

Abstract Submitted
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The limit of Hall-MHD equilibria for a small hall effect¹ ELIEZER HAMEIRI, New York University — The question of what is the limit of a Hall-MHD equilibrium as the Hall parameter (the ratio of the ion skin depth to a macroscopic length scale) becomes vanishingly small, was treated by some authors, and it was found that a certain limiting process leads to a classical MHD equilibrium with mass flow. However, the precise MHD equilibrium was not identified. We are able to identify the limiting state exactly, which enables us which enables us to generate Hall-MHD equilibria perturbatively as an expansion in the typically small Hall parameter. The benefit here is that rather than using the Hall-MHD equilibrium equations, which consist of two coupled Grad-Shafranov equations in two flux functions, we have to solve for the MHD equilibrium state, after which there is a linear system of equations to solve for the perturbation. Our entire work is based on variational formulations of the various equations involved, so perturbed equations can be solved numerically as minimum problems. Unlike common practice, we allow for finite electron pressure throughout this work.

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Eliezer Hameiri
New York University

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