Search for a Ridge structure origin with shower broadening and jet quenching

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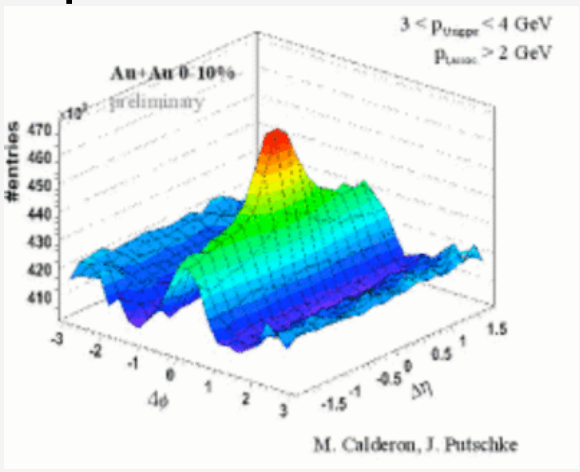
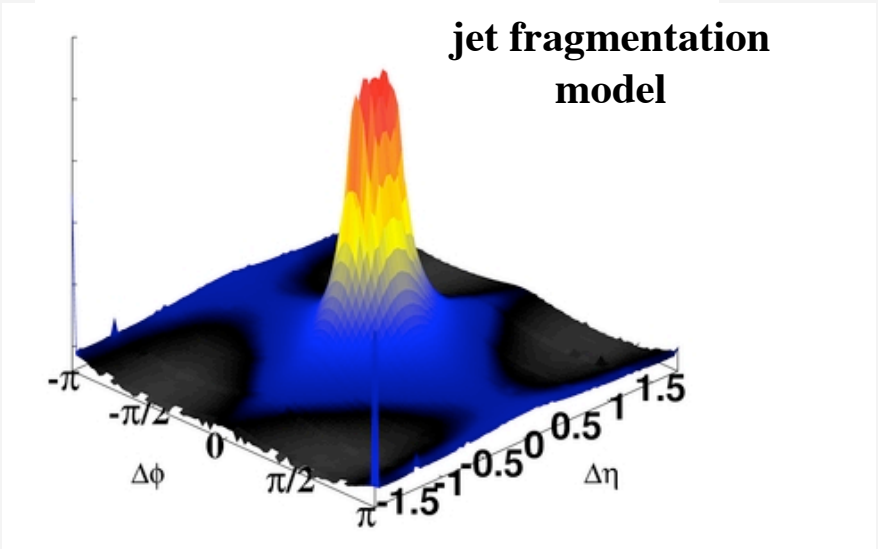
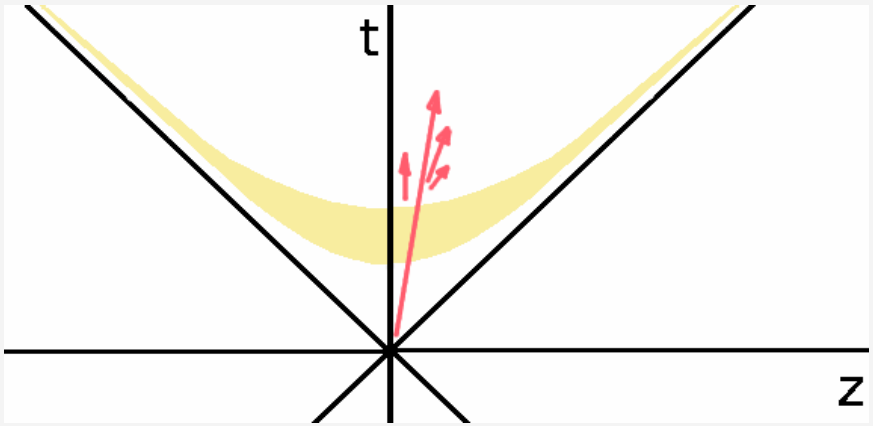
What is Ridge ?

- Ridge structure: base-like structure in the Δη direction
- Standard picture
  - → No Ridge
    due to hadrons from jet parton
  - → Indicating the correlation
    between jet and other



STAR: J.Adams, et al, J. Phys. G 32 (2006) L37

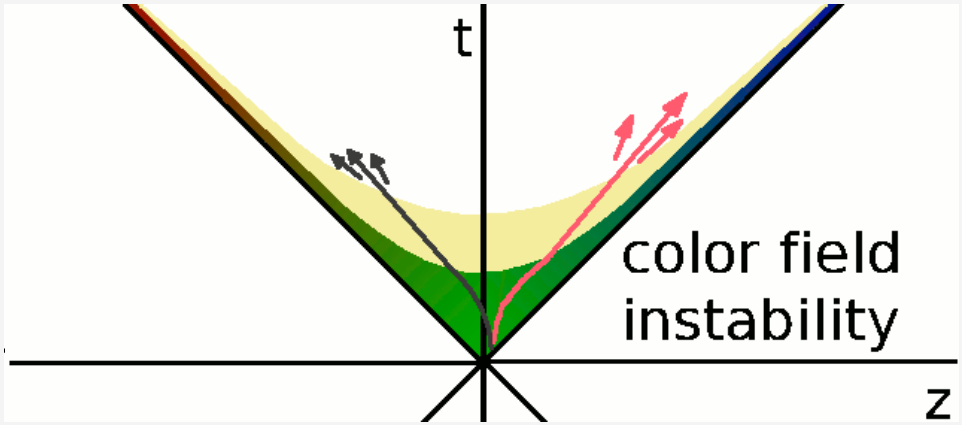


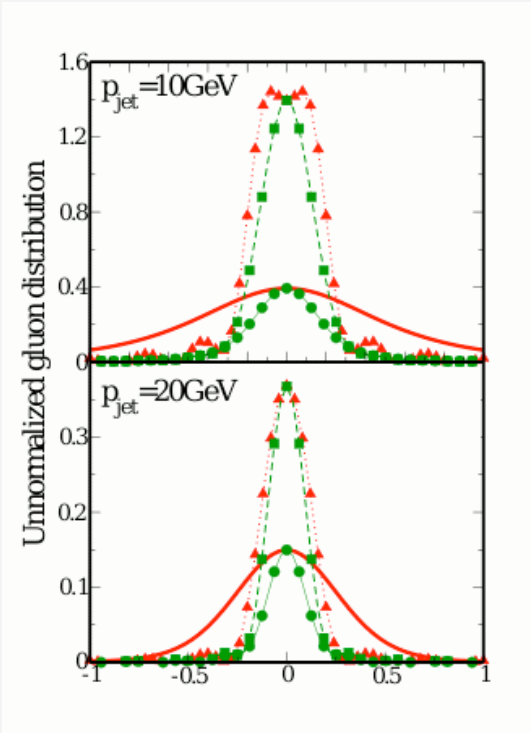


What makes RIDGE ?

- Glasma
  - Candidate of Fast thermalization
  - Generated by color field instability
- Momentum broadening
  - Mainly in η direction
    → Large Δη width

Does this effect make ridge ?





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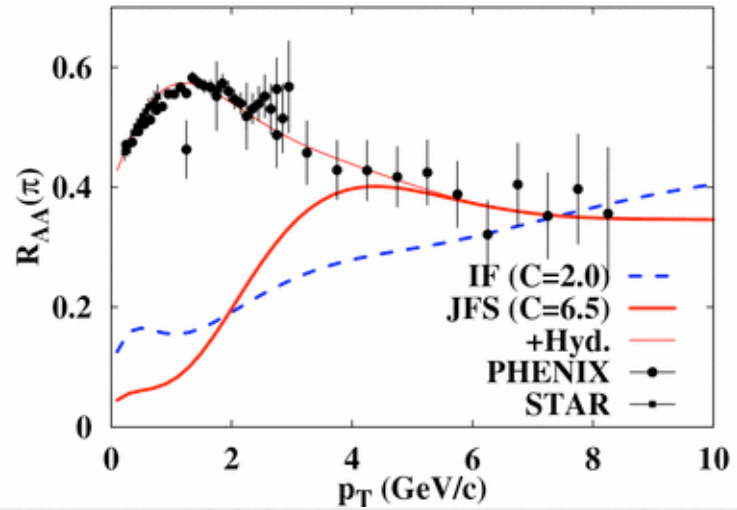
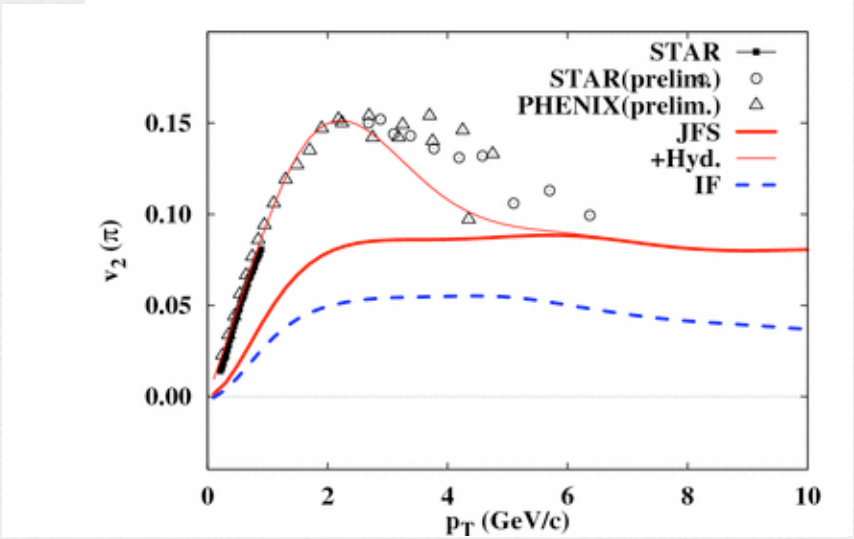
Model

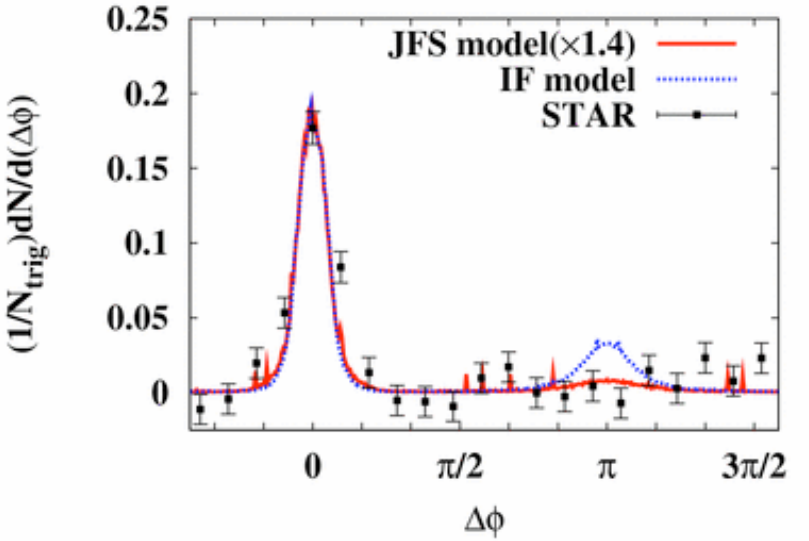
Jet-Fluid String model

Jet production (PYTHIA)
+ E-loss (3D Hydro + GLV)
+ String Form. with Fluid
+ String Frag.

Explains high p_T signals !



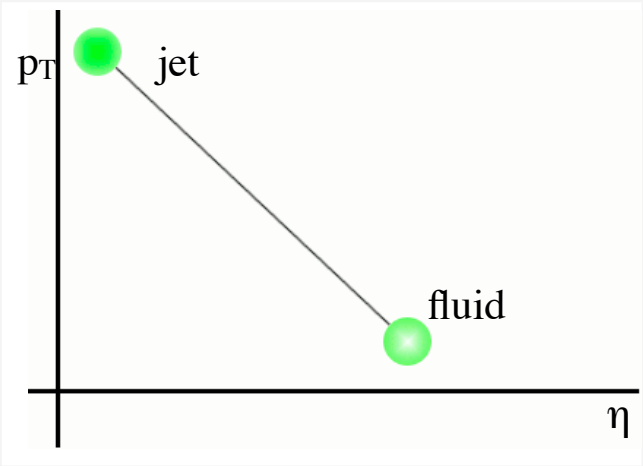


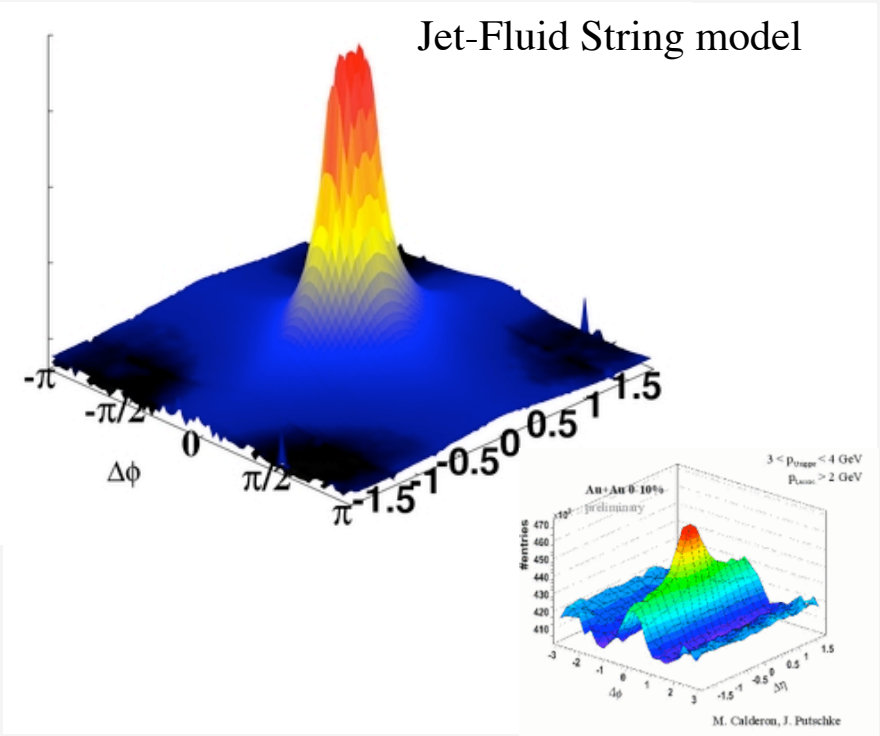


M.Isse, T.Hirano, RM, Y.Nara, A.Ohnishi, K.Yoshino, Int. J. Mod. Phys. E **16** (2007) 2338.

How about RIDGE in JFS ?

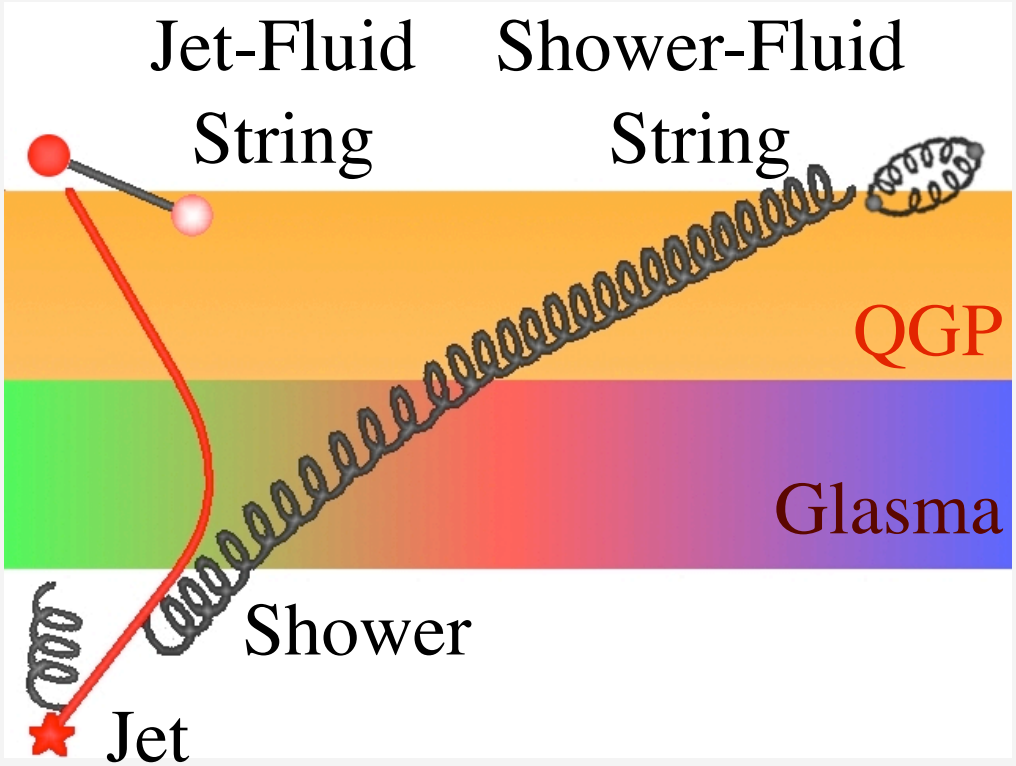
- Conjecture: Rapidity gap of endpoints makes ridge
- Answer = NO
  - Fluid p_T is too small
  - Thermal Rapidity gap is not large





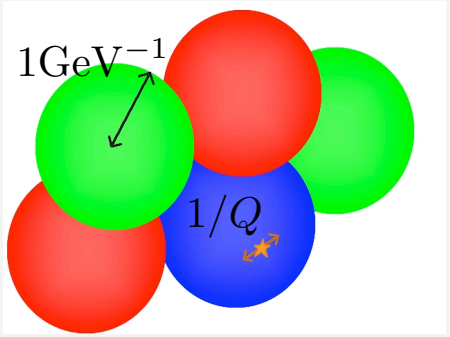
Momentum Broadening in glasma

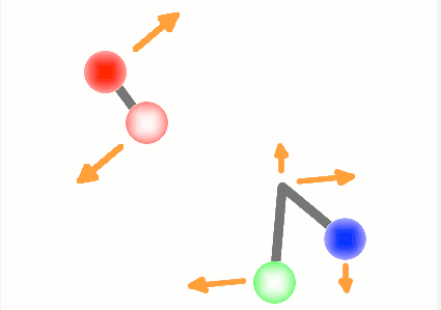
Jet-Fluid String model
+ Momentum broadening

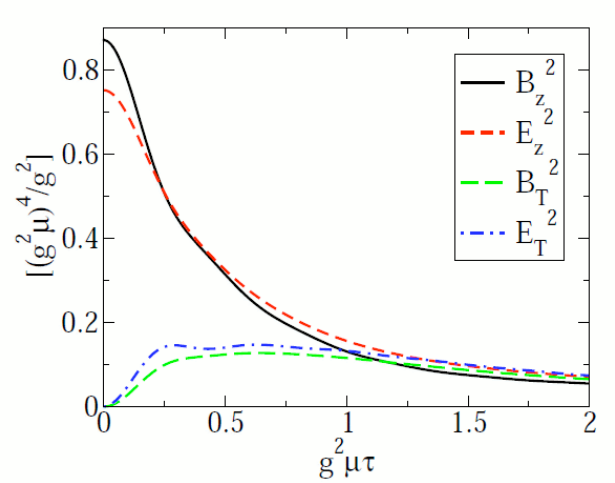


Broadening in Glasma

- Characteristic Features
  - $Q_{jet} >> Q_s$
    → Random but common field for one jet
  - Color force
    → Opposite direction for q and qbar
  - Anisotropic: $E_z > E_T$
    → Large η gap between jet and shower
- Our implementation
  - Random Gaussian
  - $\Delta p_z > \Delta p_T$
  - Opposite force for end points





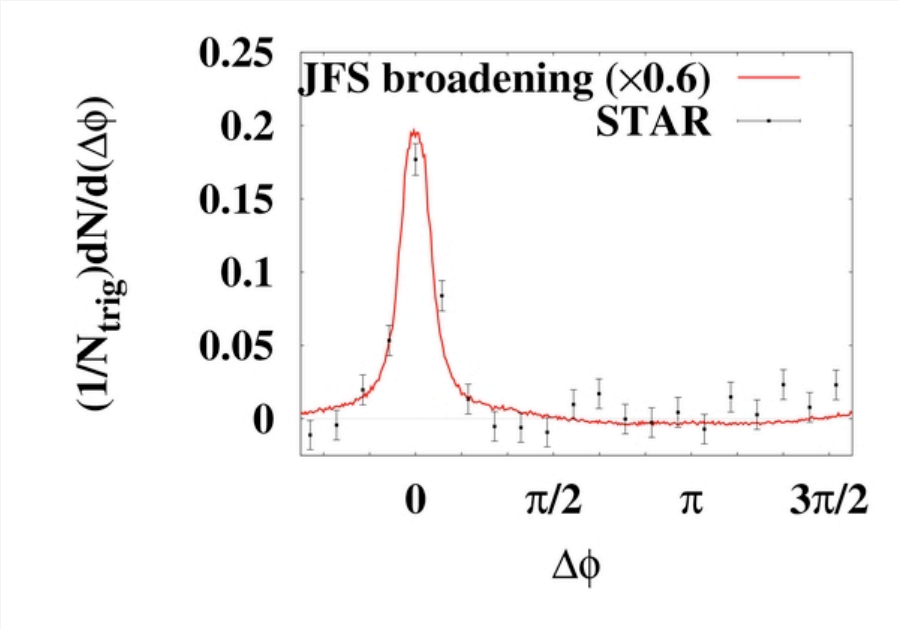


T. Lappi, L. McLerran hep-ph/0602189

Results

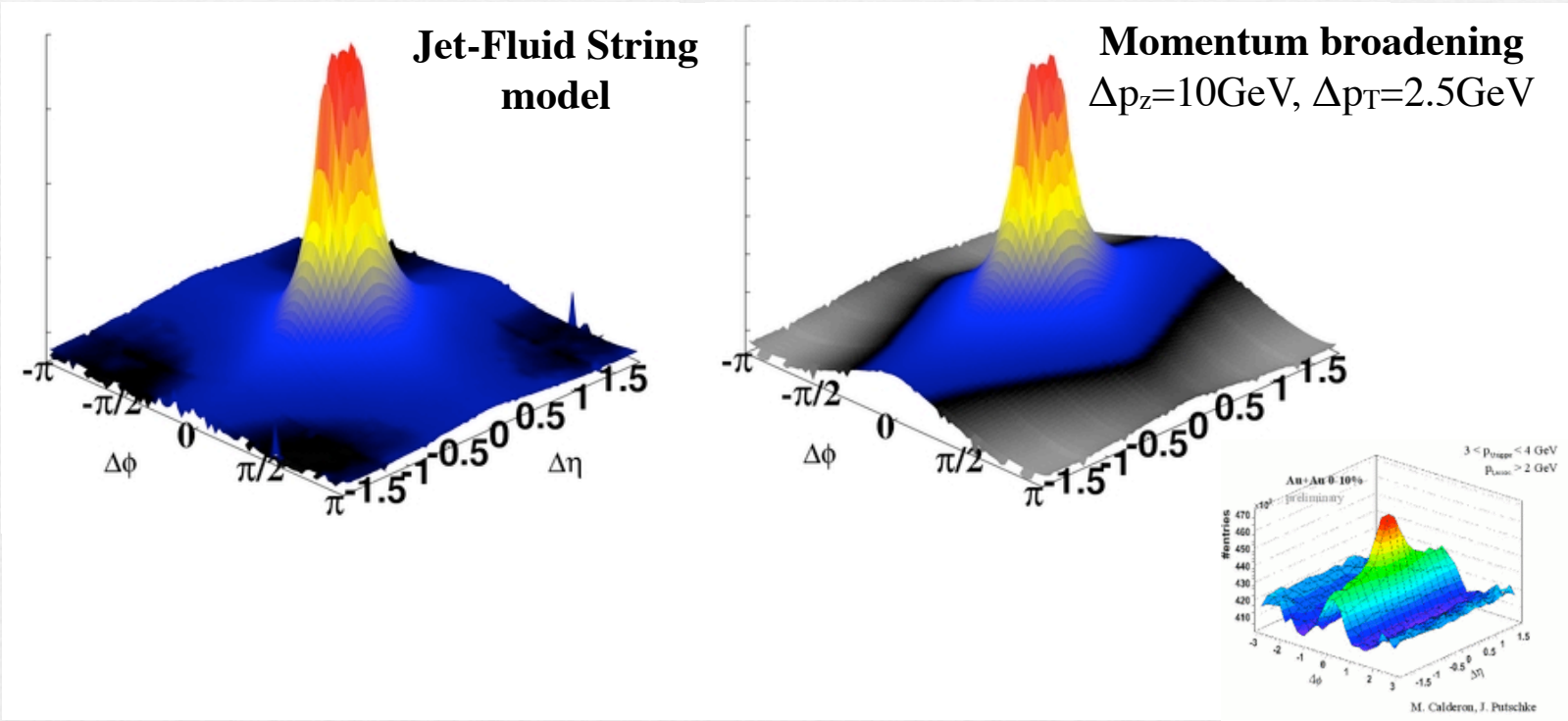
$\Delta\phi$ correlation with Broadening

- Parameters:
  $(\Delta p_z, \Delta p_T) = (10\text{GeV/c}, 2.5\text{GeV/c})$
- No backward peak
- Nearside peak
  larger width, larger yield



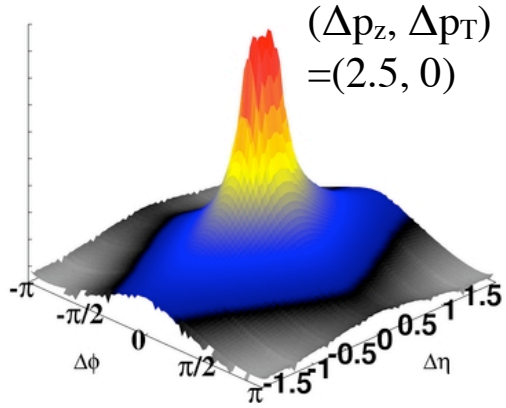
$\Delta\eta$ -$\Delta\phi$ correlation with Broadening

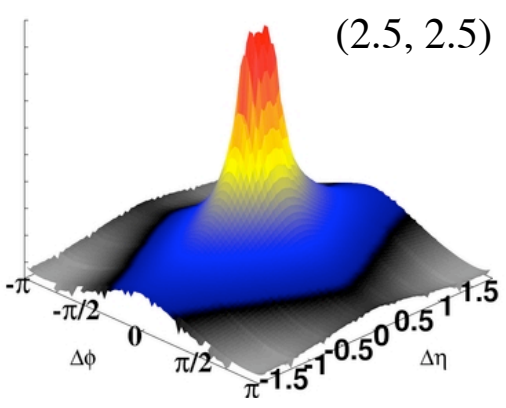
- Long $\Delta\eta$ correlation
- Small $\Delta\phi$ width
- Peak / Base ratio: too much



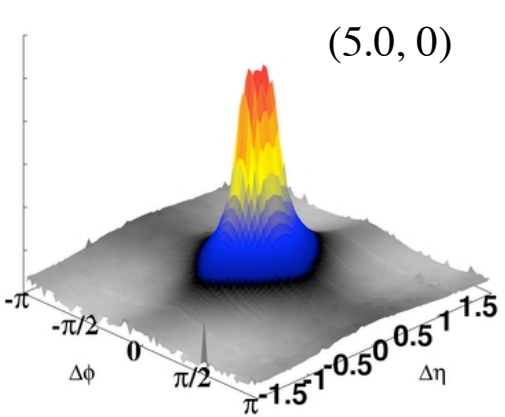
Parameter dependence

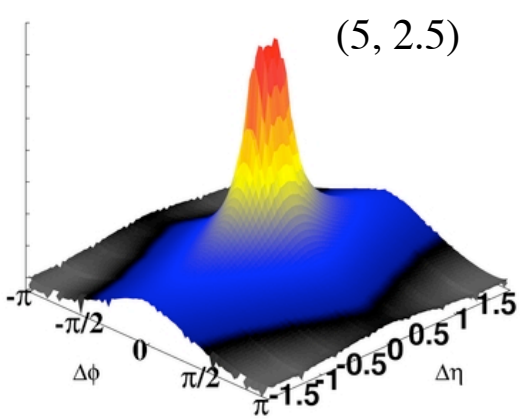
Δp_T

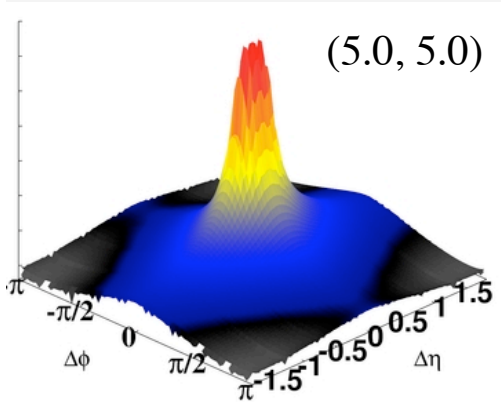




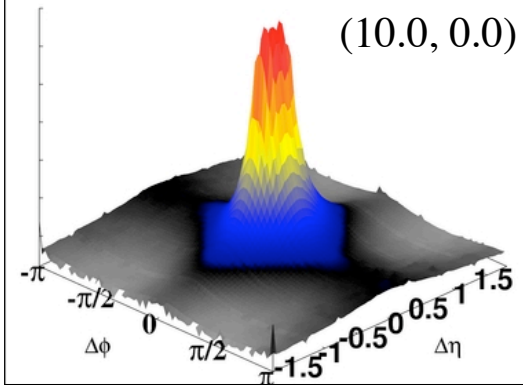
- Large Δp_z is necessary
- moderate Δp_T for shower hadronization

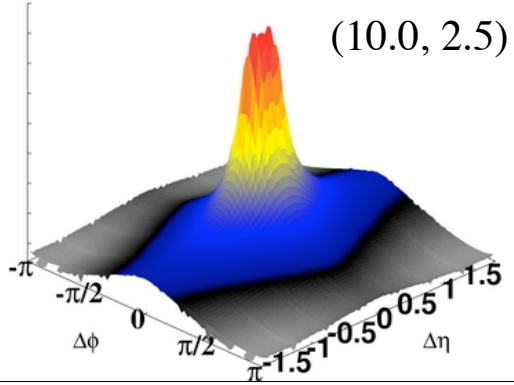


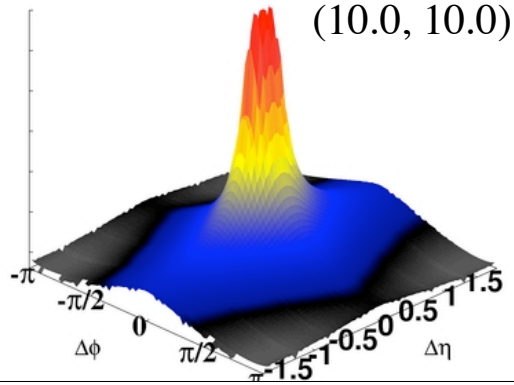




Δp_z







Summary

- Ridge doesn't appear in Jet-Fluid String model.
- We implement momentum broadening in the pre-equilibrium stage in the JFS model.
- If we have enough anisotropic momentum broadening, strings from jet and shower partons can make ridge structure.

→**Momentum broadening in glasma is a possible mechanism to create ridge structure.**

- Future work: More quantitative analysis is needed, because peak height is too large.