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Locality and not locality in magnetized accretion flows

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Theories of magnetically mediated accretion flows have focused on shearing radial magnetic field by orbital motions. We show that this generates dynamically important Poynting flux which transports energy radially. This means that disks are better thought of as layered slabs powered by their inner, accreting edge, rather than concentric annuli with vertical energy transport. We also demonstrate that using shearing boxes to estimate magnetic energy densities, stresses and accretion rates is flawed because shearing boxes set their own, unlimited, external energy supply. More, shearing boxes do not allow for meridional flows: shearing boxes are by construction not flared. Further, we show how even global simulations with large radial extents must carefully treat their radial boundary conditions.

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