

The Case for Venus Lightning

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The case for Venus lightning is built on observations of a variety of atmospheric phenomena across the missions of multiple nations over five decades of space exploration. It is not based on the presence or absence of any one signal on any one mission but on many different observations any one of which is best explained by lightning. The observations began with the Venera landed probes that carried search coil antennas into the atmosphere and detected VLF signals on descent and on the surface. It was reinforced by Venus 9 nighttime observations of optical flashes below the spacecraft. Such flashes were also seen from Earth telescopically.

A prolonged set of observations were obtained by the Pioneer Venus mission that carried an electric antenna with narrow band channels at 100 and 730 Hz that measured electromagnetic signals that were guided by the magnetic field and came from altitudes below the spacecraft. The estimated Poynting flux diminished gradually with altitude.

Most recently the ELF spectrum was measured by fluxgate magnetometers on the Venus Express mission that mapped the electromagnetic signals from <1 to 64 Hz over latitudes from about 60° to the poles and at all local times. Again no signal source other than lightning could explain the temporal variation nor the intensity of these signals. They had to be produced by atmospheric sources below the spacecraft. There were no such sources at high altitudes.

In case for lightning at Venus was never weak. The controversy was prolonged by those who felt lightning failed to possess one property they expected it to have.