Importance of Initial Conditions

- Fast Equilibration Problem
- Initial state captures important physics
- A full $T^{\mu\nu}_0$ can drastically change observables in small systems\cite{1}
- How might the full $T^{\mu\nu}_0$ at BES energies affect trajectories?
  
  - Important implications for critical point search

Hydrodynamic Equations

Bjorken Symmetric Expansion

$$\dot{\epsilon} = -\frac{\varepsilon + p + \Pi + \pi}{\tau}$$

$$\dot{\rho} = \frac{\rho_0}{\tau}$$

$$\tau \pi \Pi + \pi = \frac{4\eta}{3\tau} - \frac{1}{\tau} \left( \left( \frac{4}{3} + \lambda \right) \Pi + \frac{2}{3} \lambda^2 \Pi \Pi \right)$$

$$\Pi \Pi \Pi + \Pi = -\frac{\zeta}{\tau} - \frac{1}{\tau} \left( \delta \Pi \Pi \Pi + \frac{2}{3} \lambda^2 \Pi \Pi \Pi \right)$$

Attractors

Equation of State

- Needed to close hydrodynamic eqn’s
- BEST Collaboration EoS\cite{2}
- Taylor expansion in $T/\mu_B$
- 3D Ising contribution in critical region

Working Definition

There exists an attractor if, after some finite amount of time, solutions converge on to a non-trivial, universal curve.

Conclusion/Outlook

- Attractor behavior found to be still present after relaxing assumptions of previous work (see also [3][4])
- Important implications for critical point search and answering initial state questions (i.e. fast equilibration problem)
- Future: include hydrodynamic critical fluctuations, implement BSQ EoS into (2+1) hydro

Trajectories in the Temperature-Chemical Potential plane can vary wildly with initial conditions

Indication that critical point can be found with lower initial baryon densities

Important for BES

References