MEASURING AND MODELING THE PLASMA ENVIRONMENT AT THE LUNAR SURFACE. Z. Sternovsky,[1] M. Horanyi,[1] S. Robertson,[2] X. Wang,[2] J. Colwell[3] and P. Messmer[4], [1]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO 80309-0392 (Zoltan.Sternovsky@colorado.edu), [2]Department of Physics, University of Colorado, Boulder, CO 80309-0390, [3]Department of Physics, University of Central Florida, Orlando, FL 32816, [4]Tech-X Corporation, 5621 Arapahoe Ave, Suite A, Boulder, CO 80303

The tenuous plasma at the lunar surface in sunlight consists of photoelectrons from the regolith and electrons and ions from solar wind plasma. The plasma environment of a robotic explorer or of a manned lunar base will contain additional populations of photoelectrons from the equipment and habitation surfaces. Analysis of the photoelectron yield from lunar regolith samples indicates a smaller yield than had been assumed in initial modeling. Spherical probe tips of electric field booms (which are also photoemitters) may be operated as active plasma probes to find current-voltage relationships. With adequate modeling, it is possible to extract the densities and temperatures of the various electron populations from these data, particularly if there is a set of probes with varying distances from the different emitting surfaces. Data from low-energy electron analyzers may also be useful. A significant issue is the potential of the equipment surfaces relative to the lunar surface. In sunlight, the photoelectron gas will tend to bring surfaces to the same potential only if these surfaces have similar photoelectron yields and similar illumination. Advances in computational methods since the Apollo era allow accurate modeling of plasma dynamics in three dimensions, including current collection by biased conducting surfaces, photoemission, charging of insulating surfaces, and the transport and deposition of charged dust released from surfaces. We will describe an instrument package for diagnostic measurements of the lunar surface plasma and the charged dust environment, the use of advanced modeling methods to find the characteristics of the electron populations and the surface electric potential, and will describe recent laboratory experiments with strong UV sources illuminating regolith simulant.