HIGHLIGHTS OF 13 YEARS OF RADIO SCIENCE OCCULTATION OBSERVATIONS OF THE ATMOSPHERE AND IONOSPHERE OF VENUS

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From December, 1978, to February, 1992, the Pioneer Venus orbiter was used to acquire over 270 measurements of the vertical profiles of pressure and temperature in the atmosphere of Venus from about 90 km altitude to anywhere from 40 to 50 km, depending on the signal-to-noise ratio of the S-band and X-band radio signals, which varied with the distance from Earth. At the same time, some 500 measurements of the electron density profiles in the Venus ionosphere were also obtained.

246 of the atmospheric profiles were of sufficient quality to use for further analysis. Of these 114 were from the first high solar activity season (1978-83); 63 were from the low solar activity season of 1984-86, and 69 were from the second high solar activity season of 1989-92. These profiles were used to prepare smooth temperature-pressure-latitude maps by means of a two-segment Chebyshev polynomial fits. Finally, these maps were used to obtain maps of zonal wind as a function of pressure and latitude, which showed a strong high-latitude jet which changed significantly with season and/or time.

441 of the ionospheric measurements taken at various solar zenith angles and during three solar activity seasons, were used to produce maps of electron density versus solar zenith angle and altitude for the various seasons, showing the profound influence of solar activity on the vertical extent of the dayside ionosphere, and consequently on the transport of ions to the nightside.

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