

Impact of Jet Isolation and Truth Matching on Jet Response



ATLAS

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Jet Truth Matching

Jet Isolation

Jet Matching Distributions

Jet Isolation Distributions

Jet Response for Different Cuts

Conclusions



Jet Truth Matching

- In any performance (or physics) study need to define a radius for the matching
- It is not necessarily a trivial question: why is 0.2 better than 0.3?
- One has to be consistent: if only jets with a match within 0.2 are used, then jets with no match within 0.2 should be considered fake
- Today: Does it matter what we choose? (in the context of jet response)
- Two examples of matching:
 1. H1 derives the weights using jets with a match within a radius of 0.1 (I think, check slides later)
 2. The numerical inversion correction was derived with a loose match of 0.7 (but with strict isolation cuts...)
<https://twiki.cern.ch/twiki/bin/view/AtlasProtected/MCInitialPtAndEtaCorrection>

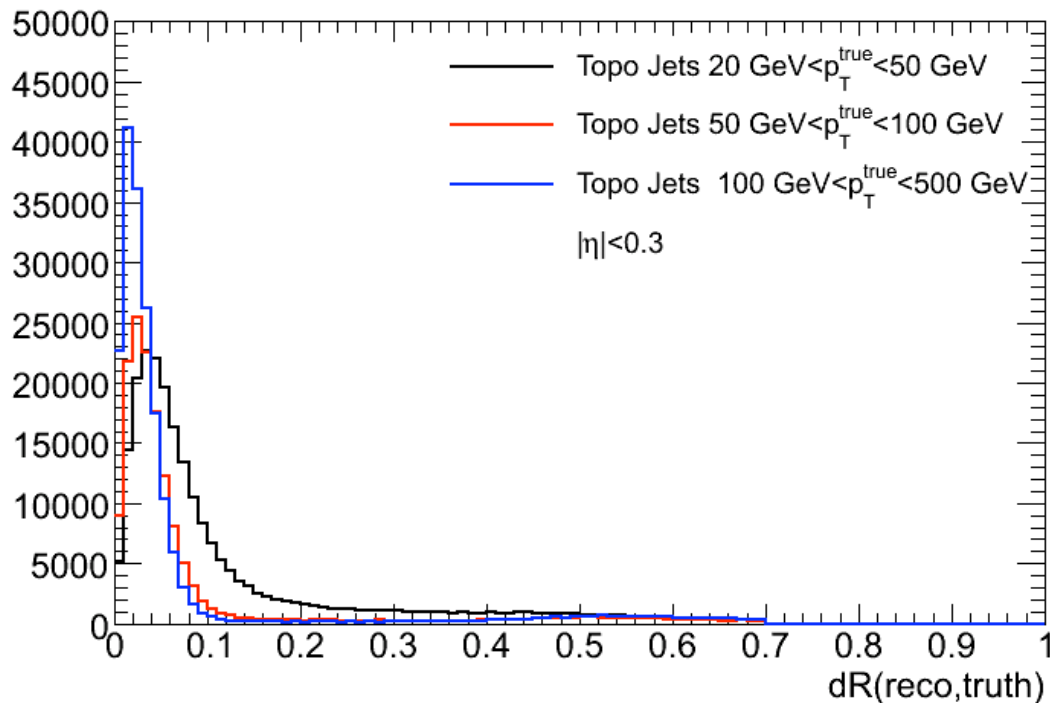
Jet Isolation

- Hard to decouple from the topic of jet truth matching: both can get you rid of split jets
- It can give you a handle on split jets, not on merged jets
- Again, need some consistency: if you derive your calibration on isolated jets, you should probably only apply it to isolated jets (and derive something different for non-isolated jets)
- Today: Does it matter what we choose? (in the context of jet response)
- Two examples of jet isolation:
 1. H1 uses no isolation to derive the weights
 2. Numerical inversion uses only jets that have no jet within 1.0 (and it is only applicable to these jets)



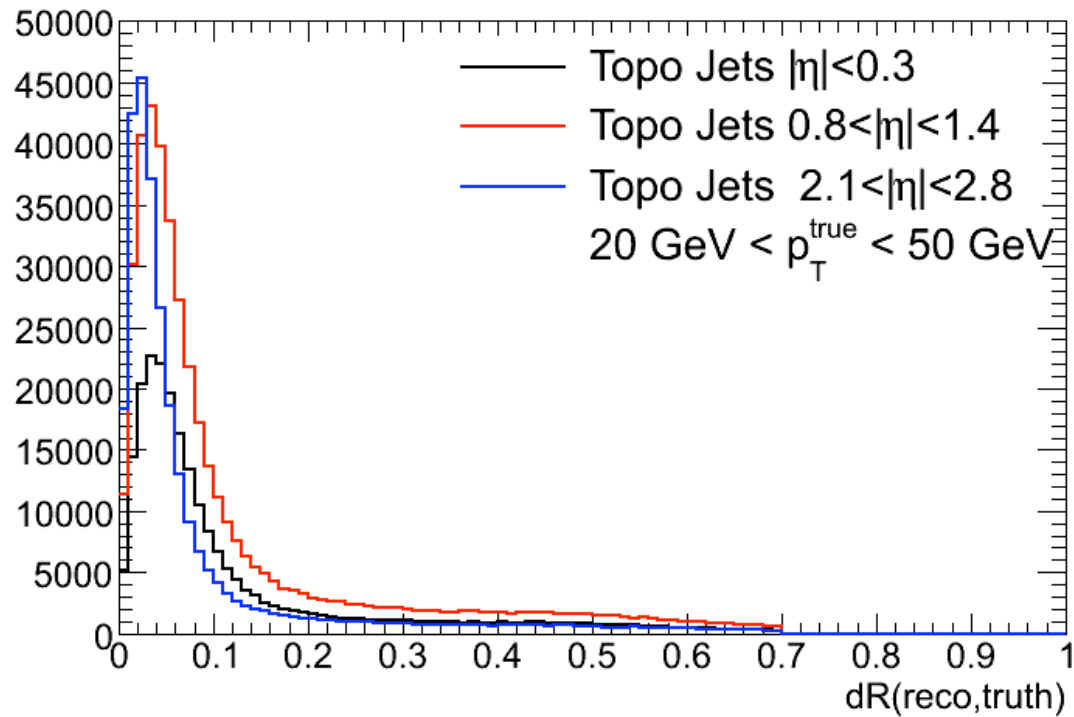
Jet Matching as a Function of p_T

In this talk look at Cone 4 jets in J2-J5 samples e344_s475_r586
Is the importance of this p_T dependent?



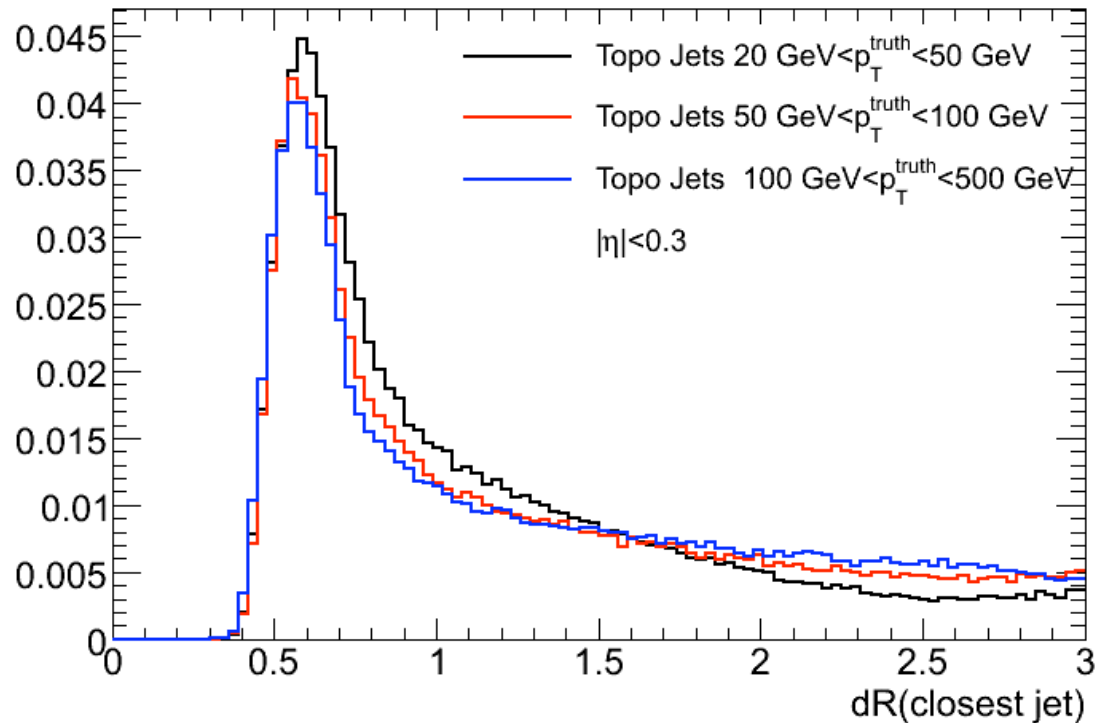
- Clearly, choice is most important at low p_T
- A too tight cut leaves too many jets out (unlikely to leave these jets out in your analyses with data)
- Small bump at high dR can be eliminated through isolation cuts (split jets that were not split at truth level)
- Similar plots for Tower jets (see back-up slides)

Jet Matching as a Function of η



- The impact will be similar for different eta regions, even if the width of these distributions might be slightly different (has to do with angular resolution)

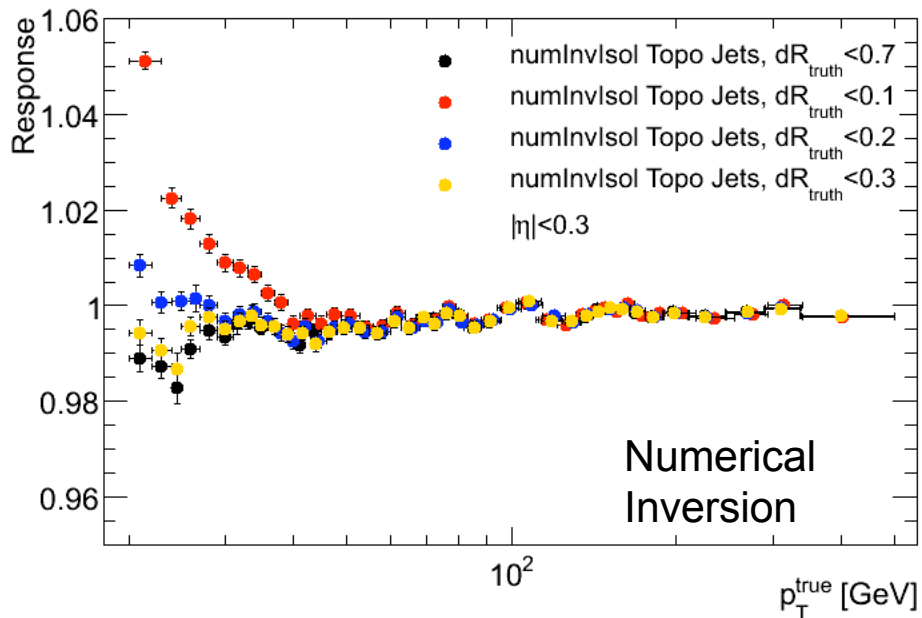
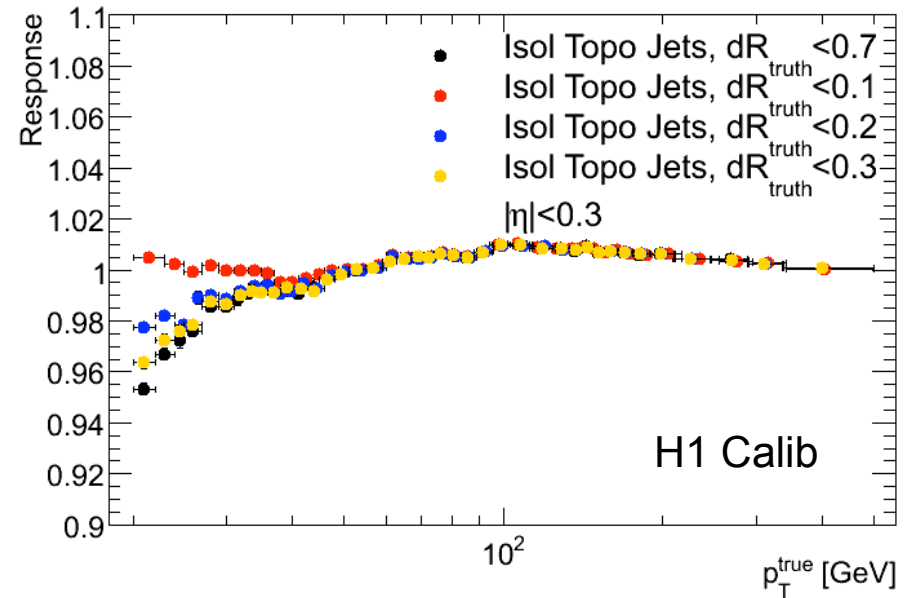
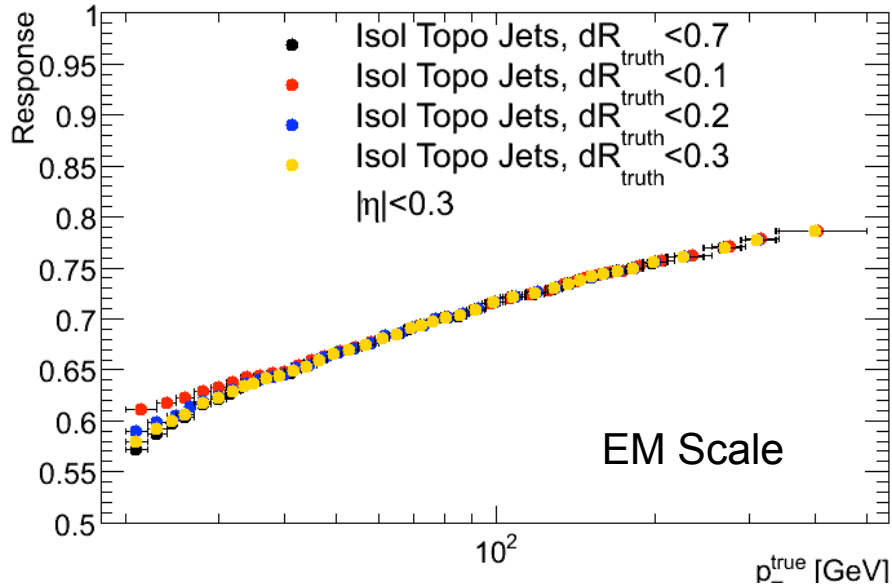
Jet Isolation as a Function of p_T



- Choice seems slightly more important at low p_T
- This is a reco quantity: we can parameterize the response as a function of it (a handle on the jet energy scale of split jets)

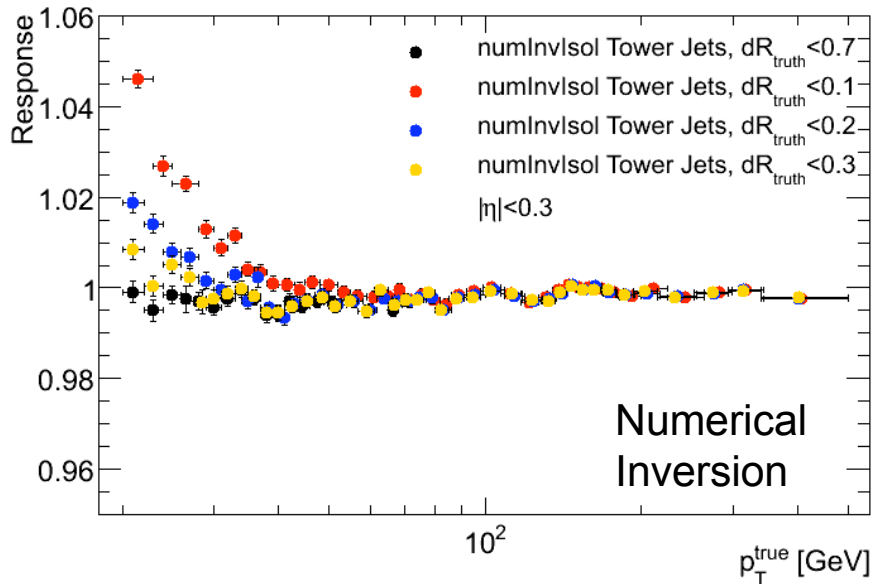
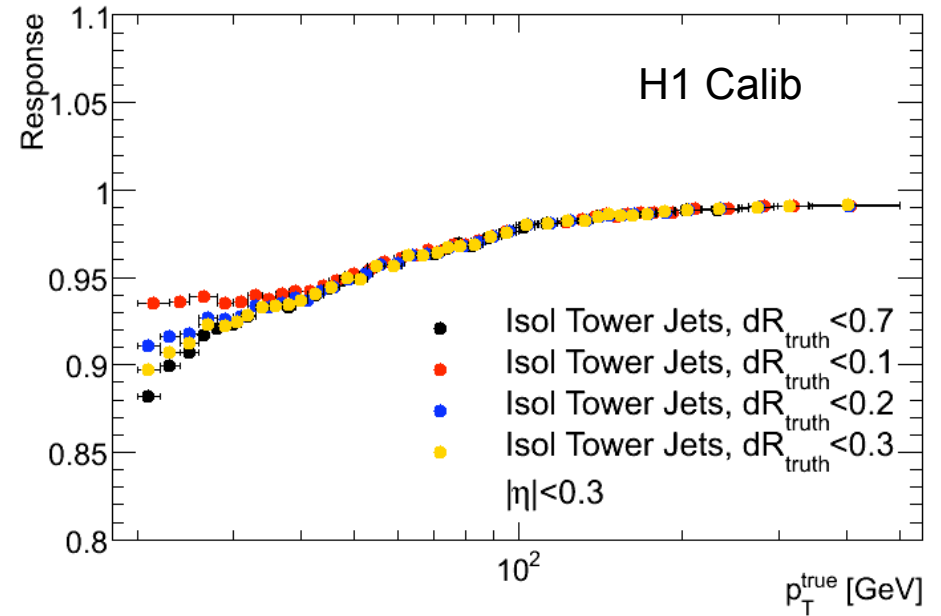
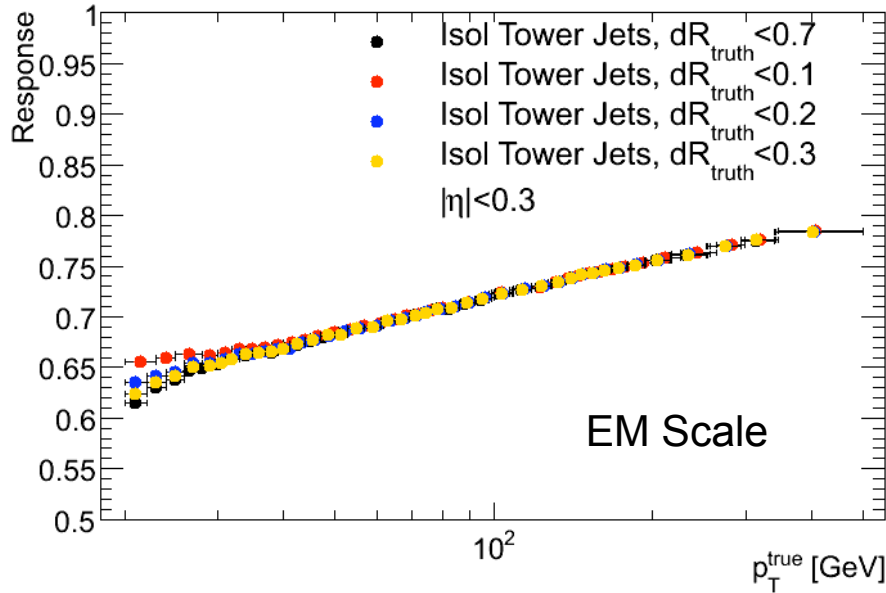


Jet Response for Isolated Jets ($dR > 1$)



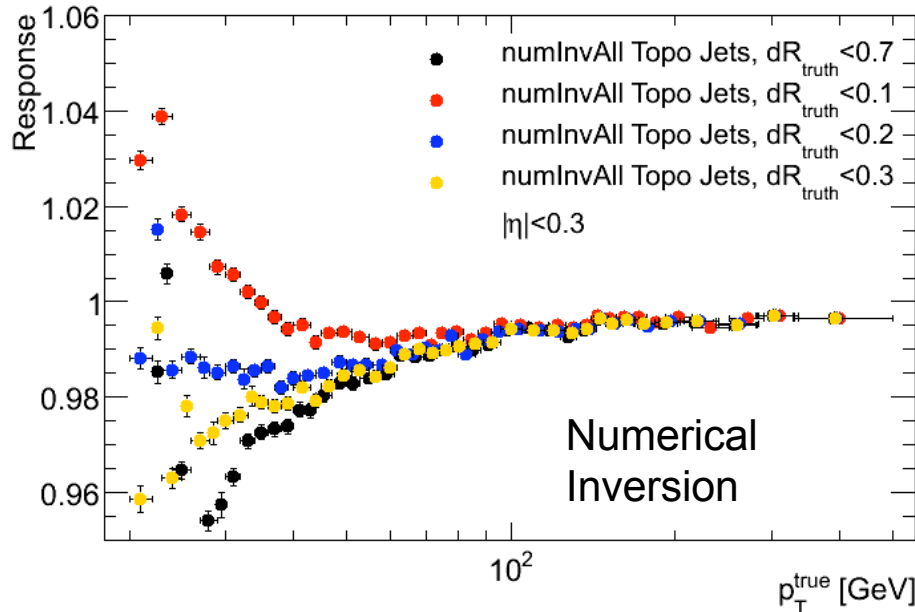
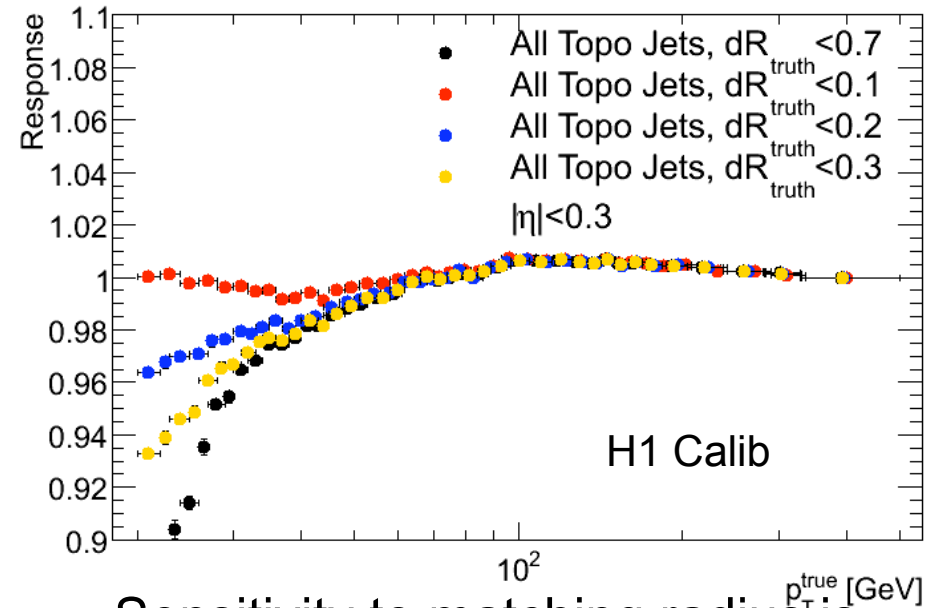
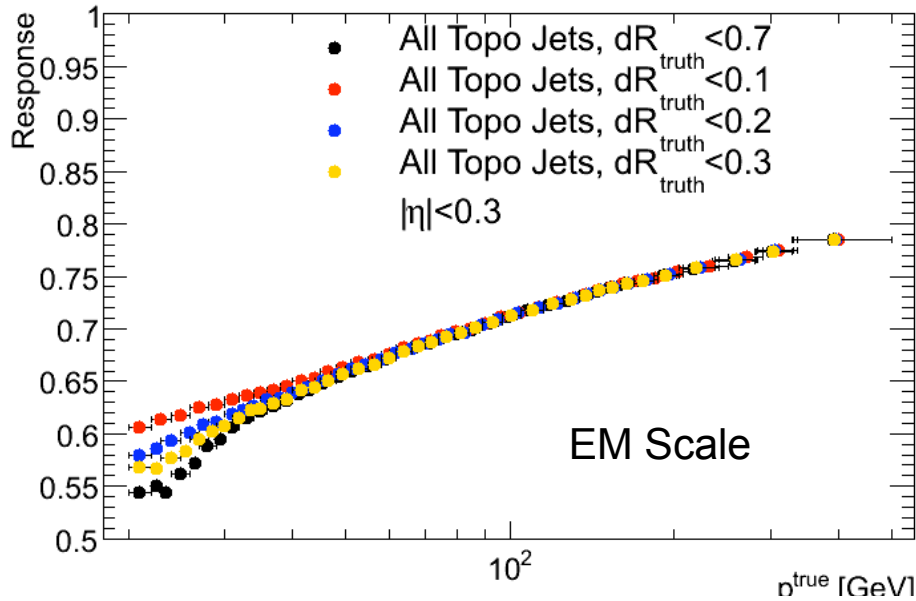
- H1 derived with $dR < 0.1$, N.I. with 0.7 (something like 0.3 might be more reasonable?)
- Effect at low p_T is certainly not negligible ($\sim 5\%$ in both cases)

Same as Before for Tower Jets



- Similar results as for Topo jets, but response for H1 jets is not linear

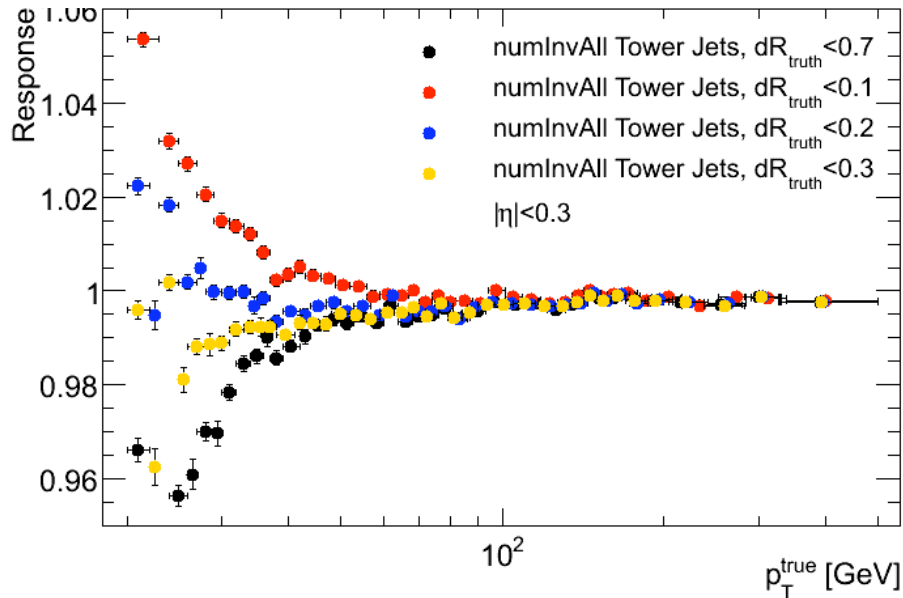
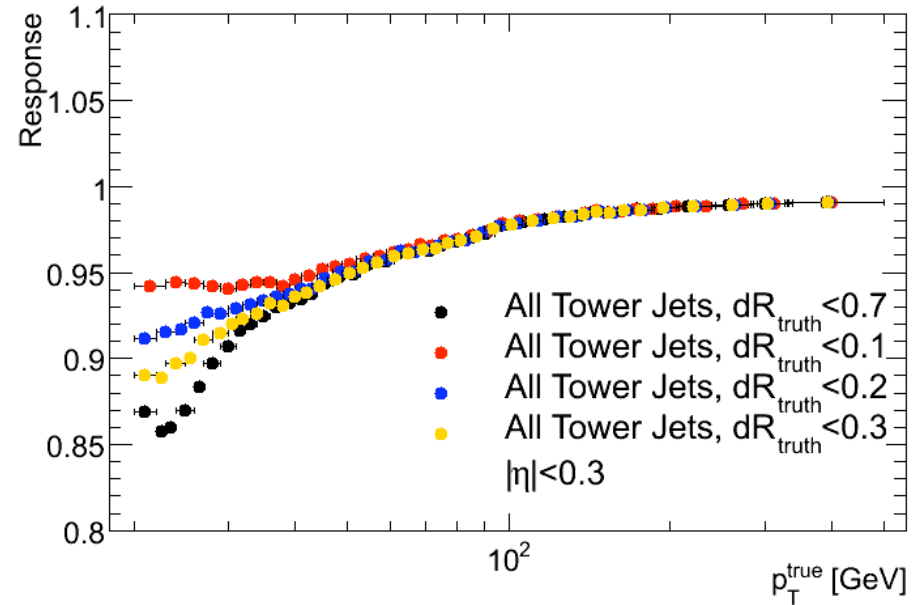
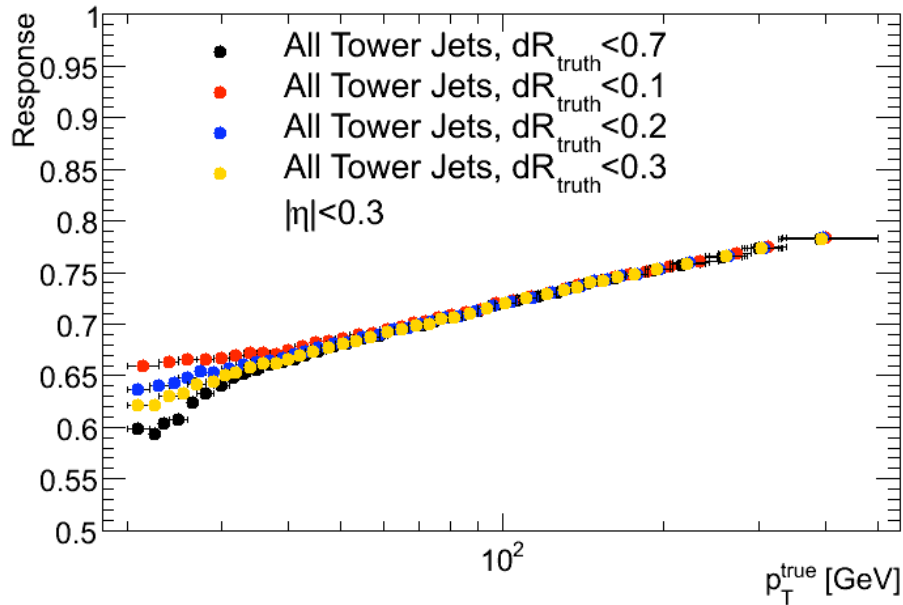
Jet Response for All Topo Jets



- Sensitivity to matching radius is larger if we have no isolation cut (>10%)
- H1 deals automatically with split jets (if you use the matching radius used in deriving the weights)
- N. I. needs dedicated correction for split jets



Jet Response for All Tower Jets



- Similar results as for Topo jets, but with the non-linear response observed for isolated jets with H1 calibration

Conclusions

- Jet matching definition affects response at a $\sim 5\%$ level, especially at low p_T : Need a standard definition
- Jet isolation definition makes the response more sensitive to matching radius and it has effects up to mid p_T (~ 100 GeV)
- For Numerical Inversion, we plan on using specific corrections for jets that are very close, for H1, when using the right matching radius the response is good
- For Cone jets, parameterizing response as a function of dR to closest jet handles only split jets (not merged). For Anti-kT this would be all that is needed

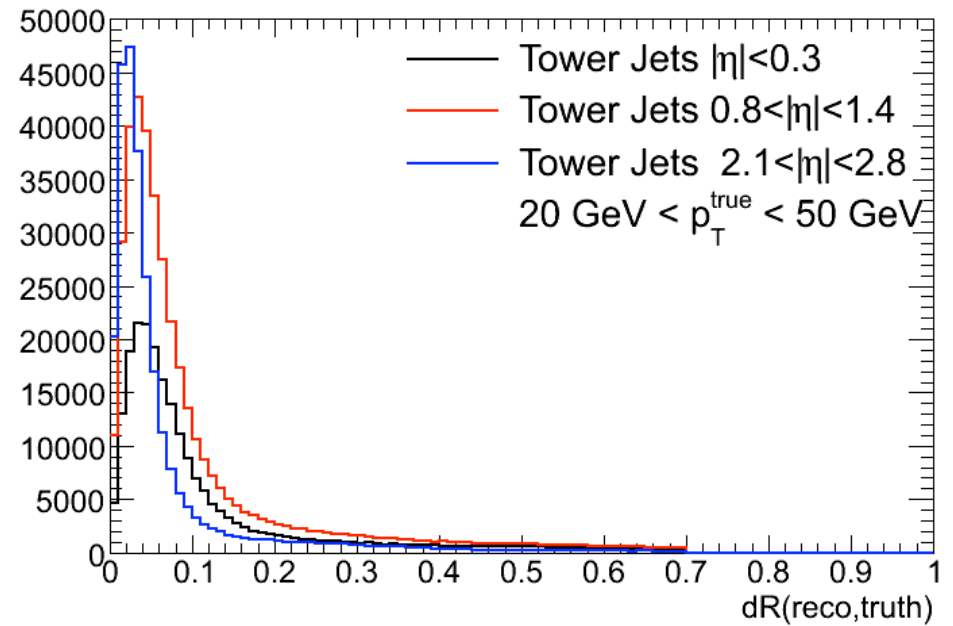
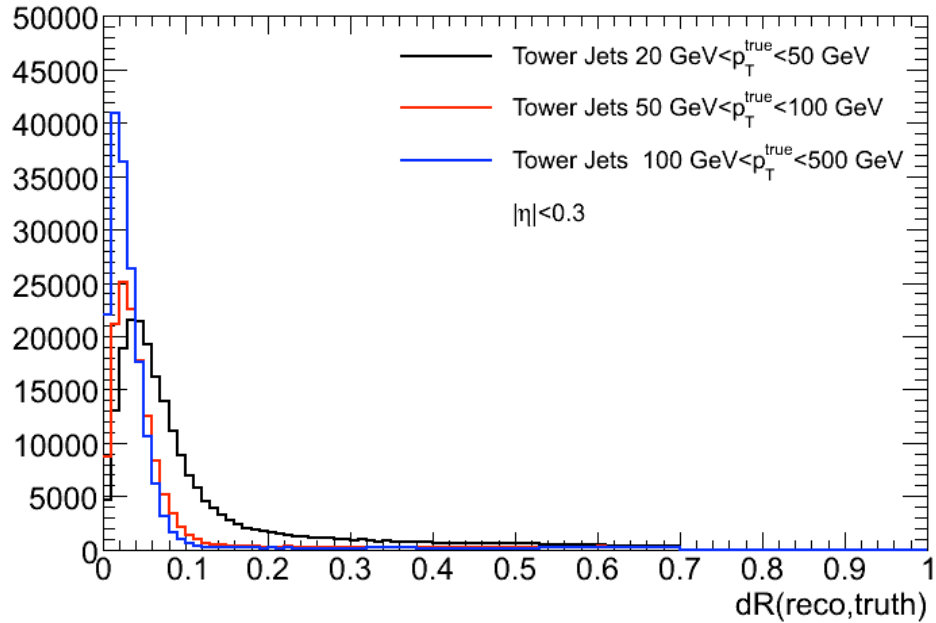


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Extra Info



Jet Matching For Tower Jets





Jet Isolation

