Computationally Efficient Description of QGP Medium Response Jet-by-Jet

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Motivations and Methods

• Understanding medium response to jet $E$-loss important for jet substructure phenomenology and studying thermalization process in QGP

• For $E$ & $\vec{P}$ deposition at each time step, use local flow velocity to boost to fluid rest frame, where jet wake evolution approximated by linearized hydro on top of Bjorken flow

• Solve linearized hydro on Bjorken flow in response to one-unit deposition of $E$ & $\vec{P}$ at the origin and store the solutions (templates)

• Take the amount of $E$ deposited at each time step as weight, form linear combinations of templates, with proper boosts and rotations using local flows and high-energy parton direction, to obtain jet wake solution

• Cooper-Frye the solution on an event-by-event basis (50 events sampled from Glauber model) and compare with MUSIC (3+1D 2nd order viscous hydro)
Distribution of particles produced from wake

\( p_T \)

\( \phi \)

\( y \)
**10 GeV parton**

- Distribution of particles produced from wake
  - $p_T$
  - $\phi$
  - $y$

**50 GeV parton**

- Distribution of particles produced from wake
  - $p_T$
  - $\phi$
  - $y$
Averaged Results and Conclusions

50 GeV parton

- Reasonable agreement with MUSIC for $p_T > 1$ GeV; able to capture features of distributions in individual events

- Apply to real jets for phenomenology, improve jet wake description in hybrid model