

## P5.4010 Ion versus electron heating in the nonlinear phase of the collisionless MRI

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See full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/P5.4010.pdf>

The magnetorotational instability (MRI) is a crucial mechanism of angular momentum transport in several astrophysical scenarios, like accretion disks around black holes [1]. The MRI has been widely studied using MHD models and simulations, in order to understand the behavior of astrophysical fluids in a state of differential rotation. In radiatively inefficient accretion flow (RIAF) models for accretion onto compact objects, the accretion proceeds via a hot, low-density plasma with the proton temperature larger than the electron temperature [2, 3]. In order to maintain the two-temperature flow characteristic of RIAF models, the typical collision rate must be much smaller than the accretion rate. This suggests that the standard MHD approach may be insufficient, and a kinetic description is required instead.

Leveraging on our recent results [4] obtained in 2D pair plasma configuration, we present our recent studies on collisionless MRI in electron-ion high- $\beta$  plasma. Increasing the mass ratio of our simulations, we show the development of an enhanced ion heating during the nonlinear phase of collisionless MRI (channel flows). In particular, we claim a mass ratio dependence of the temperature ratio of the two plasma species, with  $T_i/T_e \propto (m_i/m_e)^{1/2}$ . We will explore the mechanism responsible for this effect, identified as the compression of the current sheets formed during the nonlinear MRI. We support our assumptions with a theoretical model for kinetic compression of current sheets, giving a quantitative prediction of the electric and magnetic fields acceleration on the trapped particles during the compression phase.

### References

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