

Derivation of reduced two-dimensional fluid models via Dirac's theory of constrained Hamiltonian systems

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We present a Hamiltonian derivation of a class of reduced plasma two-dimensional fluid models, an example being the Charney-Hasegawa-Mima equation. These models are obtained from the same parent Hamiltonian model, which consists of the ion momentum equation coupled to the continuity equation, by imposing dynamical constraints. It is shown that the Poisson bracket associated with these reduced models is the Dirac bracket obtained from the Poisson bracket of the parent model.

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