

Abstract Submitted
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Application of Multivariate Regression Techniques in the Interpretation of Langmuir Probe Measurements.¹ AKINOLA OLOWOOKERE, RICHARD MARCHAND, University of Alberta, . TEAM — The use of Langmuir probes as a diagnostic tool in the study of both space and laboratory plasma cannot be overemphasized. Different approaches have been used in the interpretation of measurements collected using Langmuir probes in term of plasma parameters such as: density, temperature, and plasma potential. In this work, we apply a multivariate regression algorithm in constructing a predictive model for plasma parameters. Data used for constructing and validating the model are obtained by kinetically simulating the interaction of plasma with a fixed bias probes over a range of plasma parameters obtained using International Reference Ionosphere (IRI) model, of relevance to Low Earth Orbit satellites. Simulations are used to construct a solution library with currents collected by three spherical probes, with corresponding plasma parameters. An approximate expression, based on the Orbital Motion Limited (OML) approximation, is derived for each of the plasma parameters to be predicted. This expression is used to estimate the parameters of interest using training data set consisting of a subset of the solution library. The error in the predictions is determined and a second model, based on RBF regression is constructed to predict and correct for the error resulting from the first (OML) approximation. The skill of the combine model is validated using the data set not included in the training data set. By combining the two models, predictions of plasma parameters can be made from a probe measurement with better accuracy.

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