

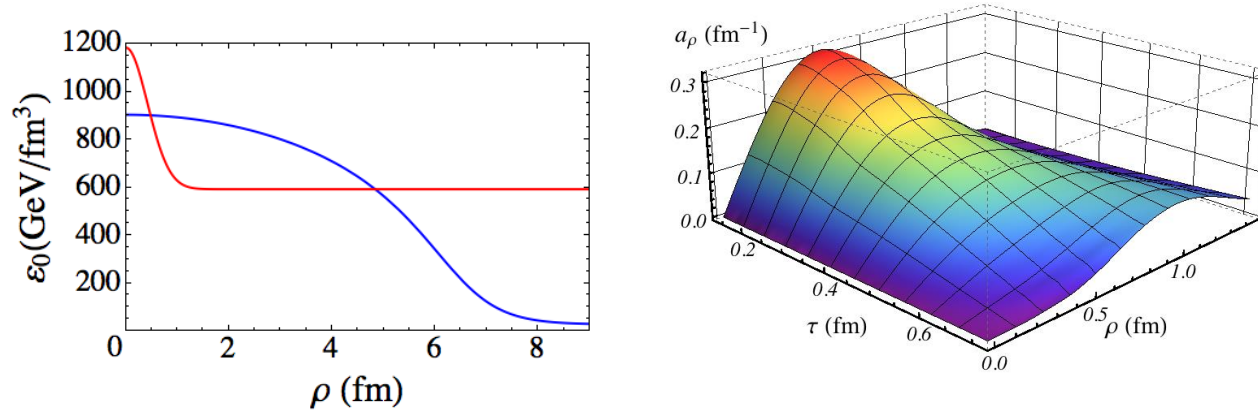
# HYDRO IN SMALL SYSTEMS?

## When is hydro applicable?

- Not far-from-equilibrium (shock)
- Not when pressure is negative (unstable)
  - But **viscous/anisotropic hydro** can apply if pressure  $\sim 0$  (!!)
- Not in small system:  $L \gg 1/T$  (perhaps  $L \gg 1/\pi T$  ?):  $VT^3 \gg 1$
- Shocks: **hydro applies within**  $0.3/T$

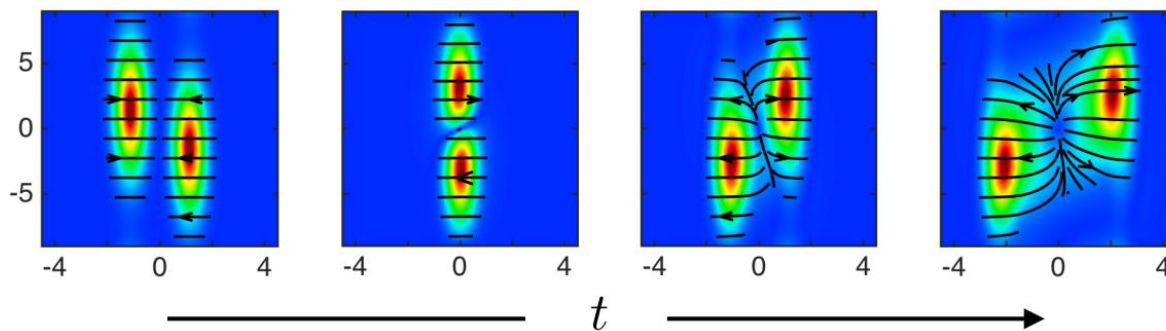
# TWO COMPUTATIONS FOR SMALL SYSTEMS

## A fluctuation in a thermal bath:



- Hydro works within 0.2 fm/c, for system of size 0.5 fm.

## A full-blown off-center 'p-p collision':



- Hydro found to work in a system with  $R \sim 1/T$

## AN ESTIMATE

### For p-Pb and p-p collisions only few particles produced

- Naïve estimate:  $s \approx 16T^3$  gives  $N_{ch} \approx Vs/7.5 \approx 2.1VT^3$
- When  $R > 1/T$  (or  $1/\pi T??$ ) then  $dN_{ch}/dy > 2.1$  (0.7???)
- Note that  $R$  increases faster than  $1/T$  ( $\tau$  versus  $\tau^{1/3}$ )
  - Hydro works better at later times
  - Flow requires time to develop, i.e. 2.1 is 'optimistic' estimate