

## Event-by-event hydrodynamics and elliptic flow from fluctuating initial state

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We develop a framework for event-by-event ideal hydrodynamics to study the differential elliptic flow which is measured at different centralities in Au+Au collisions at Relativistic Heavy Ion Collider (RHIC). Fluctuating initial energy density profiles, which here are the event-by-event analogues of the eWN profiles, are created using a Monte Carlo Glauber model. Using the same event plane method for obtaining  $v_2$  as in the data analysis, we can reproduce both the measured centrality dependence and the  $p_T$  shape of charged-particle elliptic flow up to  $p_T \sim 2$ -GeV. We also consider the relation of elliptic flow to the initial state eccentricity using different reference planes, and discuss the correlation between the physical event plane and the initial participant plane. Our results demonstrate that event-by-event hydrodynamics with initial state fluctuations must be accounted for before a meaningful lower limit for viscosity can be obtained from elliptic flow data.

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