From these photographs, map-makers will put together a detailed map. To indicate the relief, the modern system of "level curves" will be used. These will be so precise that, if desired, they could be used for the building of dams on the moon.

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METEOROLOGY

"EPHI" Tracks Lightning, Hurricanes, Tornadoes

➤ A NEW TOOL that can pick up static from lightning storms, tornadoes and hurricanes with greater accuracy has been developed at the National Bureau of Standards' Boulder Laboratories, Boulder, Colo.

The system, named "Ephi," consists of three 125-foot antenna towers, four miles apart, and a central control station, located in an old schoolhouse near Brighton, Colo.

The three antenna poles form a triangle, and when a storm occurs, the sferic, or static, radio signals reach each antenna at a slightly different time, except when a storm occurs at the exact center of the triangle.

From the antennas the signals are sent to the central control station where electronic equipment determines the direction to the lightning source.

Ephi can also count the number of static signals arriving from several different directions at the same time.

In addition, the sferic waveform of an oscilloscope can be photographed either with still or movie cameras for studies aimed at a better understanding of radio wave propagation and the nature of lightning.

For tracking tornadoes and hurricanes, two stations like the one just installed could determine the position of a storm at distances of many hundreds of miles from either station.

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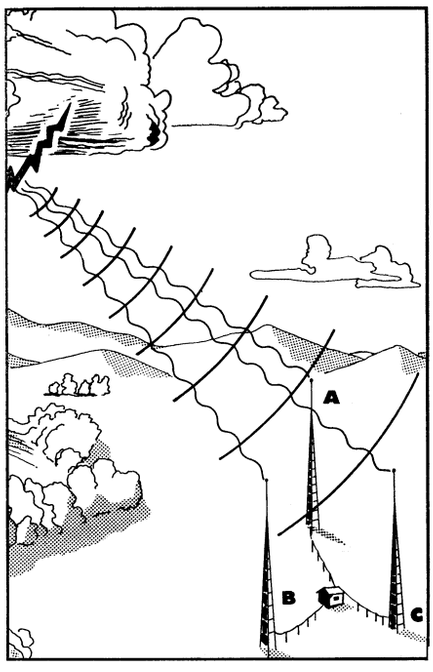

"EPHI" TRACKS A STORM