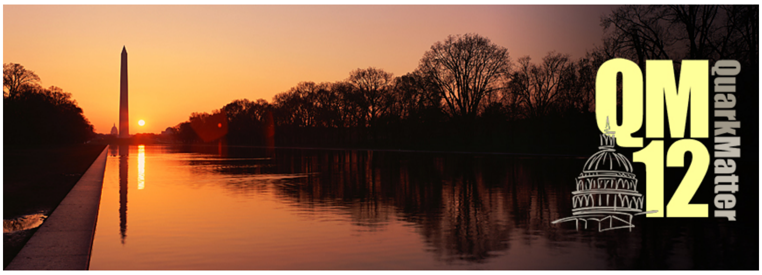

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Mapping the hydrodynamic response to the initial geometry in heavy-ion collisions

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We investigate how the initial geometry of a heavy-ion collision is transformed into final flow observables by solving event-by-event ideal hydrodynamics with realistic fluctuating initial conditions. We study quantitatively to what extent anisotropic flow (v_n) is determined by the initial eccentricity ε_n for a set of realistic simulations, and we discuss which definition of ε_n gives the best estimator of v_n. We find that the common practice of using an r^2 weight in the definition of ε_n in general results in a poorer predictor of v_n than when using r^n weight, for $n > 2$. We similarly study the importance of additional properties of the initial state. For example, we show that in order to correctly predict v_4 and v_5 for non-central collisions, one must take into account nonlinear terms proportional to ε_2^2 and $\varepsilon_2\varepsilon_3$, respectively. We find that it makes no difference whether one calculates the eccentricities over a range of rapidity, or in a single slice at $z = 0$, nor is it important whether one uses an energy or entropy density weight. This knowledge will be important for making a more direct link between experimental observables and hydrodynamic initial conditions, the latter being poorly constrained at present.

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