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Category Number and Subject: 7.1.3. Magnetic Confinement Technology; Plasma Fueling

[x] Theory [ ] Experiment

Effect of Toroidicity on Fast Fuel Relocation in Tokamaks,* P.B. Parks, *GA* and L.R. Baylor, *ORNL* – Three mechanisms have been identified [1], that extend our previous theory on $E \times B$ advection of ablation cloudlets: 1) Efficient cloudlet acceleration by the centrifugal force, stemming from M~1 parallel flows, lengthens the drift distance. 2) Because of the twist in the magnetic field lines (rotational transform), the transverse electric field E, frozen into the field lines, rotates with respect to the vertical grad-B drift direction with increasing distance along the field lines inside the cloudlet, reducing penetration slightly. 3) A differential drift velocity results from a reorientation of the polarization charge layers due to a finite magnetic shear length $L_s = qR/s$. The end parts of the cloudlet lag behind the moving electrostatic field, causing mass shedding and fuel dispersal. Theory and experimental Δn profiles agree for both HFS and LFS pellet injection on DIII-D. Deep fueling is possible in ITER with $v_{pel} \sim 300$ m/s.

[1] P.B. Parks and L.R. Baylor "How Parallel Flows and Toroidicity Affect Pellet Cloud Drifts in Tokamaks," in preparation.

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