Anisotropic flow in large and small systems and the Color Glass Condensate

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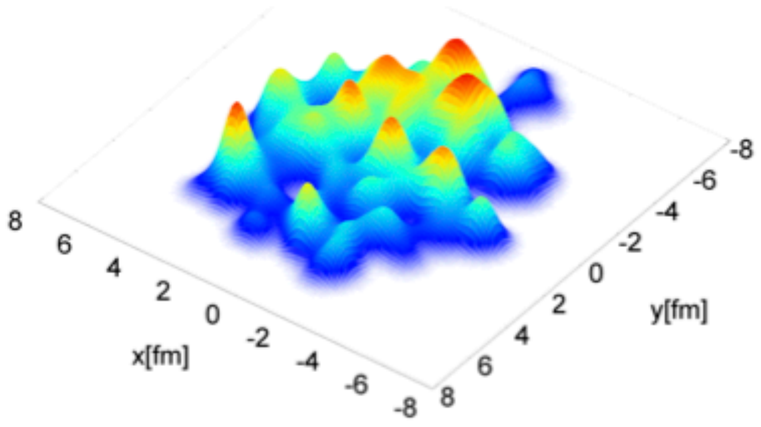
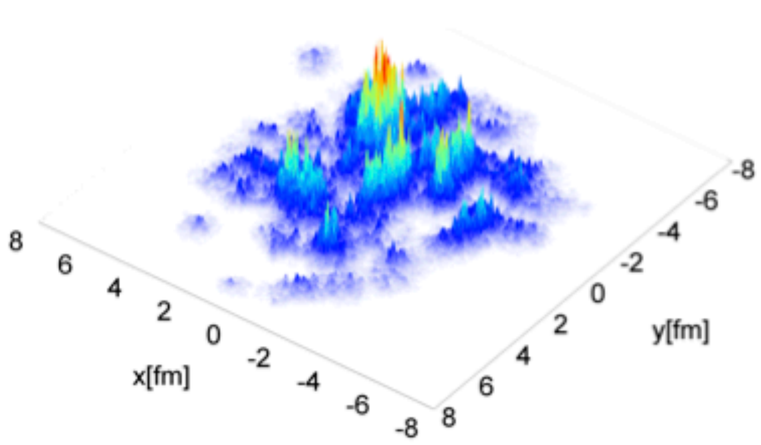
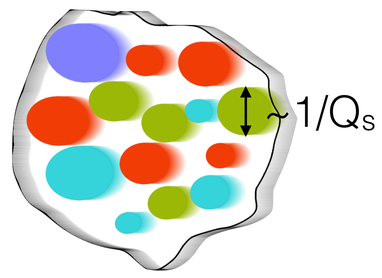
How lumpy is the initial state?

- **MC Glauber:** Size of lumps controlled by nucleon size



- **Color Class Condensate (CGC):** Size of lumps controlled by saturation scale Q_s i.e. the gluon size
  ✓Smaller than nucleon size at top energy RHIC and LHC





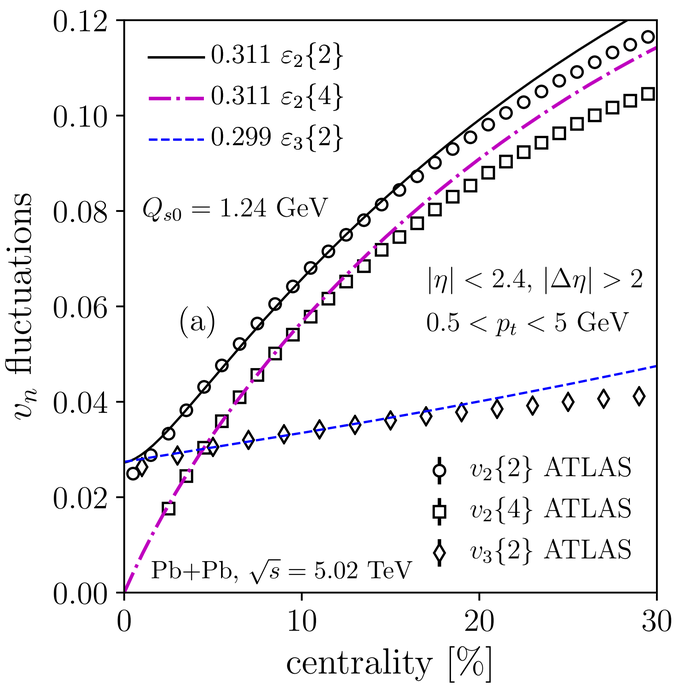
- Different matter distributions in each approach lead to **different predictions for eccentricities [1]**

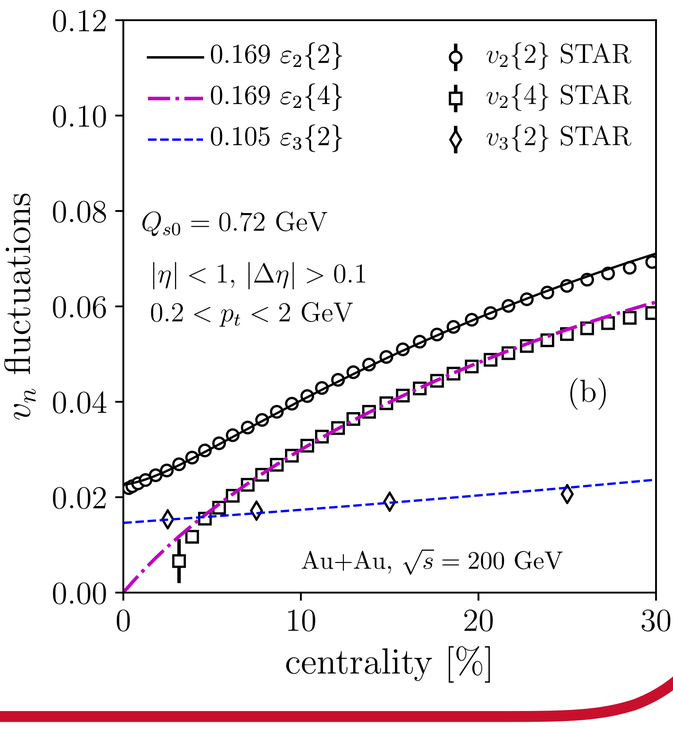
The CGC and anisotropic flow in heavy ion collisions

- Comprehensive set of observations (e.g. [2]) indicate a CGC initial state describes heavy-ion flow data better than MC Glauber

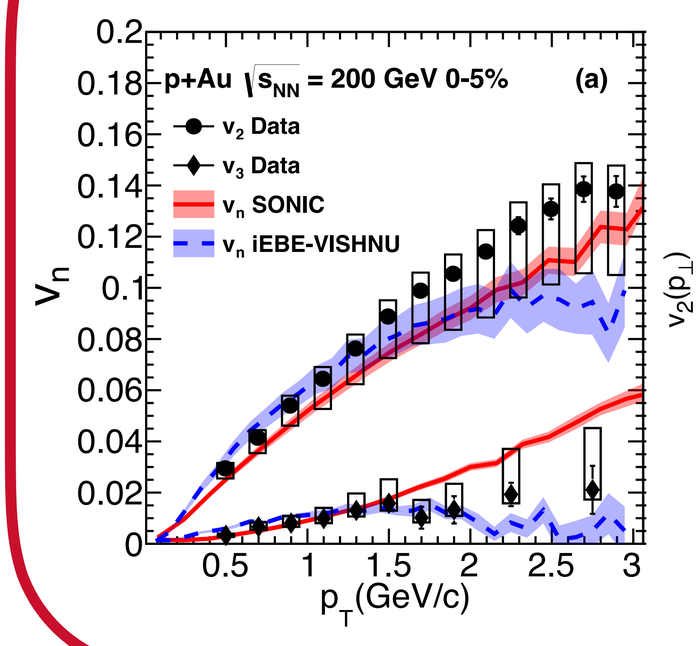
- Recent calculation [3] which determines **CGC** gluon densities directly **describes energy dependence of flow fluctuations** [4,5]

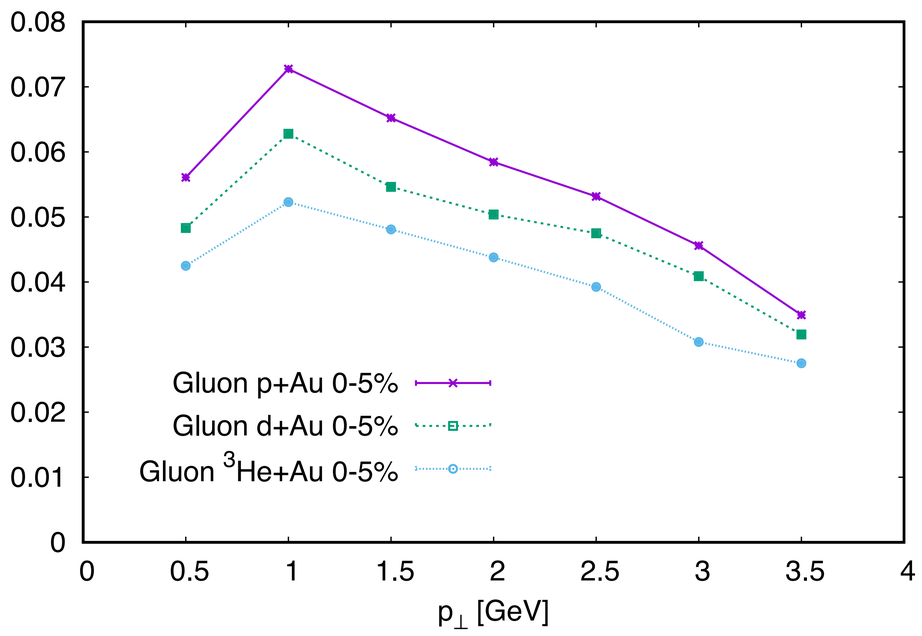
- Uses reasonable saturation scales that decrease with collision energy





CGC momentum correlations in small systems





- CGC also has color domains which can "push" colliding gluons in specific directions…

- Respective calculations have difficulties describing light system flow at RHIC [6]

- **Why does the CGC know where the gluons are in a large system, but can't say where gluons should go in a small system?**

References

1. PRL 108 (2012) 252301
2. PRC 92 (2015) 011901
3. PRC 100 (2019) 024905
4. arXiv:1904.04808
5. PRL 115 (2015) 222301
6. NP 15 (2019) 214–220

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