Sensitivity of flow harmonics to sub-nucleonic scale fluctuations arXiv:1508.02455

J. Noronha-Hostler 1, J. Noronha 1,2, M. Gyulassy 1

1 Columbia University, New York, NY USA  2 Universidade de São Paulo, São Paulo, Brazil

A tale of scales
Relativistic heavy-ions probes three different scales:
• **macroscopic scale** of the order of the radius of a large nucleus 10 fm
• **mesoscale** of the order of the size of a proton 1 fm
• **microscopic scale** set by the inverse saturation scale 1/Qs ≈ 0.1 fm

![Diagram of scales](Image)

Robustness of Spectra and $n/h$

Initial conditions

![Initial conditions graph](Image)

Smoothing Fluctuations
A cubic spline we can smooth out energy fluctuations without changing the eccentricities

All hydrodynamical calculations are done in v-USPhydro [4]

![Smoothing Fluctuations graph](Image)

Conclusions and Outlook

- PbPb and to a lesser extent pPb surprisingly robust to smoothing fluctuations $\lambda$
- New observables needed to probe energy density scale
- $p/Pb$ on the very edge of applicability of Israel-Stewart eqs. What about pp collisions??
- Effects from other transport coefficients such as bulk viscosity

References