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Multi-patch methods for magnetohydrodynamic accretion simulations FATEMEH HOSSEIN NOURI, Washington State Univ, SXS COLLABORATION — Black hole accretion is one of the most important processes in relativistic astrophysics. Numerical simulations must accurately track both disks, polar jets, and near-horizon inflows. However, many standard numerical techniques face challenges evolving some region of the fluid, at least for some range of black hole spin. Cartesian grids with legosphere excision allow outgoing characteristics and are often unstable. Spherical-polar grids suffer extreme Courant time step limitations and coordinate singularities if the poles are evolved. In this talk, we explore two other ways of evolving MHD accretion. One, already in use in numerical relativity for moderate black hole spins, is to remove the black hole interior by a coordinate transformation. The other is to evolve using cubed-sphere multipatches, which allow a horizon-conforming inner boundary without any bad behavior at the poles. We discuss our implementation of this scheme in the SpEC code and report test evolutions of magnetized accretion tori around high-spin black holes.

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