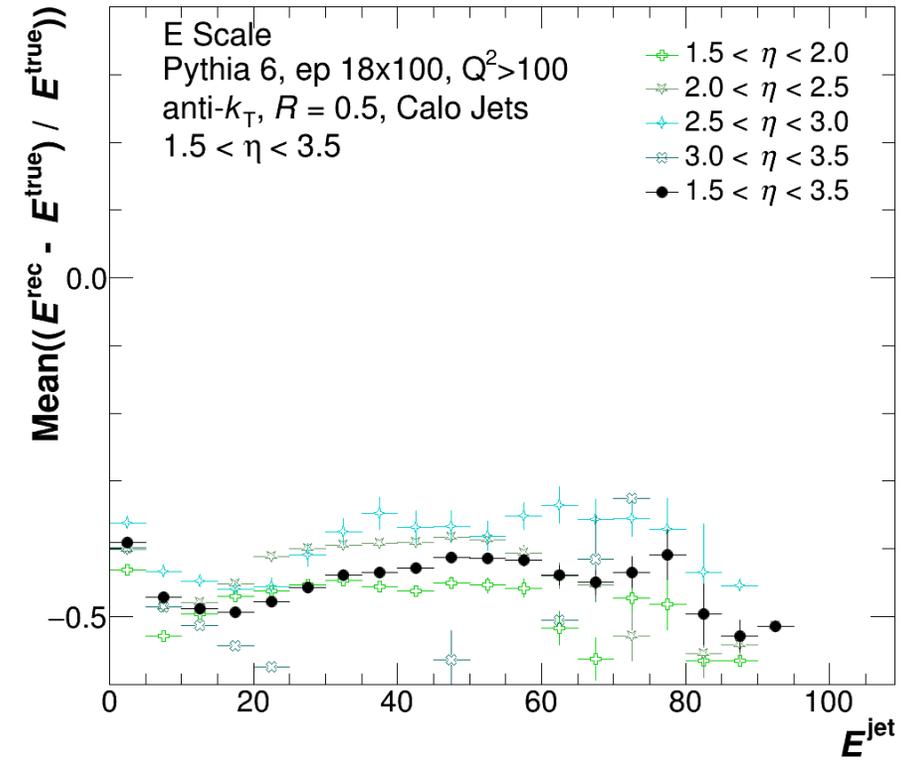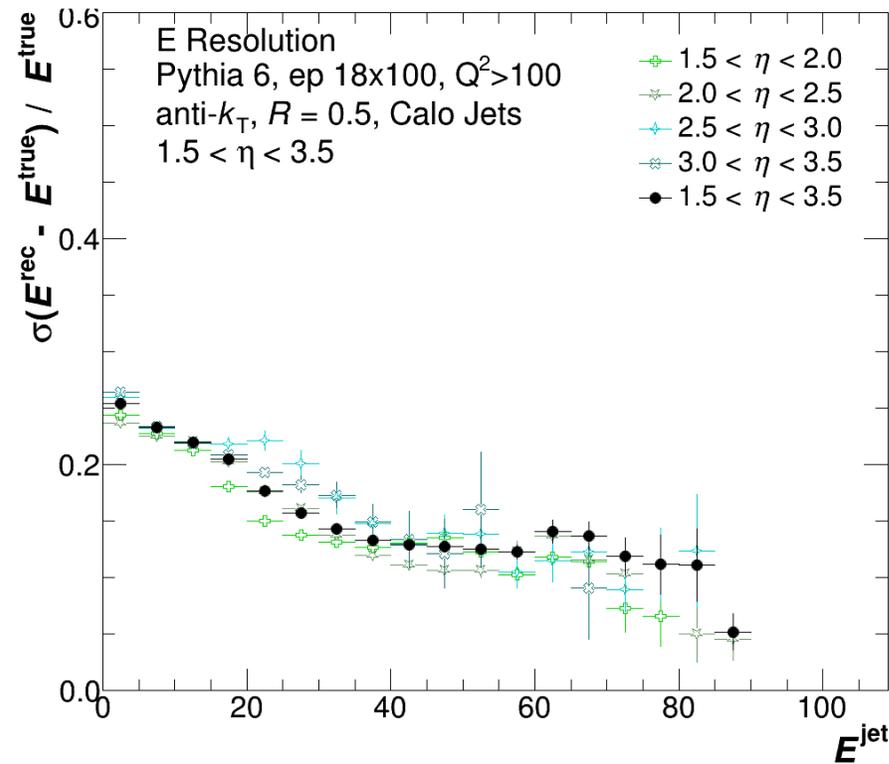# Jet Resolution

Tristan Protzman, Lehigh University

Goals and Configuration

- Jet observable resolution
  - How wide is the distribution of observed values for a given truth value?
  - Standard deviation of (observed – truth) / truth

- Jet observable scale
  - Does the distribution of measured values peak at the true value, or somewhere above or below it?
  - Mean of (observed – truth) / truth

- Jet efficiency
  - What percentage of truth jets are we able to measure?

- These will be looked at for tracking jets and calorimetry jets separately
  - HCal and EMCal separated too for debugging, though mostly calorimetry is treated together
- 5 GeV bin size throughout
- 100,000 events from June high Q^2 SIDIS production
  - 18x100 GeV ep, $Q^2 > 100$ GeV^2
- Build on event evaluator analysis code from ORNL
- Recently got jet matching working for both tracking and calorimetry, lots to still do!
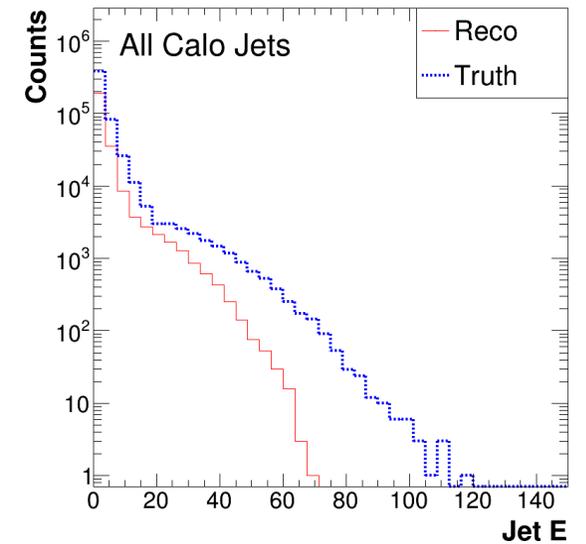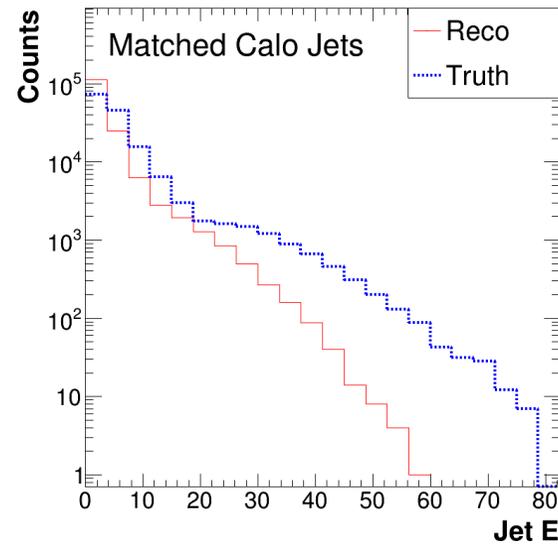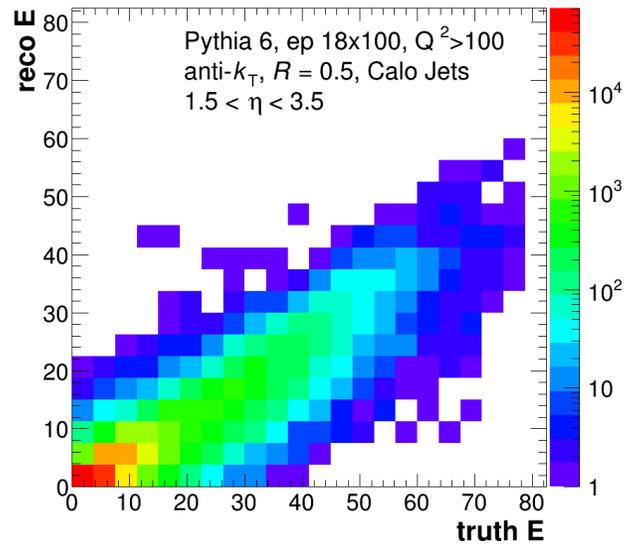
Jet Energy, Calorimetry

- Only forward calorimetry currently
  - Barrel calorimetry hopefully coming soon
- MA Clustering
  - Similar to ALICE v2
- Need to restrict which particles are used in truth jet definitions
 - Currently all are seen by both detectors

E Resolution
Pythia 6, ep 18x100, Q^2>100
anti-k_T, R = 0.5, Calo Jets
$1.5 < \eta < 3.5$

$1.5 < \eta < 2.0$
$2.0 < \eta < 2.5$
$2.5 < \eta < 3.0$
$3.0 < \eta < 3.5$
$1.5 < \eta < 3.5$

E Scale
Pythia 6, ep 18x100, Q^2>100
anti-k_T, R = 0.5, Calo Jets
$1.5 < \eta < 3.5$

$1.5 < \eta < 2.0$
$2.0 < \eta < 2.5$
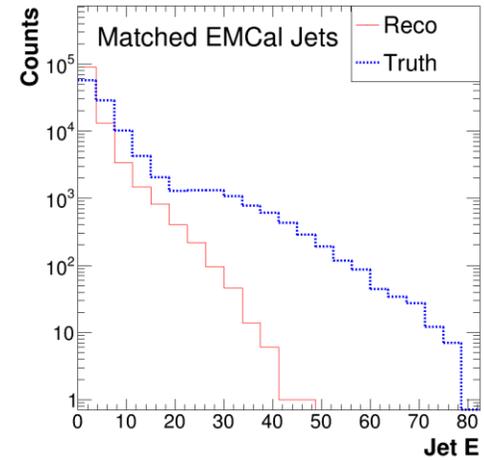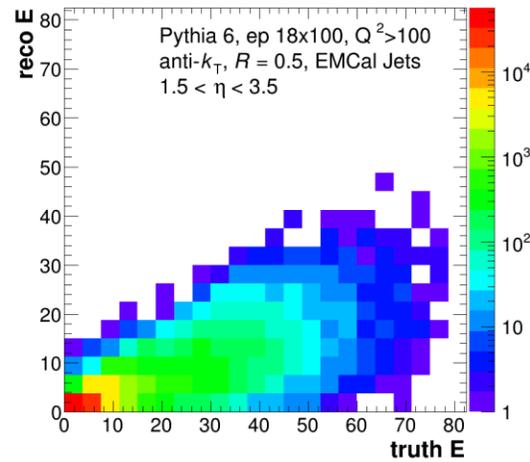$2.5 < \eta < 3.0$
$3.0 < \eta < 3.5$
$1.5 < \eta < 3.5$

Jet Energy, Calorimetry

- Not yet clear why reconstruction performance is poor at higher energies
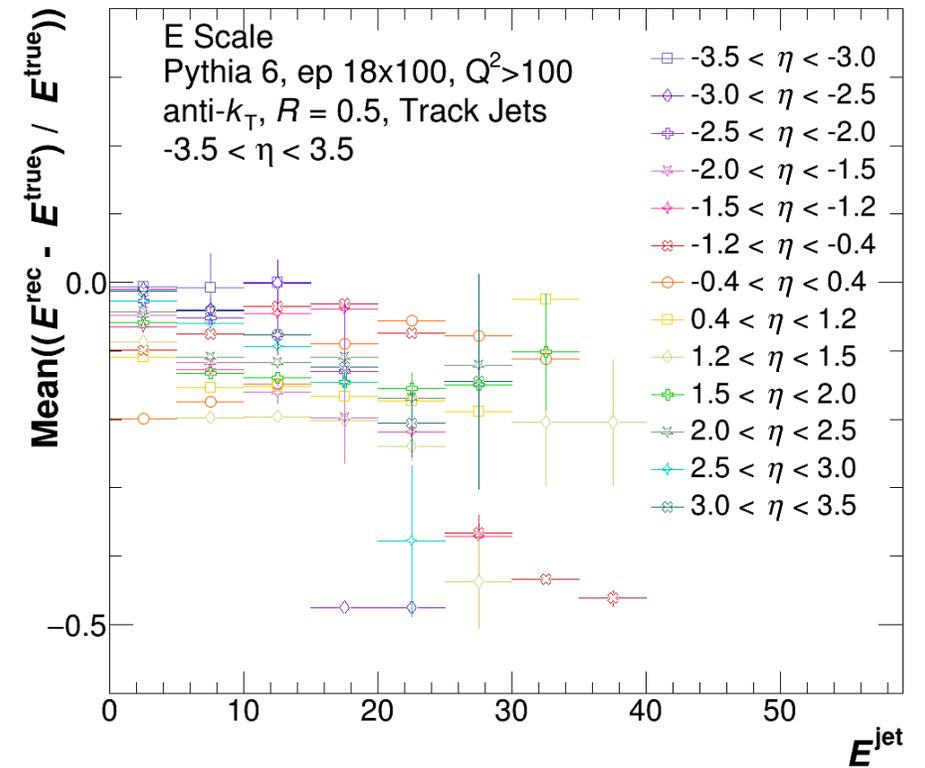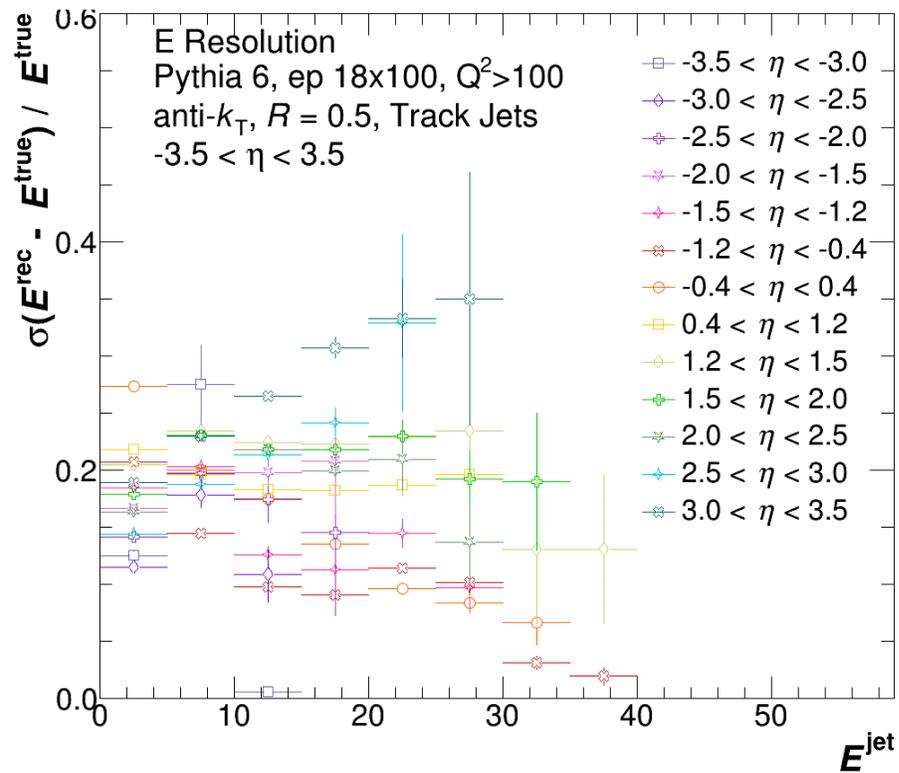- Could be related to not yet limited definition of truth jets?

EMCal and Hcal output

- Good to see that both calorimeters are now working
- Net results is better than either on its own – Good!
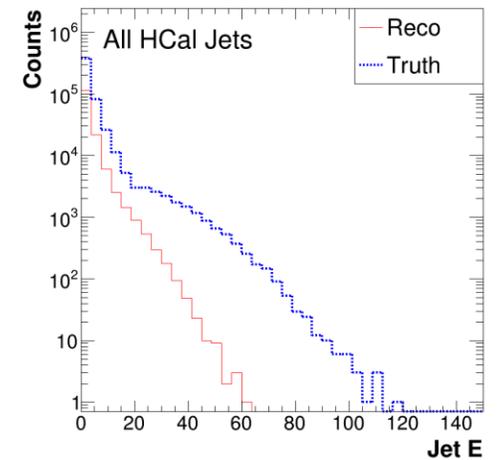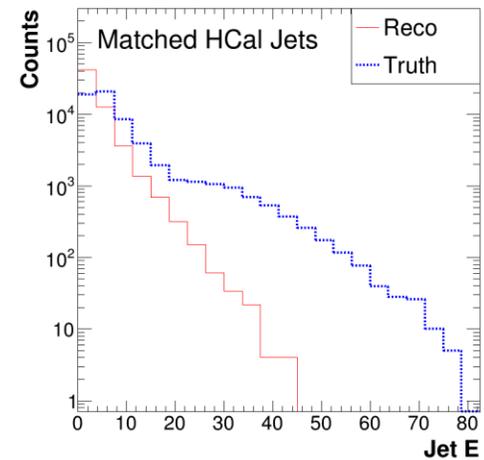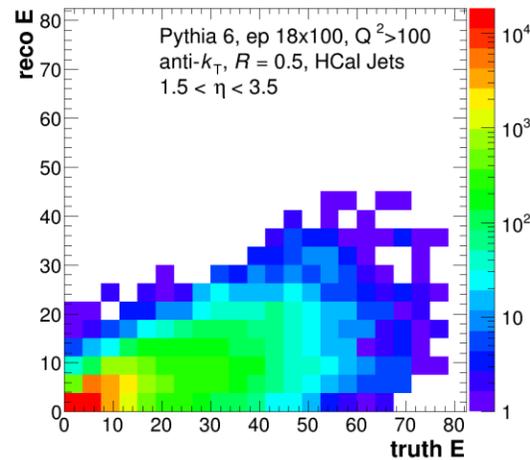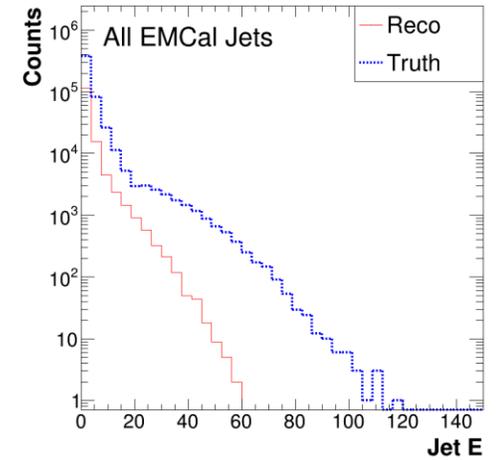
Jet Energy, Tracking

- Similar resolution and better scale than calo jets
- However, I think there is an issue since no jets are matched above 40 GeV

Jet Energy, Tracking

- Lots to investigate here
- Reco jets with greater energy than truth jets
- Matching seems to fall off around 20 GeV or so
- A track cut of pT<30 was suggested, trying that later today
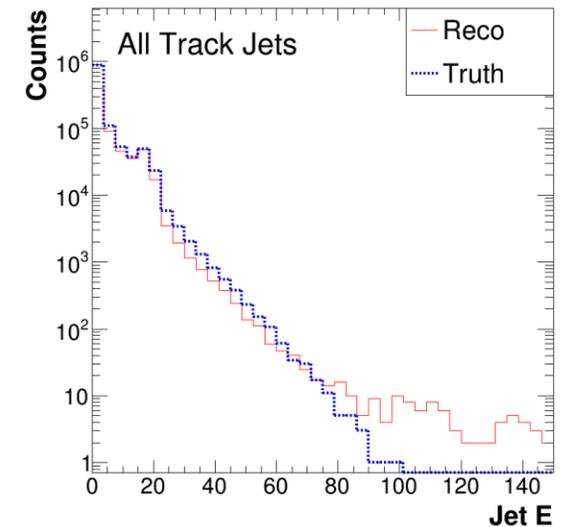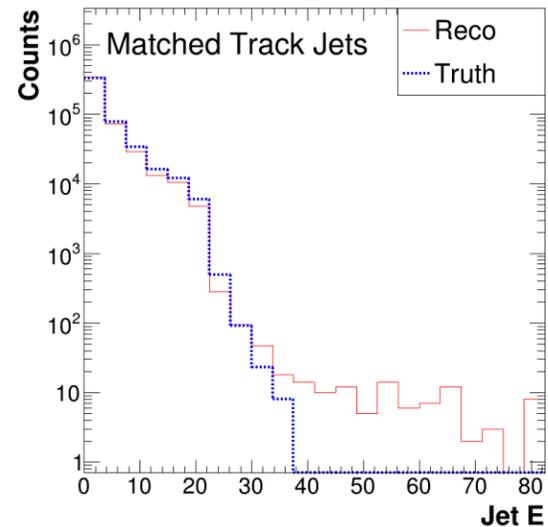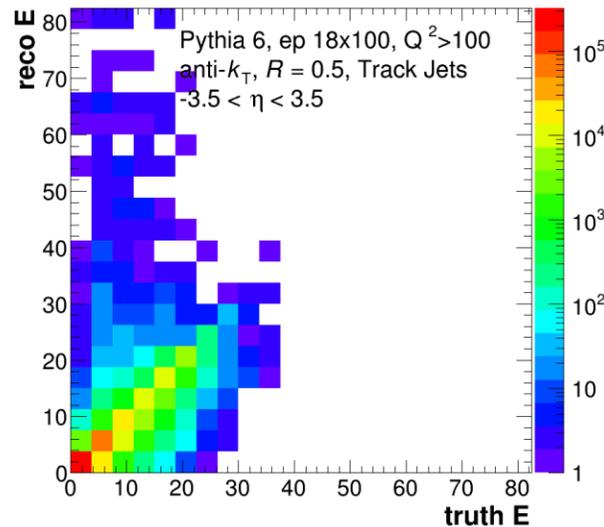
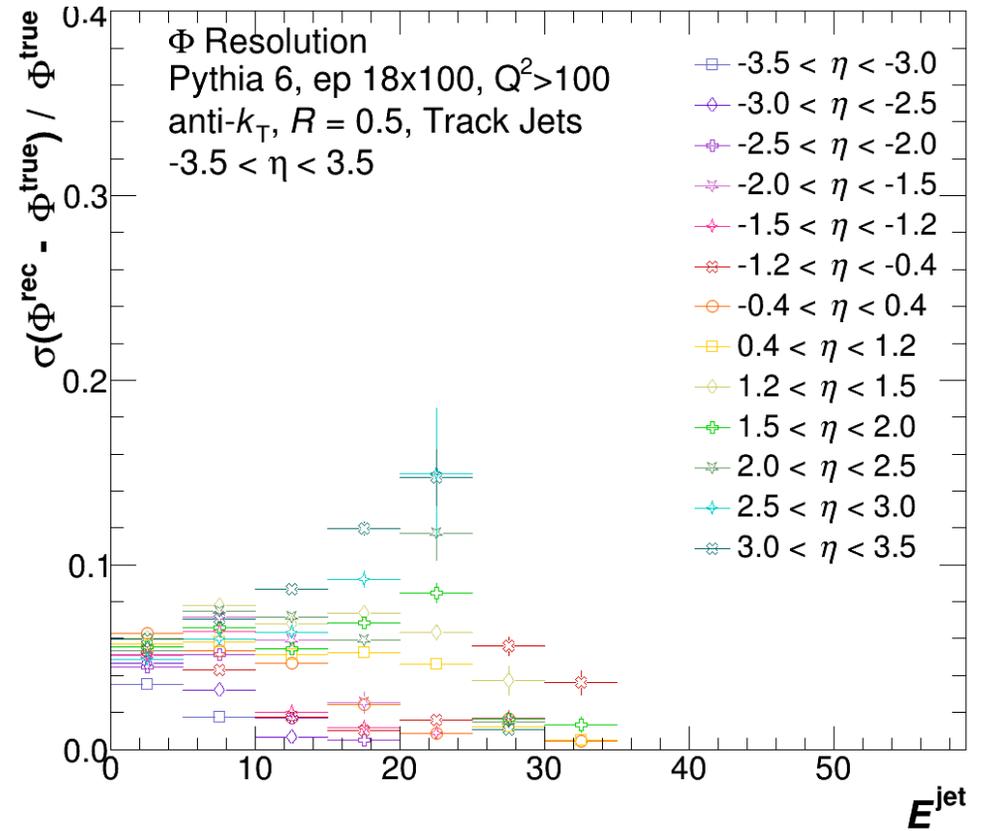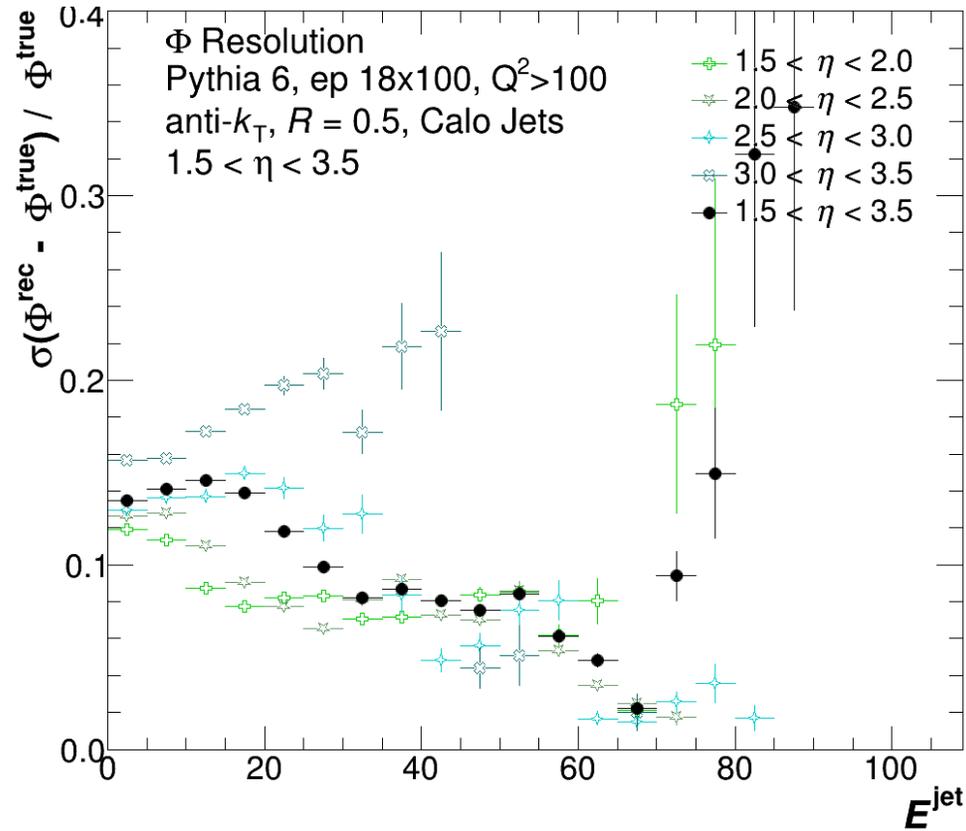# Jet Eta Resolution

- Consistent performance across energy range from both calorimetry and tracking
- Perhaps there's a better way to talk about resolution around $\eta = 0$
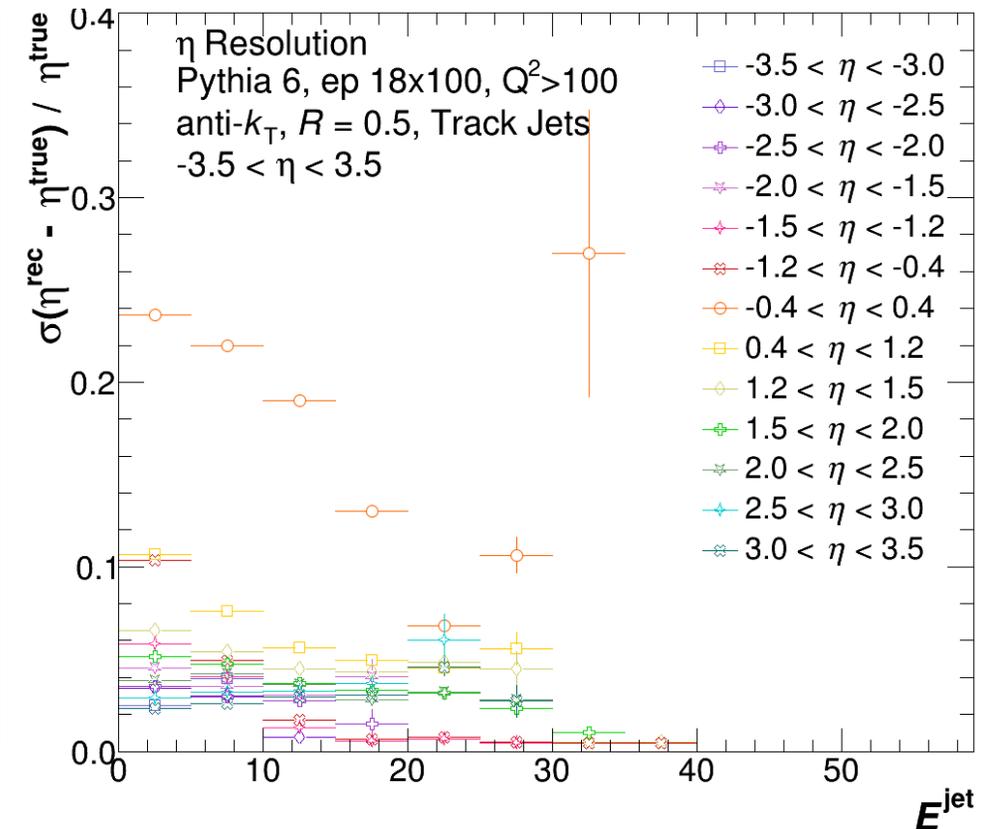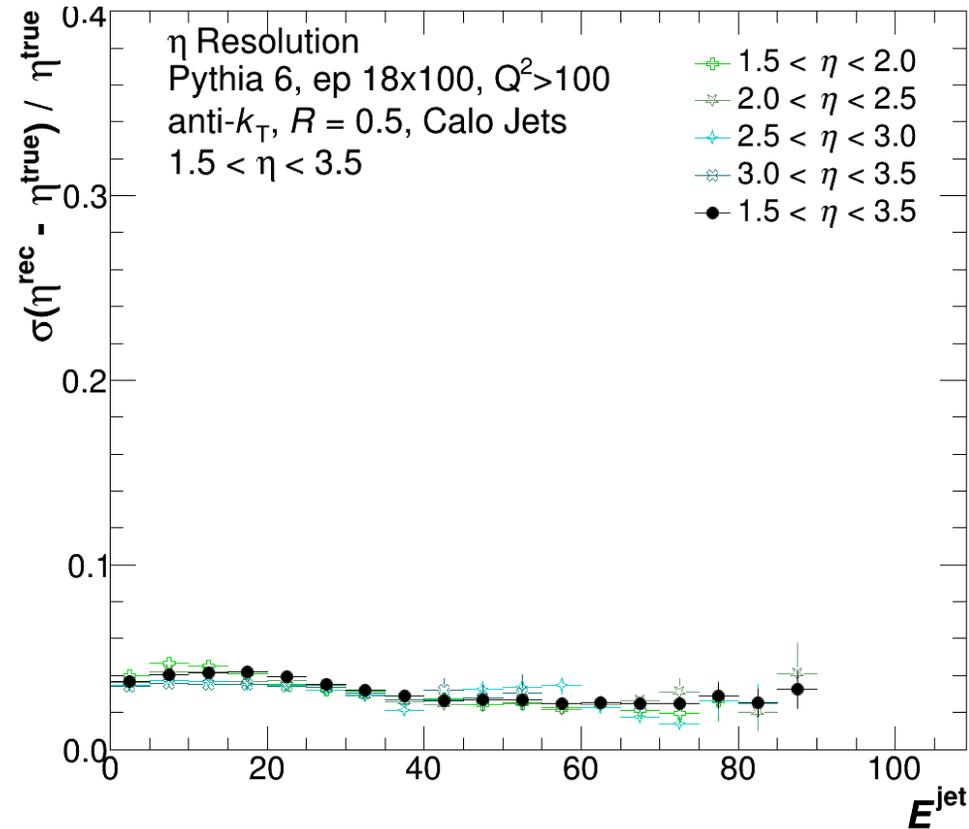
Jet Phi Resolution

Outlook

- Draw histograms for each energy bin
  - Make sure distributions are sensible
  - Functionally was present but broke with some change

- Work through mentioned issues with jet reconstruction/matching

- Add support for barrel calorimeters when added

- Efficiency plots
  - Ratio of matched jets to truth jets as a function of jet energy
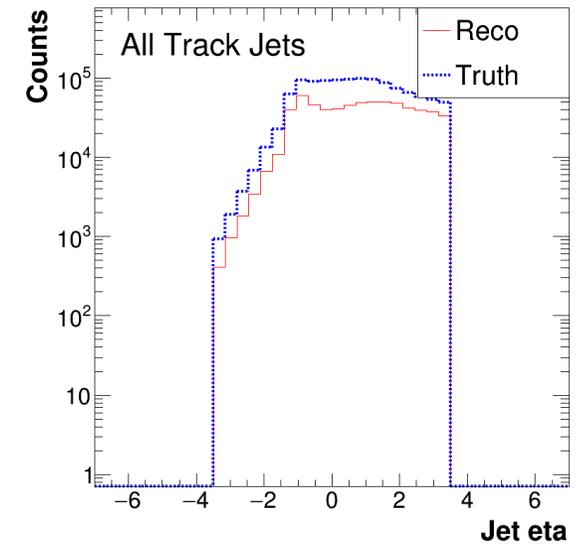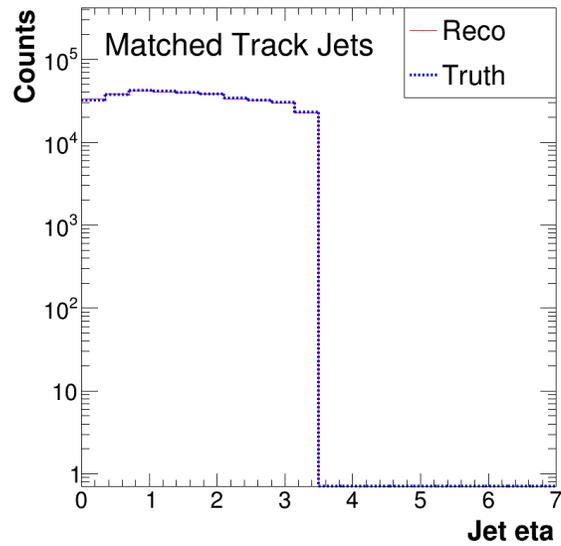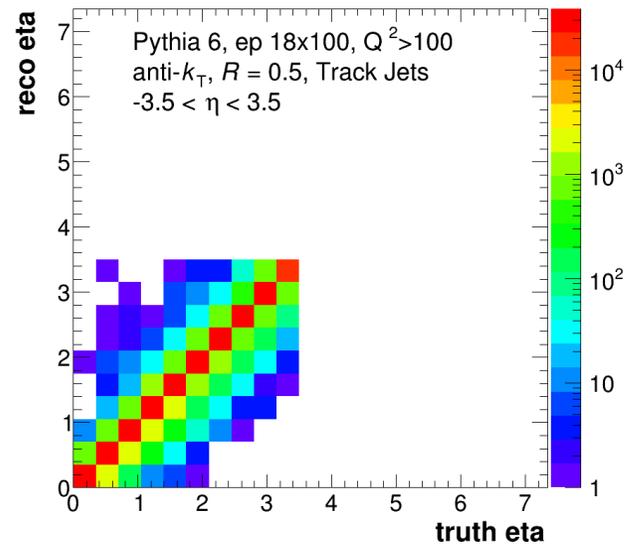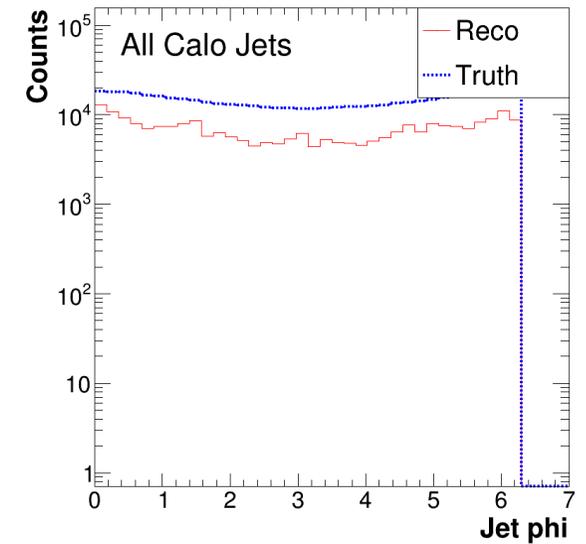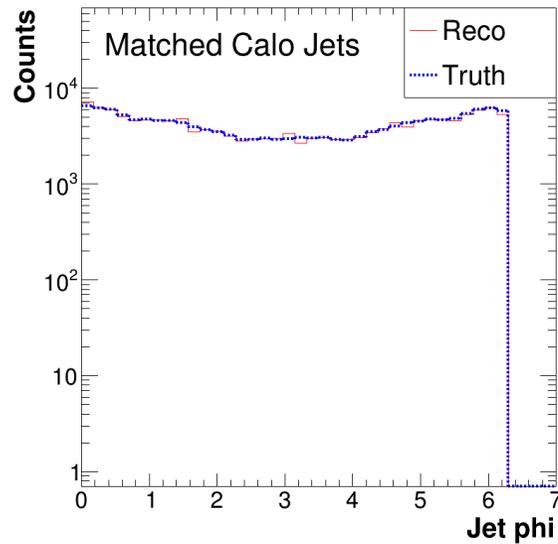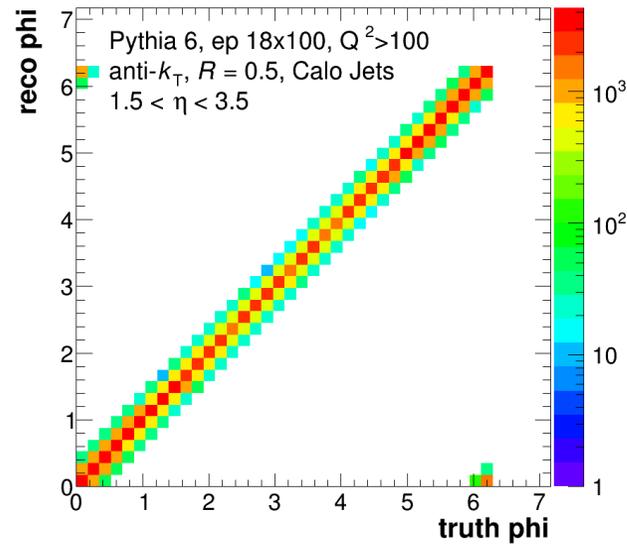
Backup

pT, Tracking
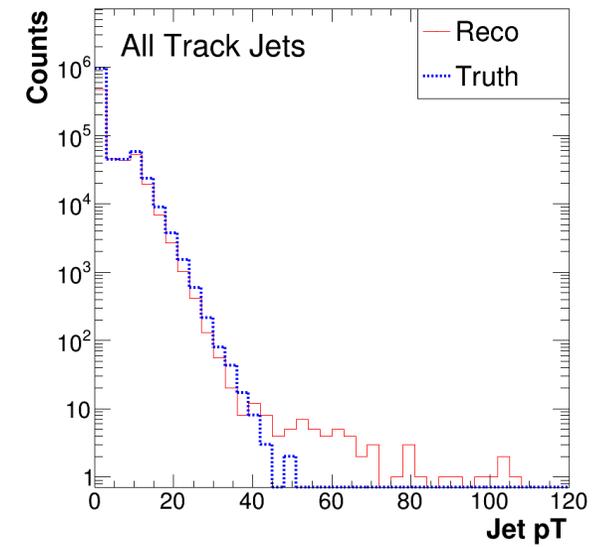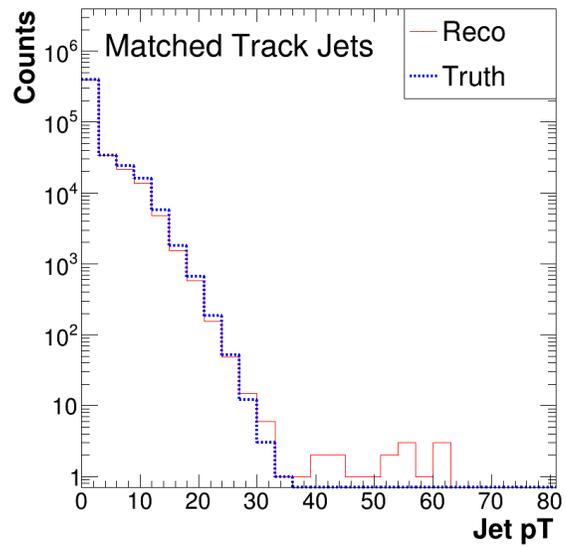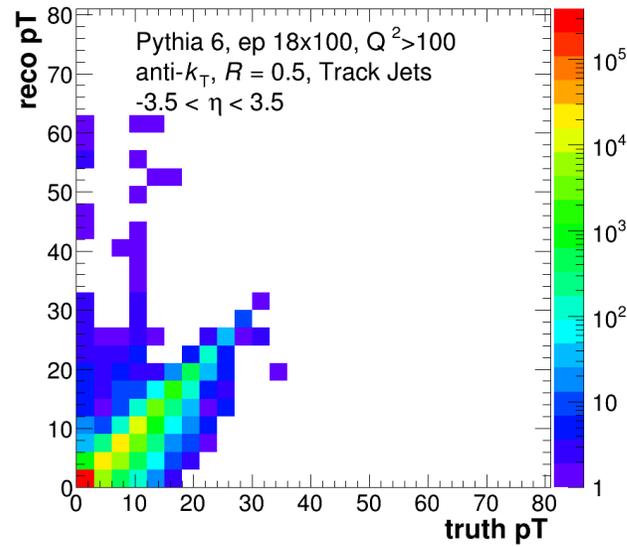
Eta, Calorimetry
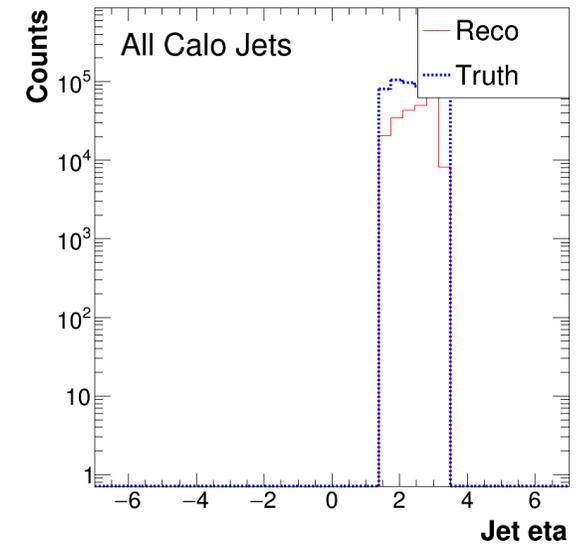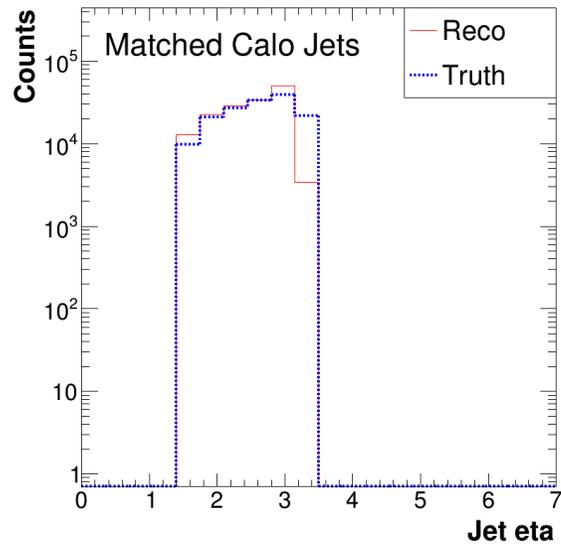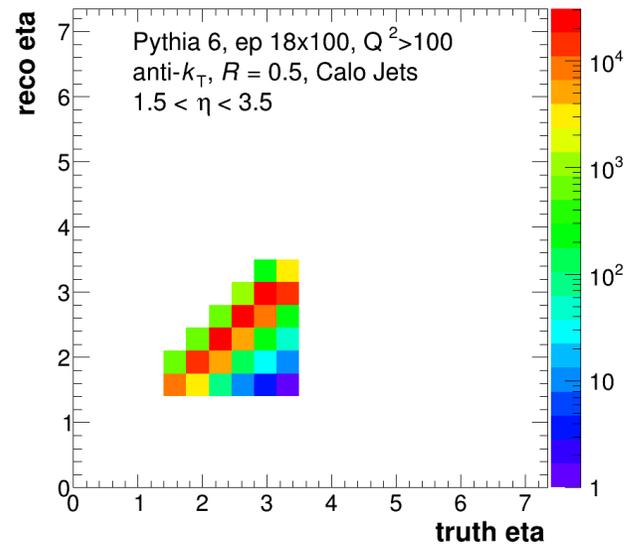
Eta, Tracking

Phi, Calorimetry

Phi, Tracking