Venera 13 & 14 Discharge Current Measurements – Evidence for Charged Aerosols in the Venus Lower Atmosphere? R. D. Lorenz[1], [1]Johns Hopkins Applied Physics Laboratory, Laurel, MD 20723, USA (ralph.lorenz@jhuapl.edu)

Introduction: Measurements of discharge currents on the Venera 13 and 14 landers during their descent in the lowest 35km of the Venus atmosphere are interpreted as driven either by an ambient electric field, or by deposition of charge from aerosols. The latter hypothesis is favored, and would entail a modest lower atmosphere aerosol opacity, with particles with charge density within a factor of a few of that observed in Saharan dust transported over long distances on Earth. This would imply the lower atmosphere is not as 'clear' as is often assumed.

Measurements: Following the discovery of low frequency (LF, 10-80 kHz) electromagnetic emissions within the Venus atmosphere during the descents of the Venera 11 and 12 landers in 1979 using the Groza ("thunderstorm") instrument (Ksanfomality et al., 1979; 1983), follow-up measurements were made with a slightly augmented instrument ("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 carried a microphone to detect thunder, while Groza-2 instead carried a seismometer. In addition, 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, a corona discharge electrode was included on Venera 13 and 14 and the discharge current was monitored.

The measurements were made only in the post-parachute phase of descent, when the vehicles were falling at a terminal velocity controlled by the disk-like drag brake at the top. This velocity varied smoothly, as the inverse square root of atmospheric density, declining from about 40 m/s at 40km, to about 8 m/s near the surface. The current measurements were reported with little comment in graphical form by Ksanfomality et al. (1982) and are reproduced in figure 1, but have received essentially no discussion in the literature since.

In [1] I provide quantitative interpretation of two possible mechanisms for these currents.

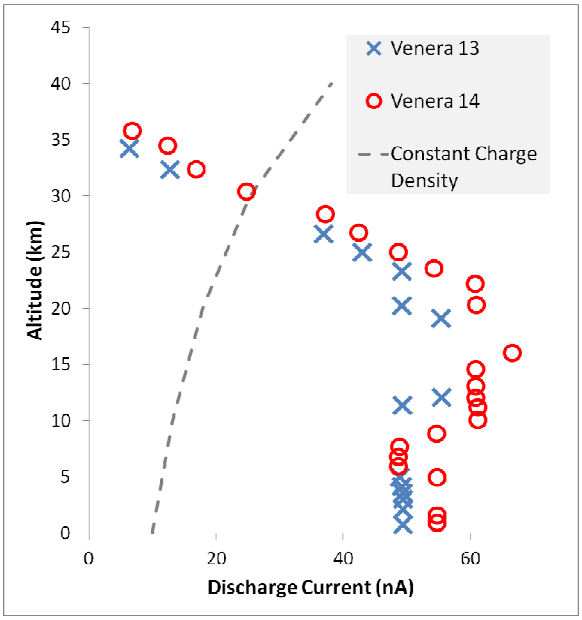

Figure 1. Measurements (Ksanfomality et al., 1982) obtained during the descent of the Venera 13 and 14 landers (crosses and circles respectively). Currents above 35km, and on the surface, were too low to be measurable. The vehicle descent speed in m/s is shown with the dashed line.

References: [1] Lorenz, R. D., Discharge Current Measurements on Venera 13 & 14 – Evidence for Charged Aerosols in the Venus Lower Atmosphere? Ksanfomality, L.V., Vasilchikov, N.M., Goroshkova, N.V., Petrova, E.V., Suvorov, A.P. and Khondryev, V.K., 1982. The Low-Frequency Electromagnetic Field in the Venus Atmosphere-Evidence from VENERA-13 and VENERA-14. Soviet Astronomy Letters, 8, 230-232.

Additional Information: RL acknowledges support of NASA grant NNX16AC78G, Venus Climate Orbiter Participating Scientist Program, and useful discussions with Leonid Ksanfomality.