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The quench rule, Dimits shift, and eigenmode localization by small-scale zonal flows SUMIRE KOBAYASHI, Dartmouth College — We perform gyrokinetic simulations in a simple Z-pinch geometry to study the physics of small scale, entropy-mode-driven zonal flows. The entropy-modes create radial $E \times B$ streamers, which become unstable to the Kelvin-Helmholz (KH) instability at the point of nonlinear saturation. Sufficiently close to marginal entropy-mode stability, the break-up of the streamers by the KH mode generates zonal flows that produce a nearly static, low transport state (the Dimits shift). The flows in this state have a preferred, automatically maintained level, typically several times stronger than the quench-rule threshold, that sits at a critical point of the linear mode-structure: the radial streamers of the entropy-modes become, at about the preferred shearing rate, radially localized to the regions where the shearing rate of the zonal flows pass through zero. Coincident with the localization, the linear growth rates drop to smaller but usually finite levels.

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