radio sciences notes

Gathered at the meeting of the International Scientific Radio Union in Washington, D.C.

RADIO ASTRONOMY

Jupiter's 10-meter radiation

The curious 10-meter radio emanations of the planet Jupiter have been studied with a long baseline interferometer. Antennas at Boulder, Colo., and Clark Lake, Calif., were used to form an interferometer 1,200 kilometers long. This is 140,000 wavelengths at a frequency of 34 megahertz.

A group led by Dr. G. A. Dulk of the University of Colorado reports that the upper limit on the size of the source of the decametric radiation, is one-tenth of a second of arc, or 400 kilometers on the surface of Jupitar. Measurements of bursts that last for about a millisecond show that within an accuracy of a tenth of a millisecond, the bursts arrived at both stations at the same time.

GEOPHYSICS

Profiling wave heights by radar

A method for obtaining both better weather predictions and wave forecasts using radar from a satellite in polar orbit has been devised. The National Aeronautics and Space Administration is considering the experiment as one of seven or so to be carried on Nimbus E, expected to be launched in 1971.

The system, called GROW for Global Radar for Ocean Waves, has been successfully tested on aircraft flights.

Nimbus E would have two radars, each of which would scan a swath of ocean 360 miles wide, profiling wave heights through clouds or clear, both night and day.

This would yield some 40,000 values over the ocean per day, compared to the 600 every six hours now obtained from ships at sea for the Northern Hemisphere and a fraction of that for the Southern Hemisphere.

Wave heights are correlated with wind speeds. These have been plotted for 12, 18 and 28 knots for fully developed seas by Drs. Willard J. Pierson Jr. of New York University and Richard K. Moore of the University of Kansas.

The rougher the ocean surface, the more the radar signal is scattered and the weaker the return signal. The scattering data would be telemetered back to earth and the wind speed computed.

IONOSPHERIC PHYSICS

Electron density under solar eclipse

The earth's ionosphere, which makes long distance short wave radio possible, exists because of sunlight. Solar radiation at the high energy end of the spectrum disassociates atoms of the upper atmosphere into ions and electrons.

In the daytime the ionosphere tends to be deep and the density of free electrons is high. At night some recombination takes place, and the density of free electrons goes down.

Studies of how these things happen, and how quickly, are aided by solar eclipses, which darken a small portion of the atmosphere for short periods. A partial eclipse conveniently occurred at Palo Alto, Calif., on May 9, 1967 for radar observers at Stanford University.

Radar beams probed the atmosphere over Palo Alto on several days before and after the eclipse, as well as the eclipse day itself. The eclipse came just at dawn, and investigators were particularly interested in how it delayed the night-to-day transition.

The eclipse held down electron density and electron-to-ion temperature ratio, Dr. M. J. Baron reports. Recovery was slow: Effects of the eclipse could be detected up to three hours after it was over.

PLANETARY ASTRONOMY

Venus unresolved

The Lincoln Laboratory experiment to locate rough spots on the surface of Venus by interferometry (SN: 2/24, p. 183) has not been entirely successful. The experiment, which used the 120-foot Haystack and the 60-foot Westford antennas as a radar interferometer, was undertaken because other radar methods of locating the rough spots—signal delay and frequency shift—left ambiguities in the data.

Interferometry could resolve the ambiguities, but in the actual experiment, Dr. Tor Hagfors reports, the interferometer baseline was too badly oriented to gain the desired degree of resolution. Since neither Haystack nor Westford can be moved, the situation had to be left at that. But the experiment did generate a good deal of knowledge and experience in the technique, and Dr. Hagfors hopes that "someone with greater baseline ability will carry out the experiment and get perfect maps" of the planet.

TERRESTRIAL MAGNETISM

Whistlers at higher frequencies

Whistlers—radio waves that propagate along force lines of the earth's magnetic field—can be generated at higher frequencies than was previously believed possible, according to calculations by Dr. C. D. Capetanopoulos of Manhattan College. He says it is possible to propagate signals between 10 and 100 kilohertz deep into the ionosphere via the whistler mode to study conditions there.

Natural whistlers, which are generated by lightning and other atmospheric electricity, usually have frequencies below 10 kilohertz—though some up to 45 kilohertz have been heard. Since whistlers follow magnetic field lines, an artificial whistler generated at a point in the Antarctic would follow a field line from that point up through the ionosphere and back down again to be received in the Arctic where its field line came to ground again.