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Quasisymmetric 3D vacuum magnetic fields with flux surfaces : near-surface expansion[1] WRICK SENGUPTA, HAROLD WEITZNER, Courant Inst — We consider a vacuum magnetic field in a three-dimensional box with periodic boundary conditions in y and z. Expanding around the y-z plane, we show that the vacuum field can be made quasisymmetric (QS) provided the lowest order magnetic potential satisfies a real hyperbolic Monge-Ampere like equation of two variables. The nonlinear equation can be solved exactly for a class of problems in the hodograph plane derived from the y and z components of the lowest order vacuum magnetic field. A close analogy can be established between steady, irrotational, compressible fluid dynamics and the QS vacuum problem in the surface expansion analysis. Consistent with recent results that QS implies the existence of flux-surfaces surfaces, we show that the condition of QS allows one to carry out the formal near-surface expansion in the distance from the y-z plane to higher orders without resonances on rational surfaces.

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