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On the interaction of cold protons with collisionless magnetic reconnection

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Magnetic reconnection is, to a large degree, controlled by the mass density of charged particles in the reconnection inflow regions. In fluid models, only parts of the kinetic aspects of the interaction of higher mass density with the reconnection process can be correctly described. While these models show a relatively simple scaling of the reconnection rate with the inflow Alfven speed, recent fully kinetic studies involving cold oxygen have shown that the actual interaction is considerably more complicated and that the reconnection rate is, at least for some time, reduced much less than what would be expected from a simple Alfven-rate scaling. For protons, which are considerably lighter and hence easier to magnetize, it is not clear whether a similar process acts, and for how long it acts if it does. We will present a first look at how reconnection is impacted by a cold, high-density, proton population, which initially exists only further in the inflow regions. Results will be compared with those expected from fluid theory, and with recent results pertaining to cold oxygen.