N72-25351

THE USE OF SATELLITE BEACONS FOR METEOROLOGICAL RESEARCH

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Atmospheric absorption measurements have been made in the past using microwave radiation from the sun, the moon, and discrete radio sources for the measurements. Oxygen and water vapor are the principal constituents absorbing the energy. Absorption is readily observed at 3 GHz and higher frequencies.

Another tool which might be used to measure absorption is microwave beacon transmissions from synchronous and near synchronous satellites. With a fixed angle of elevation of a synchronous satellite complete diurnal coverage of the integrated absorption is available. With refined interferometric equipment, angle of arrival studies can also be made and phase deviations measured.

The transmissions now available are of limited utility for consistent observations because of their low power. Large antennas and phase lock ground equipment are needed for an adequate signal to noise ratio.

Among the beacons now transmitting in the microwave region are the following:

(1) Intelsat 2 F-3 Object 1967 26A - Beacon #1 at 4058.15 MHz, Beacon #2 at 4182.00 MHz. It is now positioned at 5^{o} West Longitude. COMSAT Corporation, Washington, D.C., is responsible for this satellite and several others which are also transmitting on the same frequencies and located in either the Atlantic or Pacific areas.

(2) IDCS Beacons - a series of twenty satellites which are in a near synchronous orbit and transmit on 7299.5 MHz. The Defense Communications Agency (DCA), Mr. William de Hart, Code 480, Washington, D.C., is responsible for this series.

The technical output of a study of this type is the integrated absorption over the whole path length. This has limited utility for meteorological research but may have utility for cataloging long term changes of oxygen and water vapor at a particular area. The measurements, of course, need calibration by other techniques in order to determine the various height contributions to the absorption.

A more subtle measurement may be made of atmospheric irregularities by means of the interferometric technique. The beacon signal has phase information and the interferometric measurements of phase differences can yield new irregularity data at high angles of elevation through the total atmosphere; present ground based transmitter and angle of arrival measurements have only horizontal paths or relatively limited geometry (mountain-valley).

SESSION 2

Optical Line-of-Sight Propagation