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The Effect of Particles on Standing Shockwaves Regulating Spark Discharges in Volcanic Eruptions[1] J. VON DER LINDEN, J. SEARS, A. KUHL, D. GROTE, M. CONVERSE, C. KUENY, B. POOLE, LLNL, C. CIMARELLI, D. GAUDIN, Ludwig-Maximillian U, S. BAGLEY, R. HOUIM, U Florida, C. KIMBLIN, I. MCKENNA, Special Technologies Laboratory — Near-vent discharges emit in the VHF spectrum without lower frequencies seen in meteorological lightning (Behnke et al. 2018. JGR). This suggests the discharges are cut-off before they can form leaders associated with lower frequency emission. Experiments generating discharges in a particle-laden gas jet formed during the decompression of a shocktube filled with ash have identified a standing shockwave regulating the breakdown process (Mendez-Harper et al. 2018. GRL). Particles charge through collisions, triboelectrically, in the high pressure conduit. Once they pass the vent and enter the rarefaction region the pressure and the Paschen breakdown voltage rapidly drop enabling breakdown. The breakdown is cutoff by the rapid increase in pressure beyond the stationary Mach disk. While Mach disk formation is well understood for gas flows through a vent/nozzle, the effect of particles has not been explored. We have adapted a granular compressible hydrodynamics model (Houim, Oran 2016. JFM) to the volcanic shocktube problem. Elucidating the relationship between mass eruption rate, particle size distribution, and spark discharge behavior could result in novel radiofrequency measurement techniques for the hard to diagnose near-vent region of volcanos.

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