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Venera 13 & 14 Discharge Current Measurements – Evidence for Charged Aerosols in the Venus Lower At-mosphere?

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Following the discovery of low frequency (LF, 10-80 kHz) electromagnetic emissions within the Venus atmosphere by loop antennas (part of the Groza instrument) on the Venera 11 and 12 landers in 1979, follow-up measurements were made with Groza-2 on Venera 13 and 14. In addition to a loop antenna to detect LF distant emissions from electrostatic discharges such as lightning, Groza-2 carried a point discharge current sensor. This was carried in order to be certain that the LF emissions measured were not due to some kind of local activity generated by the descent of the vehicle itself, as in the generation of 'static' by so-called triboelectric charging of aircraft.

.The current measurements were reported with little comment in graphical form by Ksanfomality et al. (1982), but have received essentially no discussion in the literature since. In brief, the current (observed on both Venera 13 and 14) increases below the main cloud deck to a maximum of 50-70 nA at 25km altitude, and then declines a little to 50 nA near the surface; the current was zero after landing (Ksanfomality, personal communication).

Although such currents can be produced on Earth by ambient electric fields of several hundred V/m, the vertical profile is not consistent with a uniform field, and the zero current at the surface is puzzling. Instead, a preferred explanation [Lorenz, Icarus, in revision] is that there are charged aerosols in the lower atmosphere. The charge density implied is not much greater than that measured e.g. in Sahara dust measured over the Atlantic Ocean. The implied dust concentrations, not strongly constrained by other data, may have implications for the optical transparency of Venus' lower atmosphere and suggests triboelectric processes may be active in surface sediment transport and/or volcanic plumes.