



Whistler mode waves in the Venus ionosphere indicative of lightning

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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. While much evidence has been reported for lightning on Venus, some searches have been negative and the existence of Venus lightning has remained controversial. A definitive test for lightning would be the confirmation of whistler-mode waves propagating from the atmosphere to the ionosphere. The Venus Express magnetometer was equipped to transmit data at up to 128 Hz to make such measurements. Herein we report observations by the Venus Express fluxgate magnetometer that 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.