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Variational principle for multi region three dimensional relaxed magnetohydrodynamic equilibria[1] R.L. DEWAR, Plasma Research Laboratory, Australian National University (ANU), S.R. HUDSON, Princeton Plasma Physics Laboratory, M.J. HOLE, M. MCGANN, ANU, Z. YOSHIDA, University of Tokyo — Relaxed-magnetohydrodynamic (RXMHD) plasma equilibria are force-free states obtained by minimizing the magnetic energy subject to the constraint of constant magnetic helicity and magnetic fluxes within perfectly conducting toroidal boundaries, giving rise to the Beltrami equation, $\nabla \times \mathbf{B} = \mu \mathbf{B}$, with $\mathbf{B}$ the magnetic field and μ const. The Beltrami equation being consistent with the existence of field-line chaos, such a principle is suitable as a starting point for three-dimensional equilibrium theory. An extension of this variational principle to finite-pressure *multi-region* relaxed MHD (MRXMHD) is developed, in which the total plasma energy, magnetic plus kinetic, is to be minimized assuming arbitrarily thin, ideal-MHD toroidal interfaces act as flexible barriers to thermal and magnetic relaxation. Formal expressions for the variations of total energy with respect to Lagrangian displacements of the barrier interfaces are derived. Generalized magnetic coordinates and the need for control of rotational transforms on the surfaces of the interfaces are discussed.

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