Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Uncertainty and error in complex plasma chemistry models
MILES TURNER, Dublin City University — Plasma chemistry models commonly contain hundreds if not thousands of parameters, in the way of rate constants and other related coefficients. None of these parameters is exactly known. Moreover, in modern models, the parameters have often been transmitted from the primary data sources by complex and error prone routes. Consequently, typical plasma chemistry models embody unavoidable uncertainty, because of inexact knowledge of the parameters, and some margin of avoidable error, because of faulty transmission. This paper discusses a model for helium/oxygen mixtures (a moderately complex model with some 350 reactions), in which all the the rate constants have been traced to primary sources, with the initial aim of determining the uncertainty associated with each parameter. This data is then used in a Monte Carlo procedure to investigate the resulting uncertainty in the model predictions. Uncertainty is found to be unequally distributed across the model outputs, but for some results it is a factor of several or more. This certainly needs to be considered when comparing model calculations with experiments, or deciding whether conclusions drawn from the model predictions are robust. The process of tracing the sources for the rate constants shows that some of them have been polluted by various types of error. Some examples will be discussed.

Miles Turner
Dublin City University

Date submitted: 17 Jun 2014 Electronic form version 1.4