Arecibo S-Band Radar Program

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a) General Objectives: The high powered 12.6 cm wavelength radar on the 1000-ft Arecibo reflector is utilized for a number of solar system studies. Chief among these are: 1) Surface reflectivity mapping of Venus, Mercury and the Moon. Resolutions achievable on Venus are less than 1.5 km over some areas, for Mercury about 30 km and for the Moon 200 m at present. 2) High time resolution ranging measurements to the surfaces of the terrestrial planets. These measurements are used to obtain profiles and scattering parameters in the equatorial region. They can also be used to test relativistic and gravitational theories by monitoring the rate of advance of the perihelion of the orbit of Mercury and placing limits on the stability of the gravitational "constant". 3) Measurements of the orbital parameters, figure, spin vector and surface properties of asteroids and comets. 4) Observations of the Galilean Satellites of Jupiter and the satellites of Mars, Phobos and Diemos.

b) Past Twelve Months: The Galilean Satellites of Jupiter were re-observed with the 12.6 cm radar for the first time since 1981. Much more accurate measurements of the scattering properties of the three icy satellites were obtained that generally confirmed previous observations. Unambiguous measurements of the cross section and circular polarizations ratio of Io were also obtained for the first time. The radar scattering properties of four mainbelt asteroids and one near-earth asteroid were studied and the turbulence spectrum of the solar wind within 20 solar radii of the Sun was measured by examining propagation effects on echoes reflected from Venus when it was close to superior conjunction. Late May saw a commencement of a new set of mapping observations of Venus. Papers covering observations of Comets IRAS-Araki-Alcock and Halley, measurements of turbulence in the solar wind and studies of the surface of Venus were submitted for publication.

c) Next Twelve Months: A heavier than normal observing schedule is planned for the next eight months. Mapping observations of Venus will continue until early July, Mars' observations aimed at delineating areas of high surface roughness will commence in August and an attempt will be made to detect the satellites of Mars, Phobos and Diemos, in September. Approximately twenty observing sessions will be devoted to measurements of the scattering properties of the Galilean Satellites at both 70 cm and 12.6 cm wavelengths. Detailed topographic measurements of Aphrodite Terra on Venus will be made in late summer and fall aimed at attempting to verify the suggestion that this region contains numerous cross strike discontinuities and the program of high resolution (<100 m) imaging of the moon will recommence in early 1989. A number of asteroids will be observed including the small earth approaching objects, 433 Eros, 1685 Toro and 1980 PA.
d. Publications


