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Mapping Plasma Flow in Black Hole Jets with Tracers and Adaptive GRMHD

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We investigate the composition and dynamics of black hole accretion jets using novel high-res GRMHD simulations. By deploying Lagrangian composition tracers and adaptive mesh refinement (AMR), we achieve two goals: 1) We precisely track how disk material mixes into the jet and how jet plasma entrains into the surrounding sheath, and 2) We maintain high resolution dynamically within the jet and key disk regions. Our results provide a clear picture of plasma transport and the turbulent structure of the jet-disk boundary. This global model is specifically designed to supply physically realistic initial conditions for future, finer-scale hybrid simulations that will study test particle acceleration in the turbulent jet sheath, bridging global observable dynamics to local plasma physics.

Presenter: PRAHARAJ, Subhrat (University of Amsterdam)

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