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Critical Evaluation of the Global Model Approximation DEREK MONAHAN, MILES M. TURNER, Dublin City University, Ireland — The assumptions and simplifications typically associated with volume-averaged, or global, plasma chemistry models greatly limit the parameter domain over which they may be reliably applied. Well defined boundaries to these domains, however, have not been established and often only minimal model validation is offered in the literature. The aim of this project is to critically evaluate the performance of a global model over a range of parameters and gas compositions by comparing such a model to a more elaborate one dimensional kinetic simulation. The motivation for this work has arisen from the need for reliable and computationally inexpensive qualitative models in real time freedback control applications. In this paper initial findings are presented. It is found, as expected, that the most significant limitation of such a model appears to be the assumption of a Maxwellian electron energy distribution. The propensity of capacitively coupled discharges to develop energy distributions which are significantly non-Maxwellian, is well known. However, we have observed similarly restrictive behaviour in PIC simulations of a low pressure inductively coupled argon plasma. In our simulations the electrons appear to develop a bi-Maxwellian like distribution as pressure is increased above $\sim$ 10 mTorr. The volume averaged mean electron energy is then found to rise slowly with increasing pressure beyond this point. This is in direct contradiction with simple global model arguments. The source of this high energy tail is currently being investigated.

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