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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Arecibo S-Band Radar Program

PERFORMING ORGANIZATION

National Astronomy and Ionosphere Center
Space Sciences Building
Cornell University
Ithaca, N.Y. 14853

INVESTIGATOR'S NAME

Donald B. Campbell

DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a)General Objectives: The high powered 12.6cm 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 1.5km over some areas, for Mercury about 30km and for the Moon 200m 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 12.6cm 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 70cm and 12.6cm 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 (<100m) 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

Head, J.W., Crumpler, L.S., Bindschadler, D.L., Stofan, E.R., VorderBruegge, R.W. and Campbell, D.B., Venus Geology and Geophysics: A Review of Some Recent Studies, Astron. Vestnik, 21, 99, 1987.

Basilevsky, A.T., Ivanov, B.A., Burba, G.A., Chernaya, I.M., Kryuchkov, V.P., Nikovaeva, O.V., Campbell, D.B. and Ronca, L.B., Impact Craters of Venus: A Continuation of the Analysis of Data from the Venera 15 and 16 Spacecraft, J. Geophys. Res., 92, 12, 869, 1987.

Harmon, J.K. and Campbell, D.B., Radar Observations of Mercury, in press, Proceedings of the Conference on Mercury, Tucson, Arizona, 1986.

Crumpler, L.S., Head, J.W. and Harmon, J.K., Regional Linear Cross-Strike Discontinuities in Western Aphrodite Terra, Venus, Geophys. Res. Lett., 14, 607, 1987.

Coles, W.A. and Harmon, J.K., Radar Propagation Observations of the Solar Wind Near the Sun, submitted to the Astrophys. J.

Harmon, J.K., Campbell, D.B., Hine, A.A., Shapiro, I.I. and Marsden, B.G., Radar Observations of Comet IRAS-Araki-Alcock, submitted to the Astrophys. J.

Campbell, D.B., Harmon, J.K. and Shapiro, I.I., Radar Detection of Comet Halley, submitted to the Astrophys. J.

Stofan, E.R., Head, J.W., Campbell, D.B., Zisk, S.H., Bogomolov, A.F., Rzhiga, O.N., Basilevsky, A.T. and Armand, N., Geology of a Rift Zone on Venus: Beta Regio and Devana Chasma, submitted to the GSA Bulletin.