EPSC Abstracts,
Vol. 2, EPSC2007-A-00145, 2007
European Planetary Science Congress 2007

Mapping Whistler Mode Wave Source Regions on Venus

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The occurrence of lightning in a planetary atmosphere enables chemical processes to take place that would not occur under standard temperatures and pressures. The Venus Express magnetometer was equipped to transmit data at up to 128 Hz to search for lightning-associated whistler-mode waves. These measurements reveal strong, circularly polarized electromagnetic waves with frequencies near 100 Hz. The waves appear as bursts of radiation lasting 0.25 to 0.5 s. These waves have the expected properties of whistler mode signals generated by lightning discharges in the Venus clouds, and confirm the interpretation of the existence of pervasive lightning at Venus based on the observation of the electric counterpart of these waves with the Pioneer Venus Orbiter. We now have obtained a full Venus year of measurements for 2 minutes each orbit centered on periapsis. Strong bursts occur on 10% of the passes and vary in occurrence rate over the year. This variation could be due to varying coupling of the signals from the atmosphere to the ionosphere or to variations in the source strength with local time. In December 2006 the spacecraft began transmitting data for 10 minutes around each periapsis allowing the detection of signals up to 600 km in altitude and over a broader range of altitudes enabling a survey of a larger fraction of the surface in year 2.