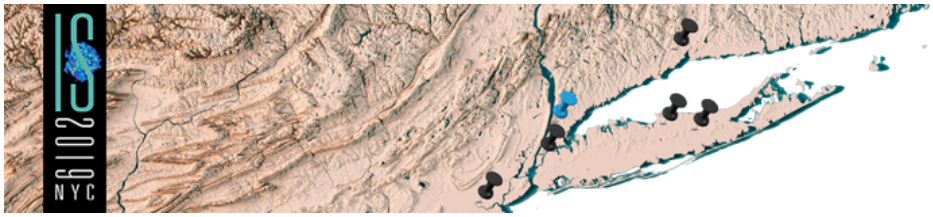

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New paradigm for fluctuations in heavy-ion collisions

Tuesday, June 25, 2019 6:40 PM (20 minutes)

We present a first-principles description of the primordial state of relativistic nucleus-nucleus collisions, whose density fluctuations and anisotropy we evaluate in the color glass condensate (CGC) framework of high-energy QCD. Relating the primordial anisotropy of the system in our approach to the measured final-state anisotropic flow through a simple linear mapping, we achieve an excellent description of both RHIC and LHC data.

Our description does not make any explicit reference to the usual, ad hoc fluctuations due to the random positions of the incoming nucleons: Primordial initial-state fluctuations are generated solely by McLerran-Venugopalan correlators of color charges. The good agreement found with the data implies, then, that QCD interactions alone can provide the system with enough density fluctuations to explain the measured triangular flow, and elliptic flow fluctuations.

This suggests a fundamental paradigm shift in our understanding of fluctuations in heavy-ion collisions: At ultrarelativistic energies, the standard Monte Carlo Glauber picture of nuclear collisions, which until now has been understood as the dominant source of fluctuations, can be abandoned.

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