Abstract Submitted
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Bridging the Gap between Global Models and Full Fluid Models in Electronegative Plasmas[1] ANDREW HURLBATT, TIMO GANS, DEBORAH O'CONNELL, York Plasma Institute, Department of Physics, University of York, Heslington, York, YO10 5DD — The value of analytical and numerical models has been proven many times over. They allow investigation of complicated discharge phenomena and the interplay that makes plasmas such a complex environment. Global Models are quick to implement and can have almost negligible computation cost, however only approximate bulk values. Fluid Models take longer to develop, and can take days to solve, but provide spatial profiles. The work presented here details a different type of model, analytically similar to Fluid Models, but computationally closer to a Global Model, and extended to give solutions for the challenging environment of electronegative plasmas. Also included are non-isothermal electrons, gas heating, and coupled neutral dynamics. Solutions are reached in minutes, and spatial profiles are given for densities, fluxes, and temperatures. This allows broad parameter sweeps that are not practical with more costly models, as well as exposing non-trivial trends that Global Models do not capture. Examples are given for a low pressure oxygen CCP. Excellent agreement is shown with a Fluid Model, and the limitations of the corresponding Global Model are demonstrated. Applicability to other systems is discussed, particularly Narrow Gap discharges, where spatial non-uniformity is high.

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