Abstract Submitted
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Efficient Coupling of Fluid-Plasma and Monte-Carlo-Neutrals Models for Edge Plasma Transport[1] A.M. DIMITS, B. I. COHEN, A. FRIEDMAN, I. JOSEPH, L.L. LODESTRO, M.E. RENSINK, T.D. ROGNLIEN, B. SJOGREEN, LLNL, D.P. STOTLER, PPPL, M.V. UMANSKY, LLNL — UEDGE [1] has been valuable for modeling transport in the tokamak edge and scrape-off layer due in part to its efficient *fully implicit* solution of coupled *fluid* neutrals and plasma models. We are developing an implicit coupling of the kinetic Monte-Carlo (MC) code DEGAS-2 [2], as the neutrals model component, to the UEDGE plasma component, based on an extension of the Jacobian-free Newton-Krylov (JFNK) method to MC residuals [3]. The coupling components build on the methods and coding already present in UEDGE. For the linear Krylov iterations, a procedure has been developed to "extract" a good preconditioner from that of UEDGE. This preconditioner may also be used to greatly accelerate the convergence rate of a relaxed fixed-point iteration, which may provide a useful "intermediate" algorithm. The JFNK method also requires calculation of Jacobian-vector products, for which any finite-difference procedure is inaccurate when a MC component is present [3]. A semi-analytical procedure that retains the standard MC accuracy and fully kinetic neutrals physics is therefore being developed. [1] T.D. Rognlien et al., Contrib. Plasma Phys. **34**, 362. (1994). [2] D. Stotler & C. Karney, Contr. Plas. Phys., 34, 392 (1994). [3] J. Willert, et al., SIAM J. Numer. Anal. **53**, 1738 (2015).

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