We are now working supplementing these anisotropic hydro equations for Λ, ξ (equivalently for $\pi^{\mu\nu}_{RS}$) by IS equations for the remaining (smaller) $\tilde{\pi}^{\mu\nu}$ components $\longrightarrow$ viscous anisotropic hydrodynamics

7) Viscous 0+1D expansion (viscous Bjorken solution)

$$u^\mu = (\mathrm{ch}\,\eta, 0, 0, \mathrm{sh}\,\eta) = \left(\frac{t}{\tau}, 0, 0, \frac{z}{t}\right)$$

$$\pi^{\mu\nu}_{NS} = 2\eta \nabla^{\langle\mu} u^{\nu\rangle} = \eta\left(\nabla^\mu u^\nu + \nabla^\nu u^\mu - \frac{1}{3}\Delta^{\mu\nu}\theta\right)$$

$$\Rightarrow \boxed{\pi^{xx}_{NS} = \pi^{yy}_{NS} = \frac{2\eta}{3\tau} > 0 \qquad \pi^{zz}_{NS} = -\left(\pi^{xx}_{NS} + \pi^{yy}_{NS}\right) = -\frac{4\eta}{3\tau} < 0}$$

no other non-zero components at $z=0$

$$\Rightarrow \boxed{\begin{aligned} p_\perp &= p + \pi^{xx} \xrightarrow[NS]{} p + \frac{2\eta}{3\tau} \\ p_L &= p_L + \pi^{zz} \xrightarrow[NS]{} p - \frac{4\eta}{3\tau} \end{aligned}} \longleftarrow \text{can become negative!}$$

anisotropic pressure!

Ignore bulk pressure Π.

Viscous hydro equation:

$$\dot{e} = -(e+p)\,\theta + \pi_{\mu\nu}\sigma^{\mu\nu} = -\frac{e+p}{\tau} + 2\,\frac{\pi_{xx}}{\tau}$$

$$= -\frac{e}{\tau}(1+c_s^2) + \frac{2}{\tau}\,\pi_{xx}(\tau)$$

I-S equation for π_{xx}:

$$\dot{\pi}_{xx} = -\frac{1}{\tau_\pi}\left(\pi^{xx} - \frac{2\eta}{3\tau}\right) - \frac{4}{3}\frac{\pi_{xx}}{\tau}$$

IS

Anisotropic hydro equations:

$$\frac{1}{1+\xi}\partial_\tau \xi - \frac{2}{\tau} - 6\,\partial_\tau \log\Lambda = \frac{4}{\tau_\pi}\left(1 - R^{3/4}(\xi)\sqrt{1+\xi}\right)$$

$$\frac{R'(\xi)}{R(\xi)}\partial_\tau \xi + 4\,\partial_\tau \log\Lambda = \frac{1}{\tau}\left(\frac{1}{\xi(1+\xi)R(\xi)} - \frac{1}{\xi} - 1\right)$$

AHYDRO