ASTRONOMY-RADIO

Moon Affects Reception

Shortly after a new or full moon the band of frequencies usable for shortwave radio broadcasts is narrowed slightly in some parts of the world.

➤ NOT just the sun, but also the moon affects reception of shortwave radio broadcasts.

Three or four days after the moon is new or full, the band of frequencies that can be used to get shortwave broadcasts through to distant stations is slightly narrower in some parts of the world than at other times.

At Huancayo, Peru, where the effect is quite pronounced, the usable frequencies at noon from November to February averaged 1.7 megacycles lower three or four days after new and full moons than after the quarters of the moon. This was reported by Dr. A. G. McNish of the National Bureau of Standards at the joint meeting in Washington of the International Scientific Radio Union, American Section, and Institute of Radio Engineers.

Just as the moon raises tides in the ocean, so it produces tides in the atmosphere. That portion of the earth's atmosphere facing the moon is actually pulled toward the moon, and the earth in turn is pulled away from the atmosphere on the opposite side. Thus the atmosphere bulges out at these two regions.

This football effect also works on the ionosphere, series of invisible layers 50 to 250 miles above sea level that bounces radio waves back to the earth and enables us to hear distant broadcasts. But this direct tidal effect alone does not adequately explain the low critical frequencies, Dr. McNish pointed out. Such an explanation has been advanced by D. F. Martyn of Australia who last year independently reported that critical frequencies vary with the phases of the moon.

As an alternate explanation Dr. McNish and T. N. Gautier, also of the National Bureau of Standards, suggest that the variations are due to magnetic fields which are known to be set up within the atmosphere by the lunar variations.

Solar radiation ionizes the atmosphere on the sunlit side of the earth by knocking electrons out of atoms. Currents can flow in this ionized atmosphere. The magnetic field of these currents modifies slightly the earth's magnetic field. These resulting currents are further modified by the tidal action of the moon.

These currents affect the ionized layer of the earth, and tend to decrease its density. When the ionization is reduced, the highest frequency that can be used to get broadcasts through to distant countries is lowered. This critical frequency has been found to be a megacycle or two lower than it would be were the near-by moon not affecting the ionized layers.

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ASTRONOMY-RADIO

Radio Signals Go Farther

➤ SHORTWAVE radio broadcasts go much farther with only one reflection from the earth's radio roof when the sun's disk is marred with many sunspots than during sunspot minimum.

This is because the reflecting layer is much higher during sunspot maximum, R. C. Peavey of the National Bureau of Standards stated at the joint meeting of the International Scientific Radio Union, American Section, and the Institute of Radio Engineers in Washington.

The point of reflection is higher throughout the entire day, Mr. Peavey and Miss Gladys R. White, also of the Bureau, have found. From the middle of the afternoon through the evening, it is as much as 125 miles higher than during sunspot minimum.

In the past it has been assumed that radio signals during a single hop go a maximum distance of 2,500 miles. But when there is much activity on the sun, a single-hop transmission may be 800 miles more than this. Signals being reflected only once have been estimated to travel as far as 3,300 miles.

The whole radio roof, layer of ionized particles that return radio signals to the earth, is much thicker during sunspot maximum, Mr. Peavey reported. The thickest part of the ionized layer moves farther from the earth without an appreciable increase in the height of the bottom of the layer.

This mattress of atoms with the electrons knocked out of them is twice as thick in the early morning during sunspot maximum as during periods of little activity on the sun. It becomes three times as thick during the middle of the day.

At sunspot maximum the highest frequency which is reflected from the radio roof at any instant when the signals are sent directly skyward is much higher than at other times. It has always been expected, Mr. Peavey said, that the highest usable frequency would increase along with an increase in critical frequency. While this is true a big proportion of the time, there are outstanding exceptions.

At certain hours for certain locations the maximum usable frequency will not be appreciably greater than at sunspot minimum. The point at which the signal is reflected largely determines just when these exceptions will occur.

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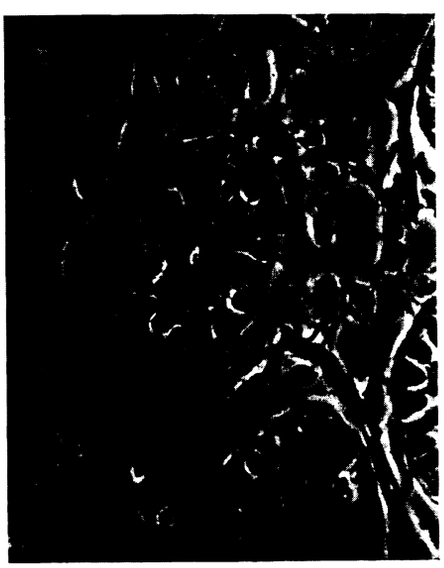

***DELICATE CELL STRUCTURE—** Details of liver tissue photographed in a fresh unstained condition are revealed by the phase microscope. (See SNL, May 8). They are invisible under the ordinary microscope. This instrument is expected to reveal much about important life processes. The picture was taken at the Carnegie Institution Department of Johns Hopkins Medical School.*