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Physics of supersonic two-fluid islands RICHARD FITZPATRICK, IFS, U. of Texas at Austin, FULVIO MILITELLO, FRANCOIS WAELBROECK — Simulations of a magnetic island in a diamagnetic plasma are performed with the four-field equations, but with the magnetic flux-function specified. The ions are assumed to be cold. The island frequency is determined by adjusting the equilibrium E cross B velocity until there is no net electromagnetic torque acting on the island. Our simulations cover the "unmagnetized" regime $W \ll \rho_s$, the supersonic regime $\rho_s \ll W \ll \rho_s\,(L_s/L_n)$, and the subsonic regime $\rho_s\,(L_s/L_n) \ll W$, where W is the island width. In the"unmagnetized" regime, we expect the ions to flow straight through the island, and for the island to be convected by the electrons. Conversely, in the subsonic regime, we expect the density to be flattened across the island, and for the island to be convected by the ions. In both cases, we do not expect a substantial polarization current. However, in the intermediate supersonic regime, we expect the density to only partically flatten, and the island to be only partially convected by the ions. In this case, there is likely to be a substantial polarization current. We find that this current is *stabilizing*.

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