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A numerical study of plasma-neutral interaction effects on gas penetration into a tokamak plasma[1] SINA TAHERI, URI SHUMLAK, University of Washington, JACOB R KING, Tech-X Corporation — The plasma edge dynamics has become an area of extreme importance in plasma physics investigations. Many experimental studies has indicated that the overall performance characteristics of confined plasmas are determined by phenomena happening in this thin region. Atomic reactions between plasma and neutral species involving recycling and fueling are important in the dynamic behavior of magnetically confined plasma devices particularly in edge region. Also, injecting massive high pressure gas, liquid jets, and killer pellets are a few of the possible approaches to mitigate disruptions and control damage to vessel structures. In this research, a reacting plasma-neutral model [Meier & Shumlak, POP 19 (2012)] is incorporated into the NIMROD plasma simulation code allowing for the study of electron-impact ionization, radiative recombination, and resonant charge-exchange in plasma-neutral systems. The penetration of neutral gas into a tokamak plasma during a massive gas injection is modeled for both 1D and 2D configurations. It is expected that atomic reactions strongly block the gas penetration and a shock wave starts to propagate backwards into the incoming gas.

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Sina Taheri
University of Washington

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