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Influence of the inverse sheath on divertor plasma performance in tokamak edge plasma simulations REBECCA MASLINE, ROMAN SMIRNOV, SERGEI KRASHENINNIKOV, University of California, San Diego — The 2-dimensional multifluid tokamak edge plasma code UEDGE is used to assess the effect of the newly proposed "inverse sheath" at the divertor plate on plasma detachment. The inverse sheath is a monotonic positive potential sheath at the plasma edge near the wall that is different than the space-charge-limited sheath, and results from a combination of strong thermionic emission from material surfaces with ion cooling due to charge exchange and other collisions. Plasma dynamics shown in kinetic simulations of the inverse sheath regime indicate extreme cooling at the plasma edge. This has been proposed as a novel mechanism to promote divertor detachment through mitigating plasma-surface interactions via electron cooling precipitated by thermionic emission from tungsten divertor plates. We use a DIII-D-like geometry to model the detachment of a plasma using different wall boundary conditions that model both the "conventional" sheath and the "inverse" sheath regimes. Our simulations indicate that the inverse sheath conditions result in different plasma dynamics that modify detachment transition conditions when compared to the conventional sheath regime. The extension of the inverse sheath regime to practical applications in tokamak divertors is discussed.

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