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On the use of calibrated resistivity models in global GRMHD simulations

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In this contribution, I will discuss the prospects for using PIC calibrated resistivity models in global GRMHD fluid simulations. Using relativistic PIC simulations of plasmoid dominated reconnecting current sheet with and without guide field, we have recently investigated the statistical properties of the non-ideal electric field at the X-points. There are interesting differences between the cases with and without guidefield. While the non-ideal field in the zero guidefield case can be expressed solely by means of bulk flow quantities (two-fluid or single fluid with further assumptions), the case with moderate guidefield requires a modeling of the pressure tensor. I will show how these findings can be used to formulate an effective non-uniform resistivity model. I will further discuss the potential pitfalls of this approach which might necessitate more sophisticated models of the anisotropic pressure tensor in the X-points.

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