Jet performance simulations in *p*+*p* and Au+Au

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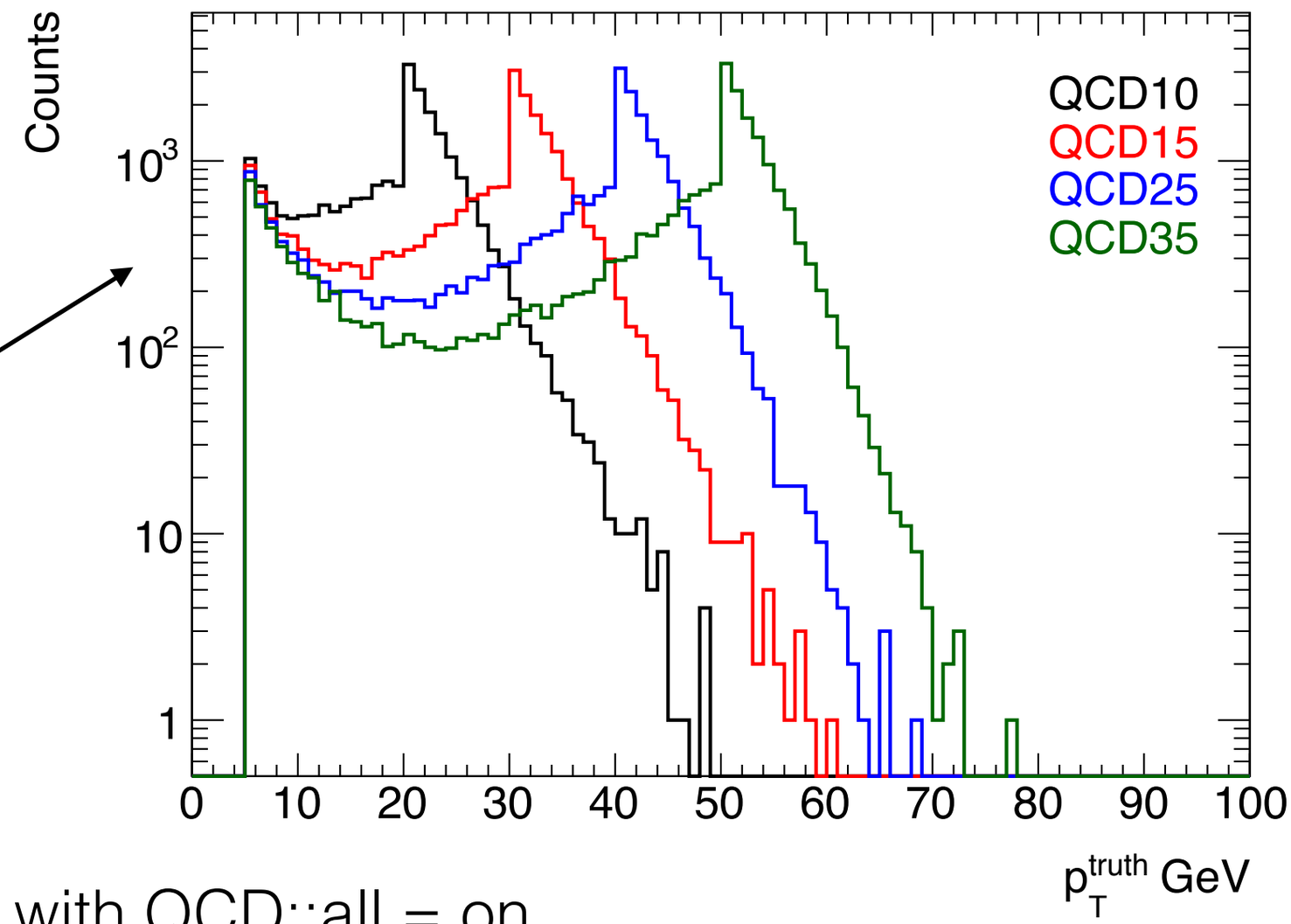
6 June 2017
sPHENIX Simulations Meeting

MC Sample Overview

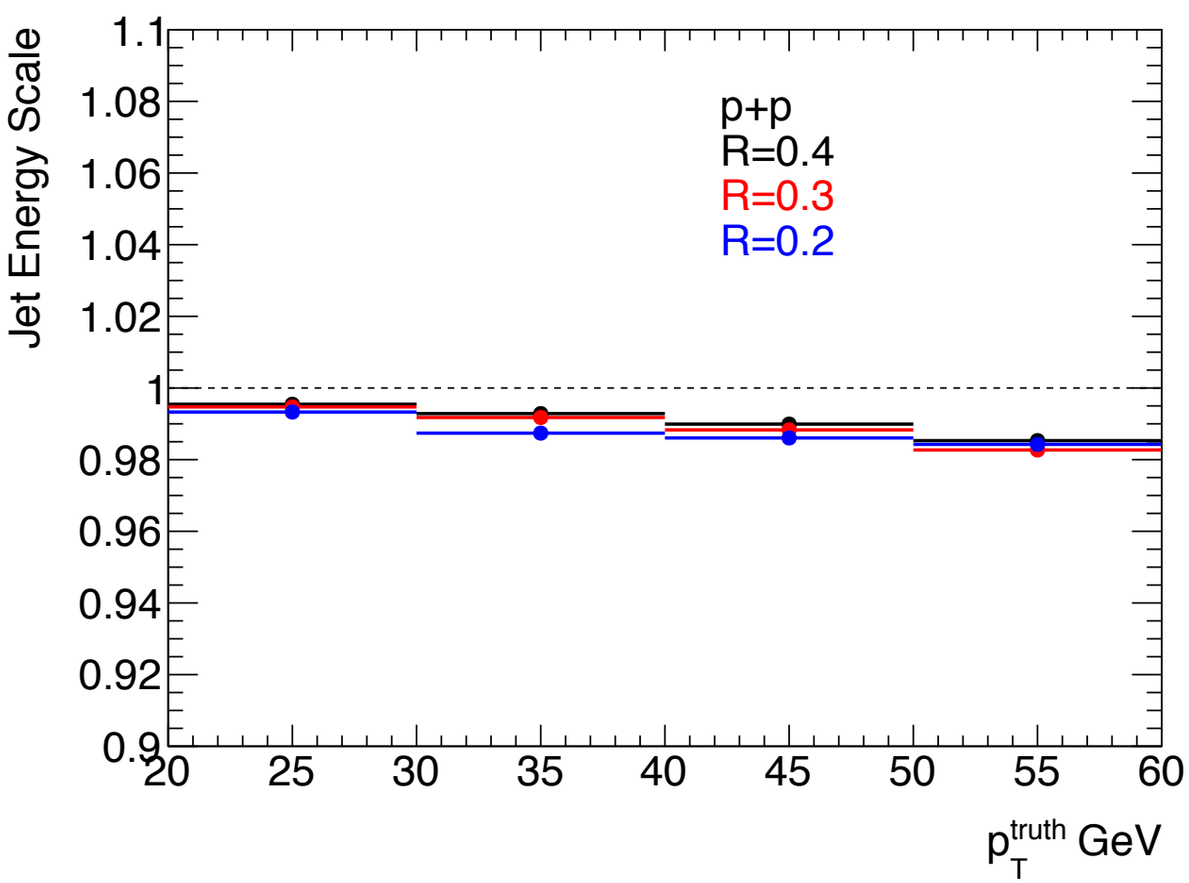
R=0.4 truth jet spectra, from the four QCD samples

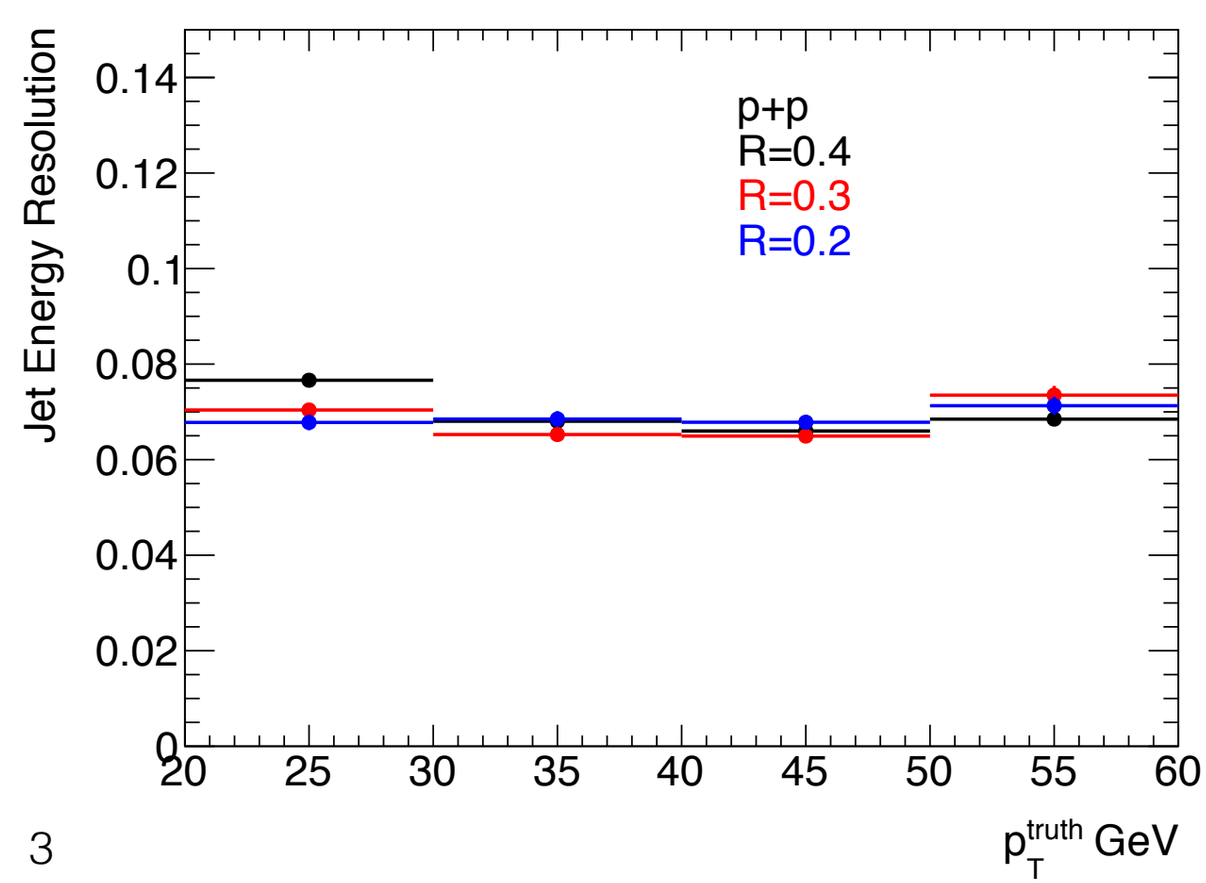


- Generated 10k Pythia8 events with QCD::all = on
  - ➡ use four pTHatMin thresholds (10, 15, 25, 35 GeV) and *R*=0.4 truth-jet requirements (>20/30/40/50 GeV)
  - ➡ HepMC input located at /sphenix/user/dvp/gen/QCD*XX/ for XX=10, etc.*
- Do separately for straight *pp* and embedded Au+Au (*b* = 0-4 fm Hijing)
  - ➡ “fixed-vertex” G4 Hits files at /sphenix/data/data02/review_2017-08-02/sHijing/fm_0-4/

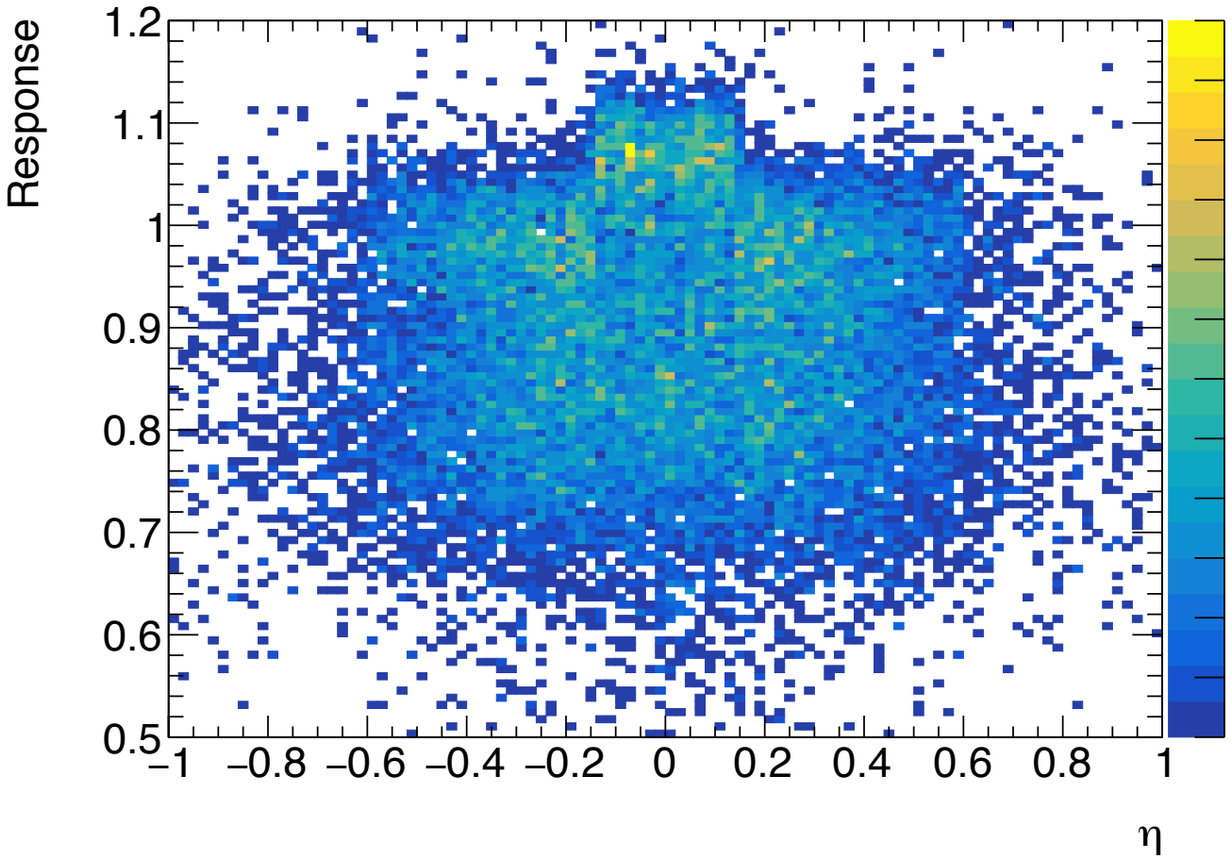
Jet performance in *p*+*p*

- Erin matches each truth jet to its nearest reco jet (within $\Delta R < R^{\text{anti-kt}}$)
  - ➡ then, we determine the Response = $p_T^{\text{reco}} / p_T^{\text{truth}}$, and fit to a Gaussian to determine JES and JER
  - ➡ stitch together performance for 20-60 GeV from 10-GeV wide range from each "QCD" slice
- Below: JES closure within ~2% and 7% JER(!)
  - ➡ but the underlying response distributions are somewhat pathological … see next slide…

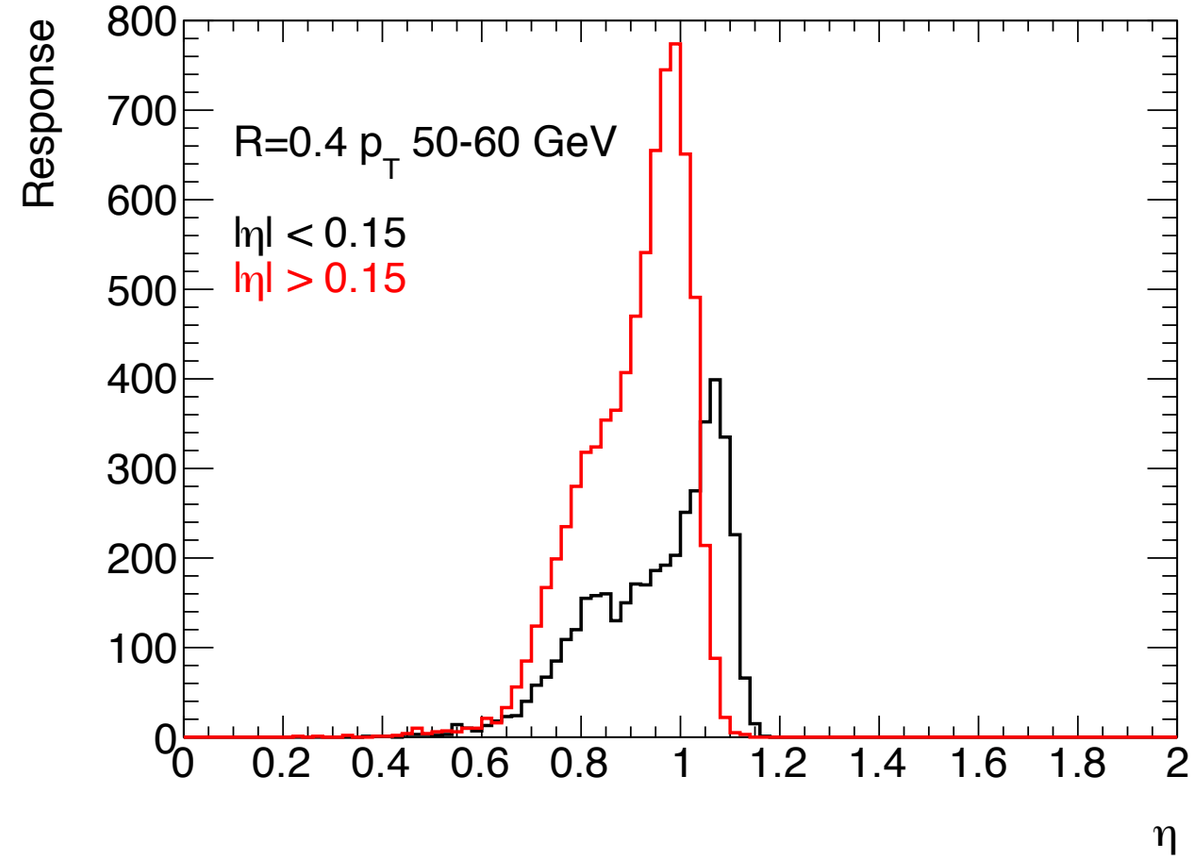




η-dependence in jet response

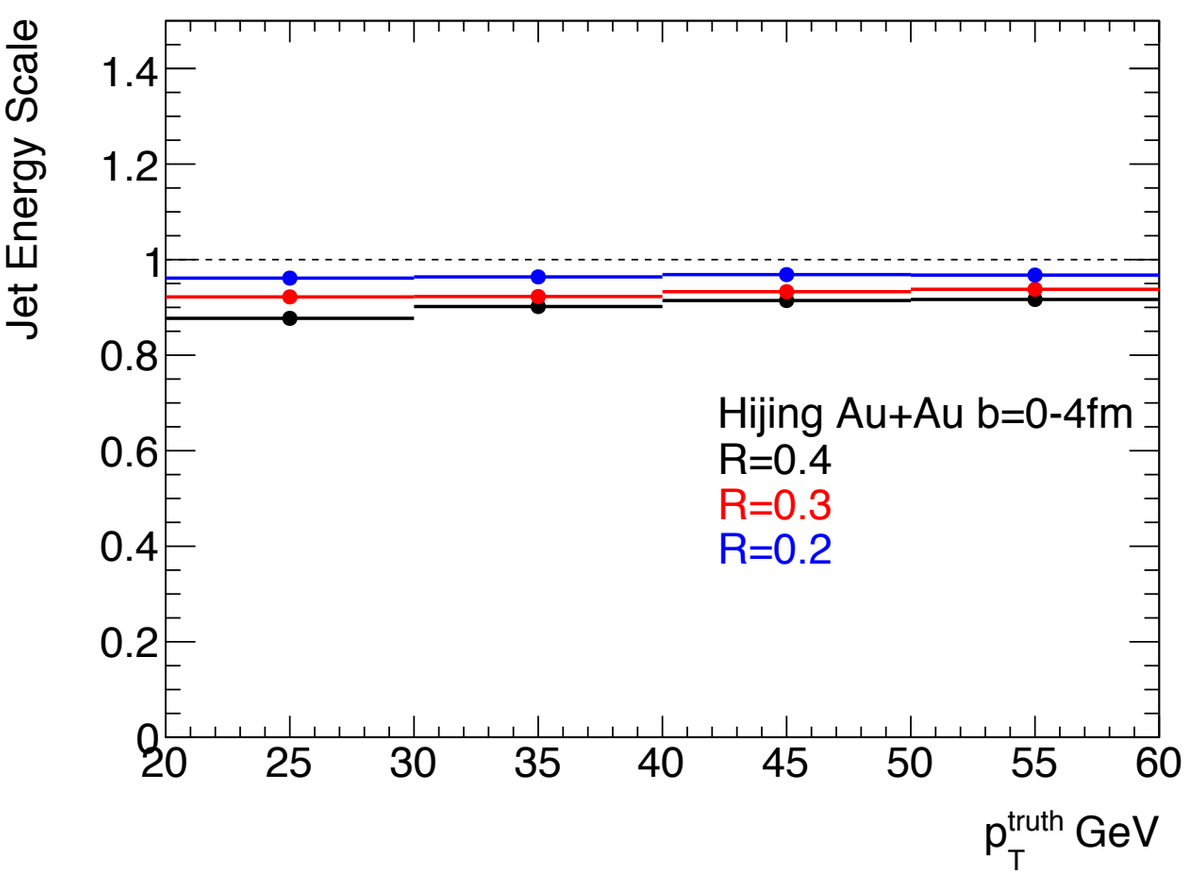
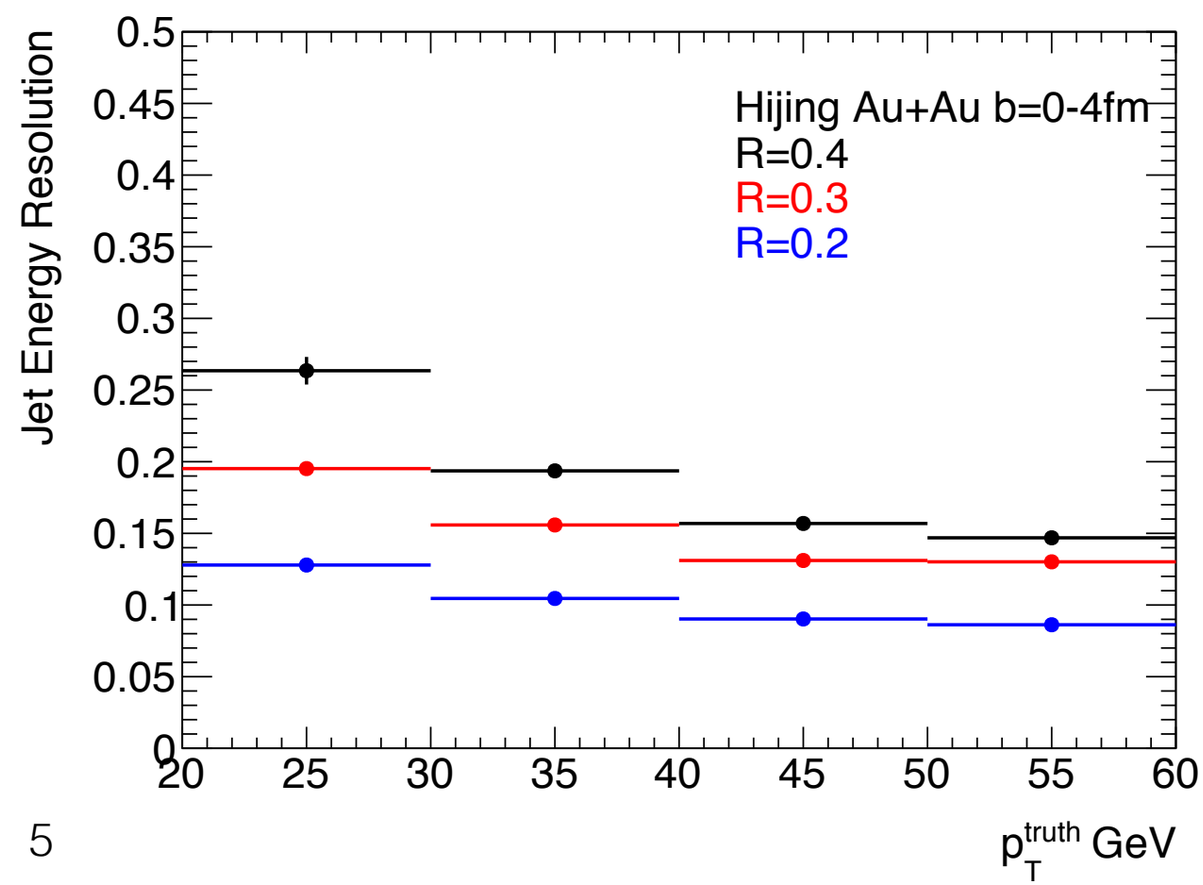


p+p collisions, R=0.4, 50-60 GeV truth jets, Response vs. η



Response distribution in different η regions

- Change in overall response when moving to new G4_CEMC_Spacal macro
  - ➡ specifically, an over-calibration of the jet response for $|\eta|<0.15$ (roughly where the three 1-D-projective blocks are), affecting Gaussian fits
  - ➡ also seen by Joe Osborn in single particle sims — need tower-by-tower calibration for any jet reco?

Jet performance in Au+Au

- To determine performance in Hijing Au+Au events, use the new *Subtracted* jet containers
  - ➡ e.g. even if "*p*+*p*-like" response is weird, can still test the new (re-implemented) jet background subtraction…
- JES within 5-10% of unity (slight downturn at low-p_T from "self-energy bias"?)
- JER has expected dependence on *R* and p_T