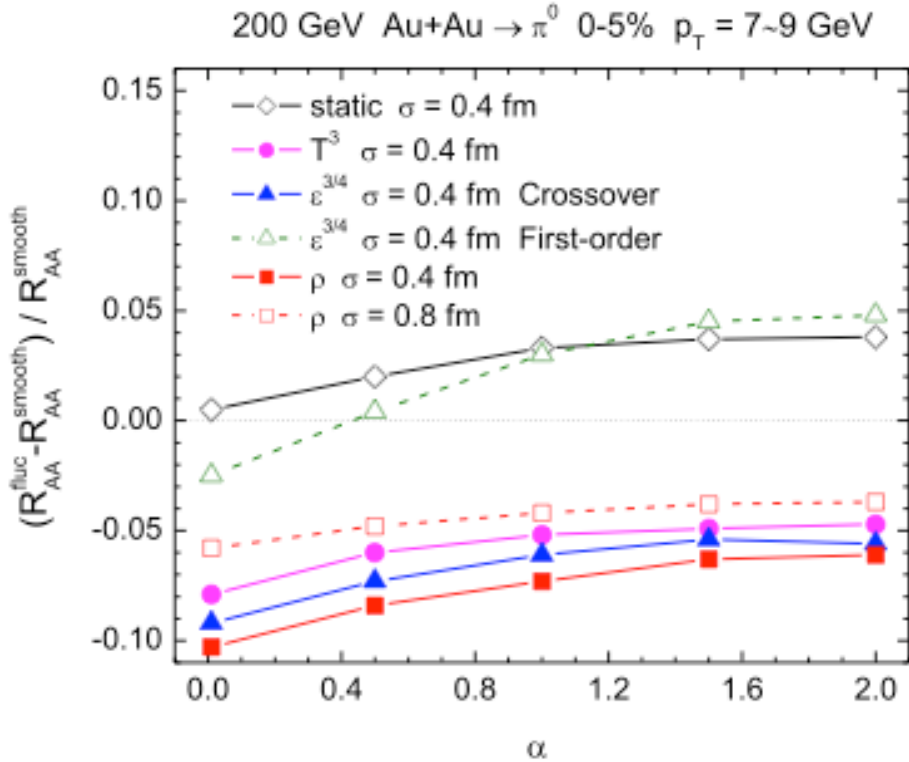


## Effects of initial fluctuations on jet-energy loss

H. Zhang,<sup>1</sup> T. Song, and C. M. Ko

<sup>1</sup>*Institute of Particle Physics and Key Laboratory of quark & Lepton Physics, Central China Normal University, Wuhan, 430079, China*

Based on the 2+1-dimensional ideal hydrodynamics, we have studied the effect of initial fluctuations on jet-energy loss in relativistic heavy ion collisions within the description of the NLO perturbative QCD [1]. Our results show that fluctuating initial conditions lead to slightly more energy loss than smooth initial conditions as shown in Fig. 1. In general, the jet-energy loss increases with time due to its path-length dependence. This increase is, however, reduced by the decreasing medium density



**FIG. 1.** Relative difference between the nuclear modification factor of  $p_T = 7-9$  GeV hadrons as a function of the path-length dependence parameter  $\alpha$  for different medium dependence in central Au+Au collisions.

with time. Where the total energy loss mainly takes place along the jet path is determined by the competition between the path-length dependence of jet-energy loss and the time dependence of the medium density. For fluctuating initial conditions, our results for the rate of the average energy loss difference between the two cases of fluctuating and smooth initial conditions show that the correlation between the fluctuation in the production probability of initial parton jets and the fluctuation in the local medium density is positive during the early times along the jet path and negative during the later times.

Consequently, the net effect of initial fluctuations on jet-energy loss is determined by whether the energy loss mainly takes place when this correlation is positive or negative. The total energy loss in the fluctuation conditions is then larger than that in the smooth case if most energy loss takes place when the correlation is positive, while it is smaller if it takes place when the correlation is negative. Our results further show that the initial positive correlation dominates the fluctuation effect for linear and quadratic path-length dependence of jet-energy loss in central as well as in noncentral A + A collisions. However, because this dominance is stronger in non-central collisions than in central collisions, the difference between the nuclear modification factors calculated with fluctuating initial conditions and smooth initial conditions in non-central A + A collisions is greater than that in central A + A collisions. Similarly, the jet-energy loss for the linear ( $\alpha=1$ ) path-length dependence is more affected by the fluctuation effect than that for the quadratic ( $\alpha=2$ ) path-length dependence. Our results are opposite to those found in Ref. [2] for a static medium and also those in Ref. [3] using a 2 + 1 ideal hydrodynamics and with the jet-energy loss depending on the local energy density, which show a reduced jet-energy loss in the QGP for the fluctuating initial conditions.

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