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Electrical phenomena on other planets: lightning discharges, corona and sprites (MG7)

Venus Lightning Characteristics and Polar Vortex Correlation

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Venus Express started taking magnetic field measurements at periapsis in 2006. Since then it has consistently detected whistler-mode signals attributed to lightning. Most, if not all, of these are thought to be intercloud, intracloud, or upward-going lightning; the cloud deck on Venus is at an altitude of about 60 km and thus cloud-to-ground strikes are extremely unlikely. These bursts have peak-to-peak amplitudes of up to 1.5 nT in the frequency range 42-60 Hz. They are transverse and right-hand circularly polarized with respect to the background magnetic field. When this field is close to 0 nT, the occurrence rate is very low; it rises sharply at 15-20 nT, then gradually dies off as the field strength further increases. There are very few bursts observed below 200 km; the occurrence rate peaks sharply around 215 km then slowly decreases with increasing altitudes. Burst amplitude distributions and averages are also in agreement with these findings. Between 80 and 90 degrees north latitude, the burst rate with respect to local time maximizes over the terminators. It has been suggested that a burst rate local maximum around 83 degrees north latitude can be attributed to the approximate edge of the polar vortex. We further examine this possibility within this study.