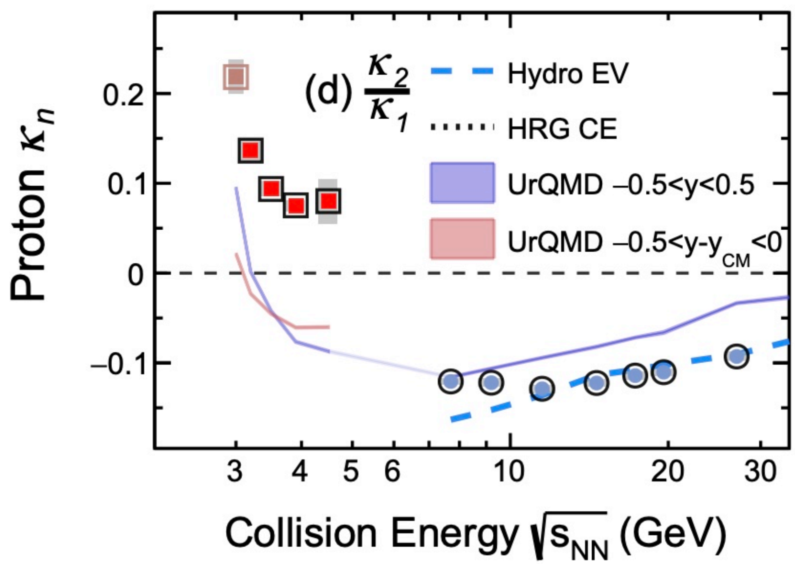
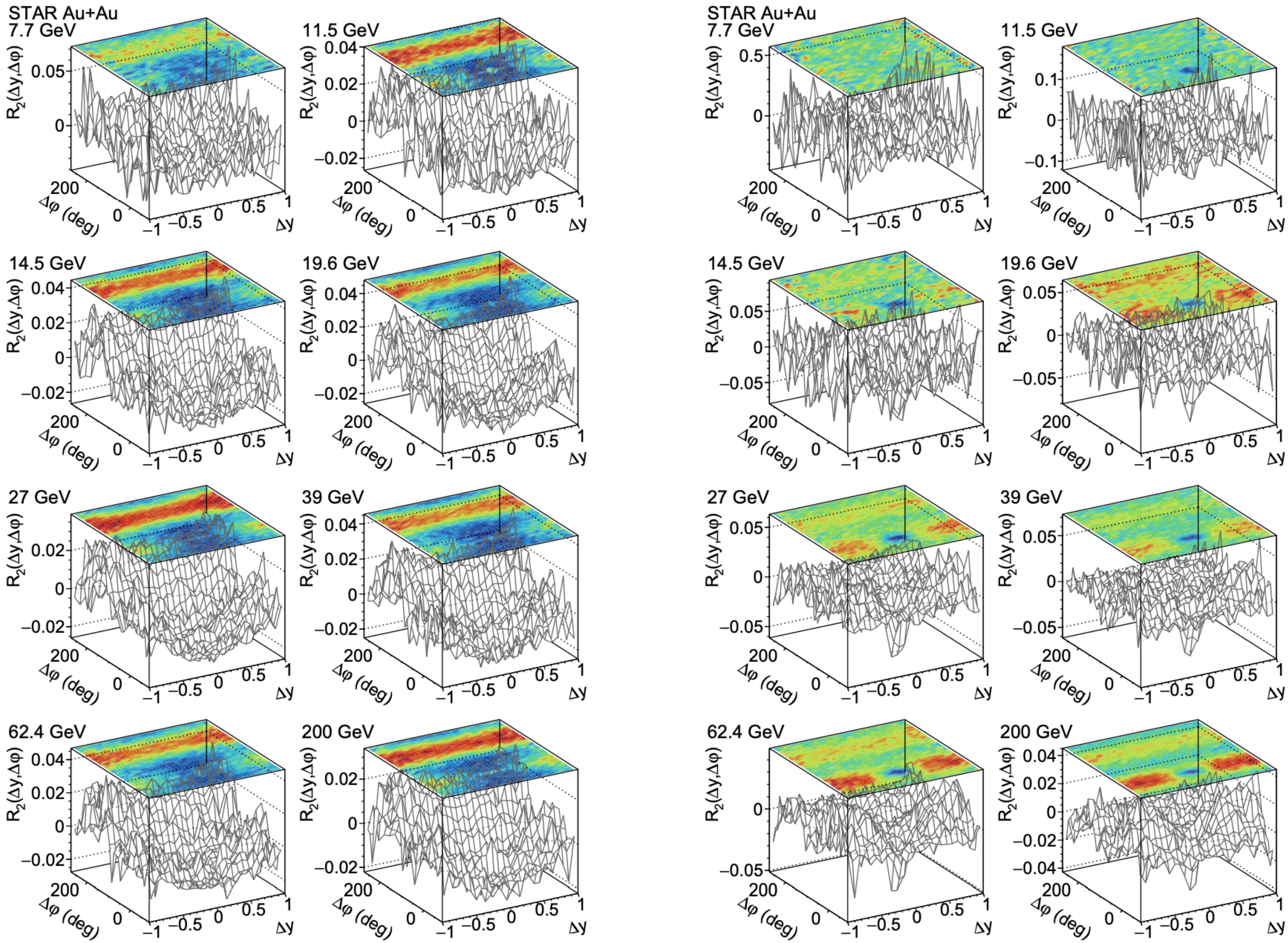
Lower Order Fluctuations

One big benefit of lower order fluctuations: they are easier to measure and clearer to interpret. They are directly related to easily measured 2-particle correlations like charge balance functions, or $\Delta\phi$, $\Delta\eta$, Δp_T correlations.

Detector effects and backgrounds are easily diagnosed. Do experiments know the EXACT shape of their probability distributions for missing a track?

Physics effects are more easily recognized and quantified. Interpreting fluctuations while ignoring the differential correlations is flying blind. Can we understand these results better?



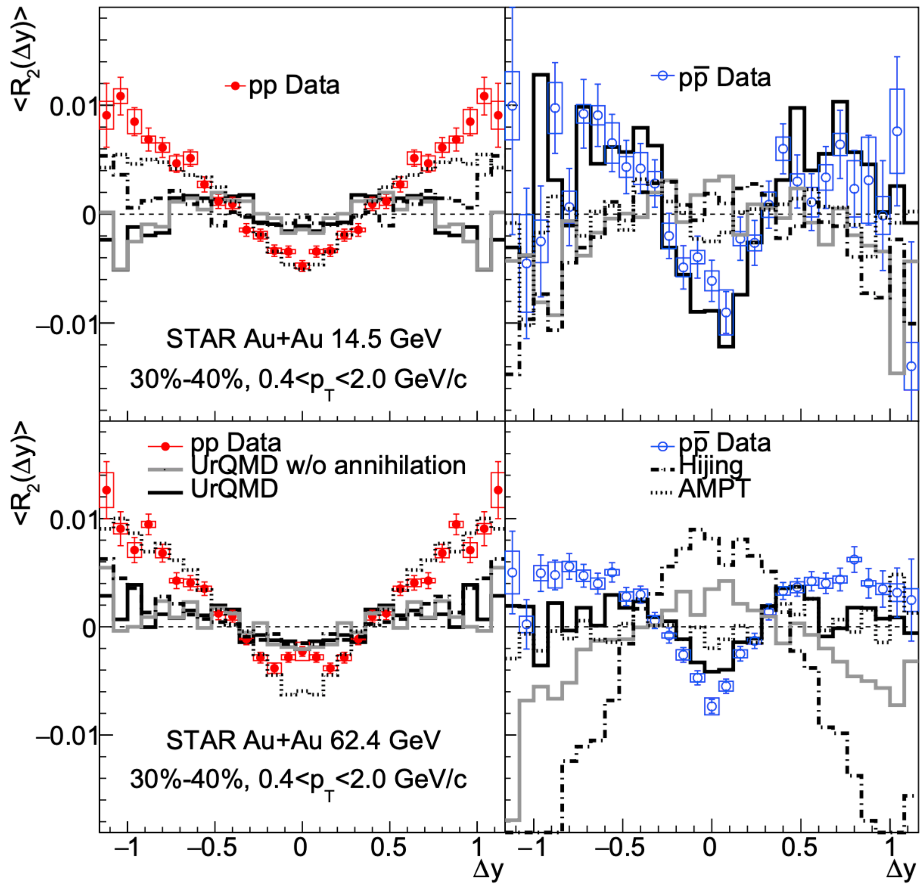


(a) Like-sign protons (b) Unlike-sign protons

STAR, Phys. Rev. C **101**, 014916

In BESI data, the contribution from repulsive interactions is evident. What do these correlations look like in the FXT range? How do they compare to models now implementing these effects? (hydro-EV: Vovchenko, Koch, Shen, Physical Review C 105, 014904 (2022))

Do this analysis again and for FXT



(b) protons

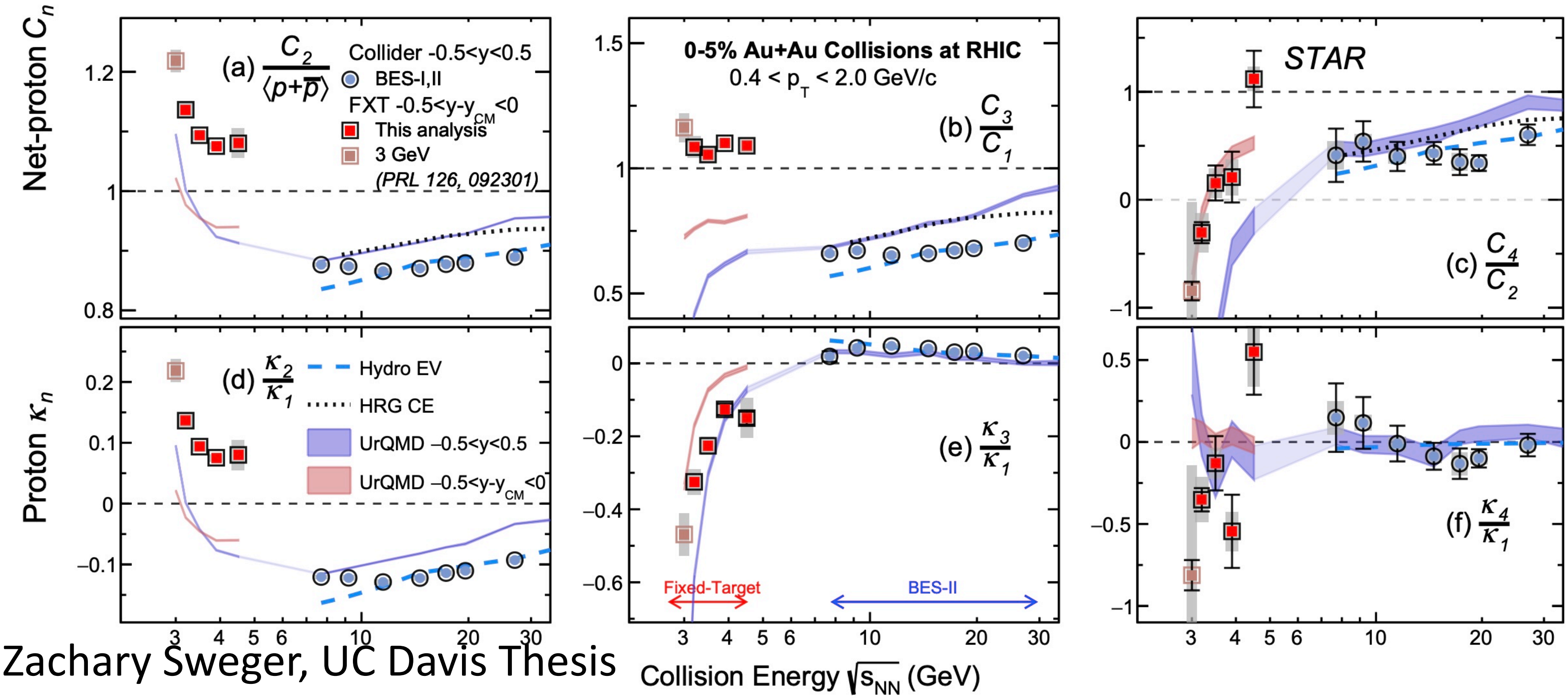
Reminder: we are looking at integrals over models and data. Agreement can and often is accidental.

$$\hat{C}_2 = \int\int R_2(\eta_1,\eta_2)\rho_1(\eta_1)\rho_2(\eta_2)d\eta_1 d\eta_2$$

None of these models agree with the data for both pp and p-pbar correlations in this energy range.

Updating this with BESII extended acceptance, increased statistics and FXT energies is very interesting and should be a high priority.

C_2: Repulsive then Attractive



Zachary Sweger, UC Davis Thesis

Hydro-EV shows repulsive interactions seem to describe $C_2 < 1$ down to 20 GeV.

Below that, data begin to rise, calling for attractive interactions.

But UrQMD shows such a simple interpretation is too naive: what drives the increase? **Show differential data from models and experiment. Stop flying blind.**