

Abstract Submitted
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A Fast Four Fluid Model of Electronegative Plasmas Including Non-Isothermal Neutrals¹ ANDREW HURLBATT, TIMO GANS, DEBORAH O'CONNELL, York Plasma Institute, Department of Physics, University of York, Heslington, York, YO10 5DD — A novel semi-analytical fluid model has been developed of a four component plasma consisting of positive ions, negative ions, non-maxwellian electrons and non-isothermal neutrals. The four dominant interspecies reactions are considered, as well as elastic collisions between charged and neutral species. The model is based on an idealised RF discharge with an infinite planar geometry, and provides time averaged spatial profiles of species densities and fluxes, as well as neutral gas temperature, within the plasma bulk and presheath. Due to the combination of boundary conditions and normalisations, only the mean electron energy and the relative electron density are required as input parameters. The pressure length product of the system is given as an output, meaning the model can be scaled to any plasma discharge sharing geometrical characteristics. Despite the increased complexity and reduced assumptions compared with other similar electronegative models, analyticity is maintained until the point of spatial integration. This means the computation time is on the order of seconds, allowing the detailed investigation of discharge properties on phenomena such as Neutral Gas Depletion and electronegative to electropositive transitions over large regions of parameter space.

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