Measurement of transverse momentum (j_{T}) distributions of charged-particle jet fragments in pp collisions at $\sqrt{s}$ = 5.02 TeV with ALICE

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For the ALICE collaboration

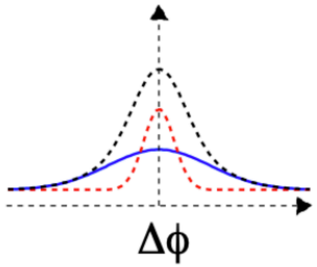
Physics motivation

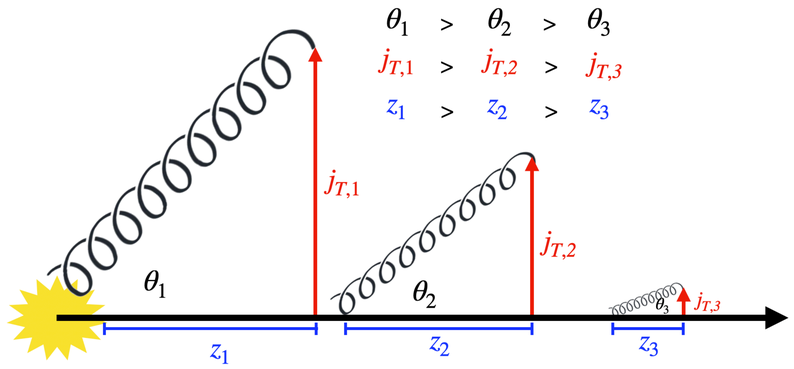
Parton showering

$Q^2 >> \lambda_{QCD}$

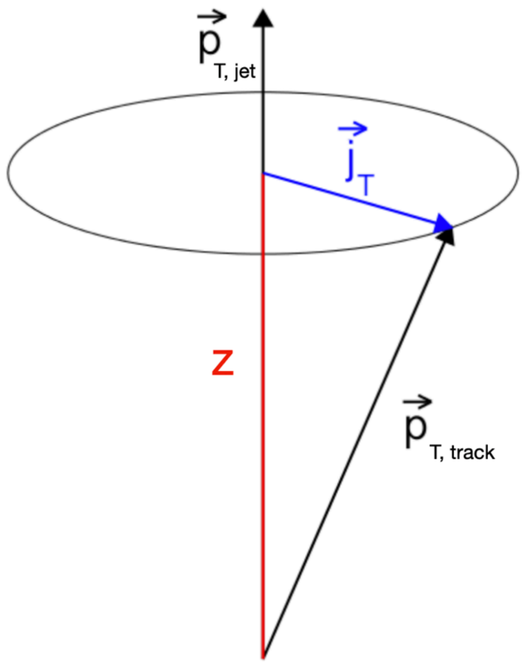
$z << 1$

Angular Ordering





j_T, z

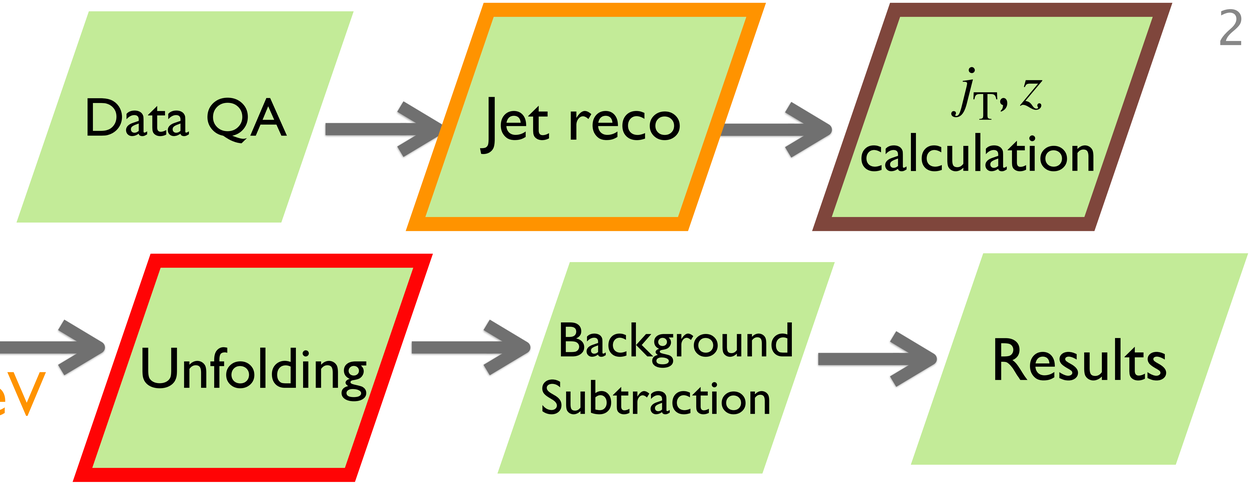


- Angular ordering in parton showering
  - Smaller angle radiation at lower virtuality
  - Naive expectation of enhancement of high j_T, z at early stage
    low j_T, z at late stage

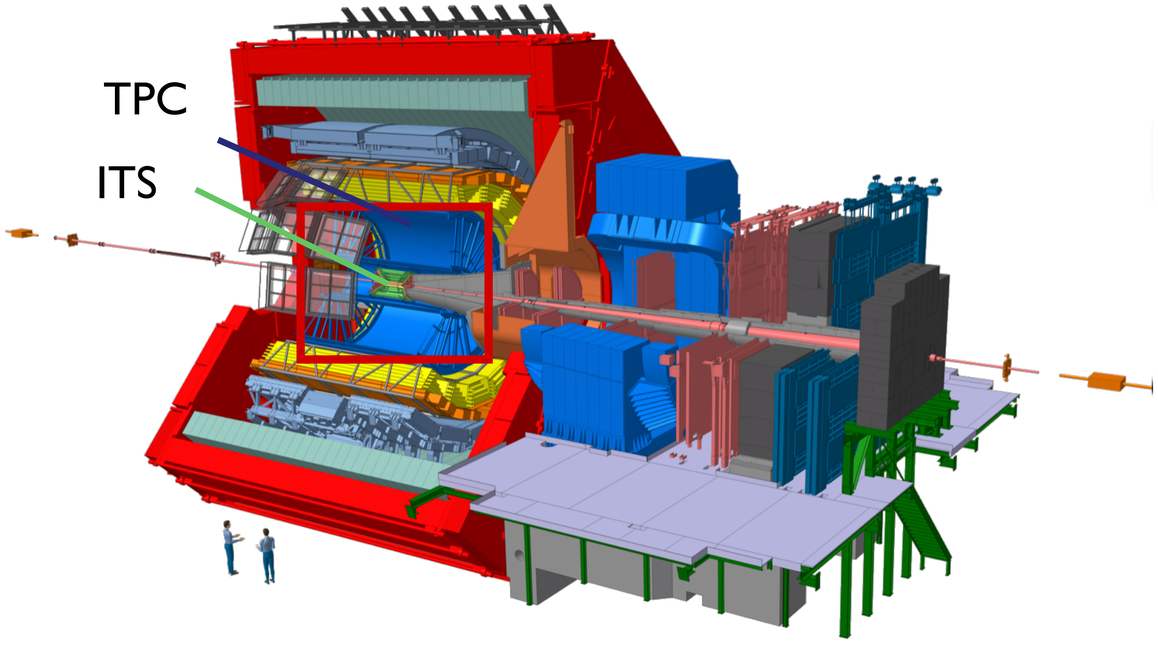
- $j_T = \dfrac{|\vec{p}_{jet} \times \vec{p}_{track}|}{|\vec{p}_{jet}|}$
- $z = \dfrac{\vec{p}_{jet} \cdot \vec{p}_{track}}{p^2_{jet}}$

Data analysis

Jet reco / j_T & z



- 2017 LHC pp collisions at $\sqrt{s}$ = 5.02 TeV



Jet reconstruction

- Charged jets in $|\eta| < 0.5$ are reconstructed with charged tracks in the ITS/TPC ($p_T > 0.15$ GeV/c and $|\eta| < 0.9$, $0 < \varphi < 2\pi$)
- Anti-k_T algorithm with R = 0.4

j_T, z measurement

- j_T and z are calculated with charged jets and constituents reconstructed in ALICE ITS/TPC ($|\eta| < 0.9$, $0 < \varphi < 2\pi$)
- Minimum p_T = 0.15 GeV/c for charged particles

Data analysis

Unfolding

Unfolding

- The 3-D unfolding method is necessary for the closure over j_T in various z bins
- Correct detector effect by unfolding

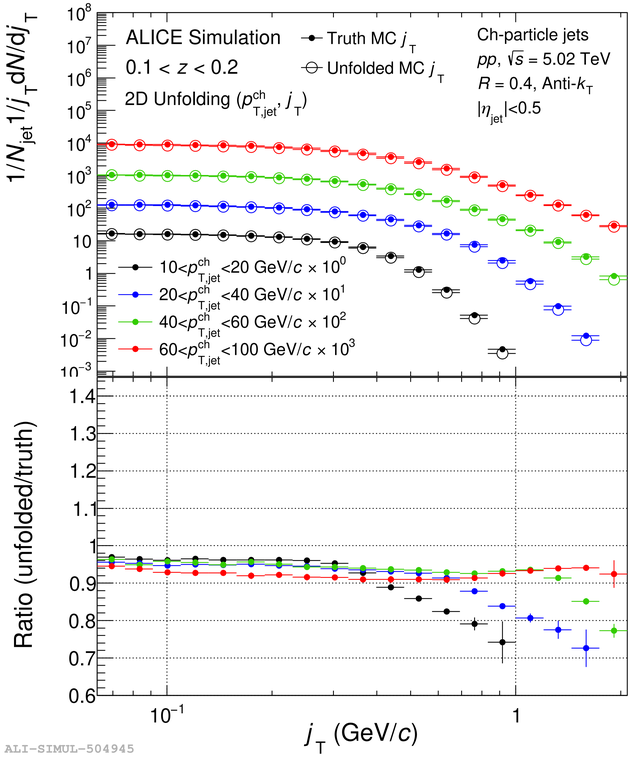
4-D response matrix

$$(j_T^{obs},\ p_{T,jet}^{obs},\ j_T^{true},\ p_{T,jet}^{true})$$

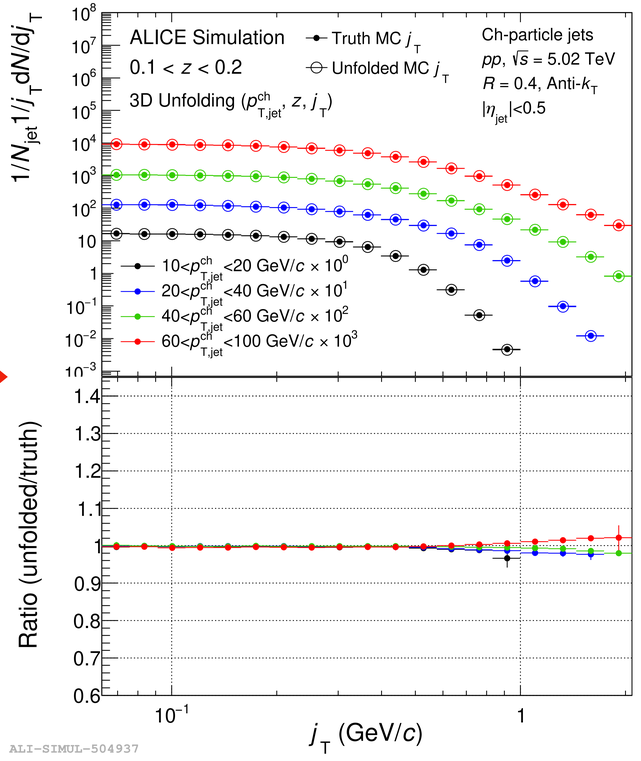
6-D response matrix

$$(j_T^{obs},\ p_{T,jet}^{obs},\ z^{obs},\ j_T^{true},\ p_{T,jet}^{true},\ z^{true})$$

2-D unfolding



3-D unfolding

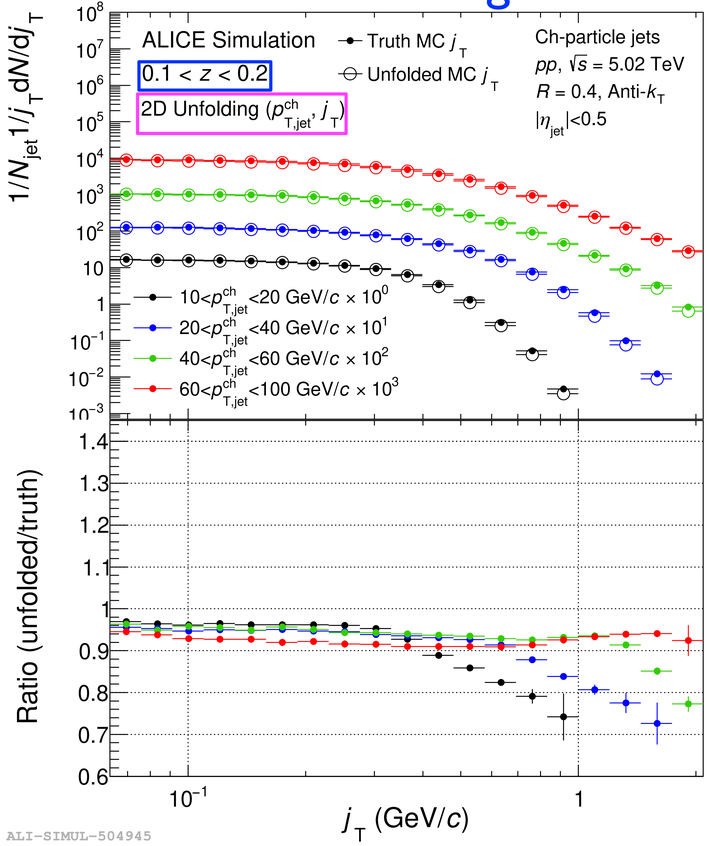


Data analysis

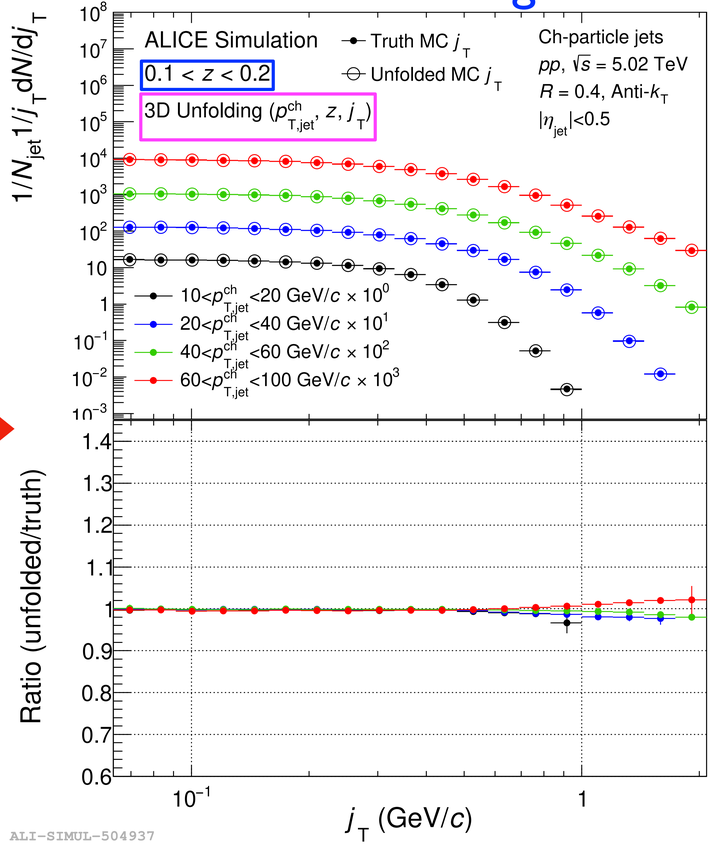
2D vs 3D Unfolding

Low z bin
$(0.1 < z < 0.2)$

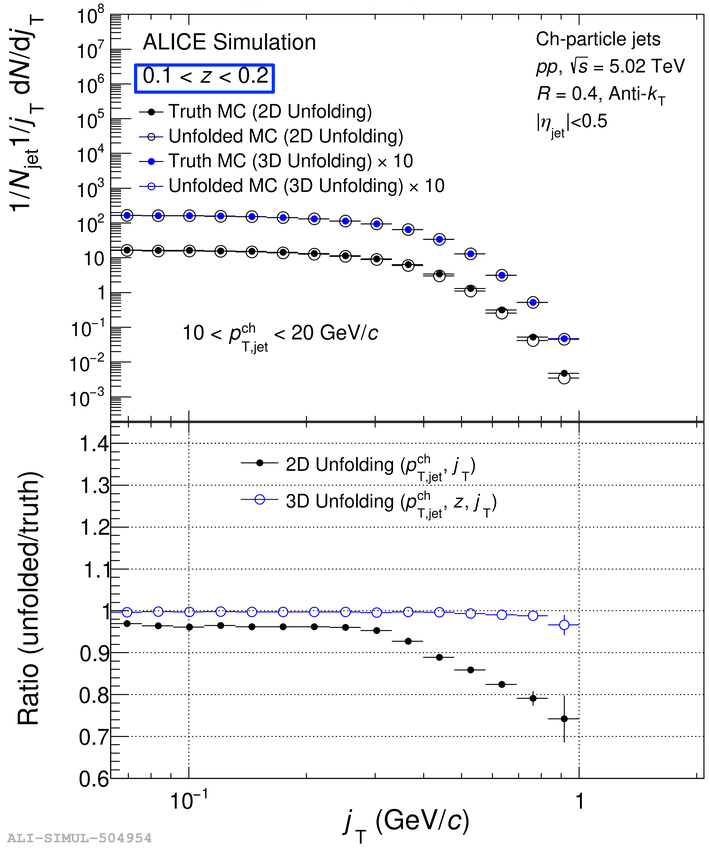
2-D unfolding



3-D unfolding



2-D vs 3-D



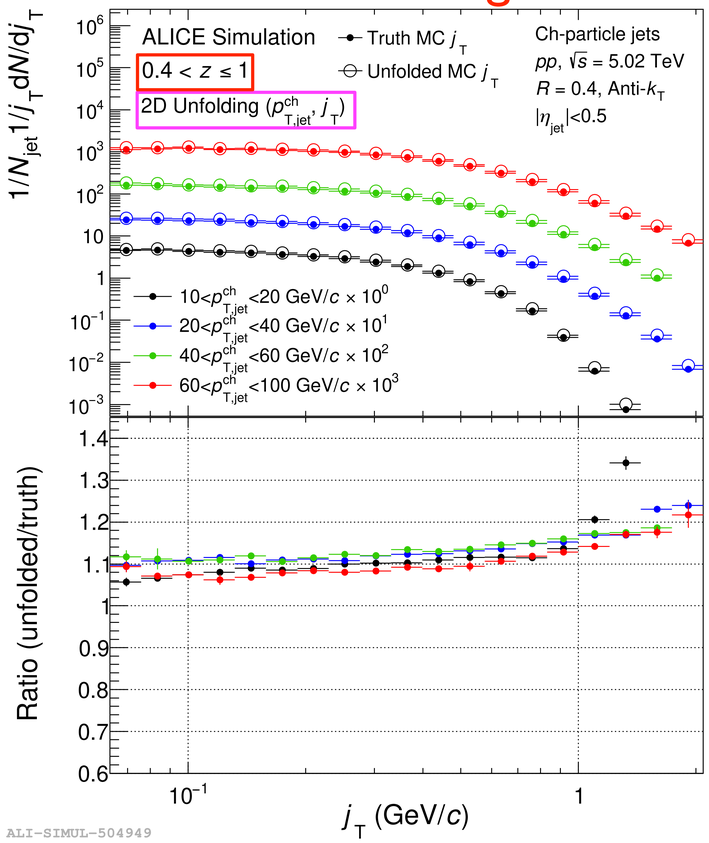
- 2-D and 3-D unfolding closure test results are compared to validate the 3-D unfolding

Data analysis

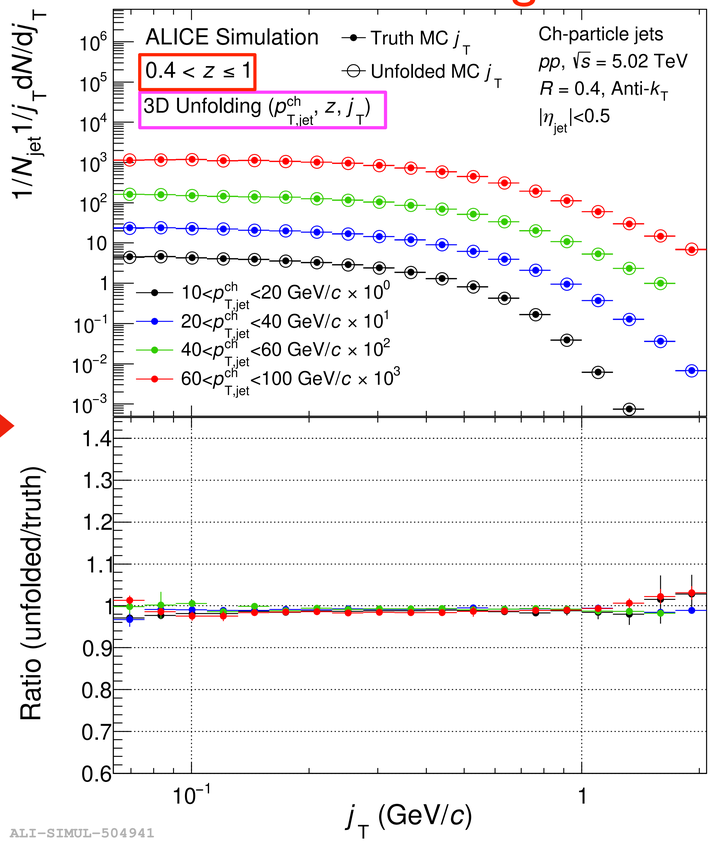
2D vs 3D Unfolding

high z bin
$(0.4 < z \leq 1)$

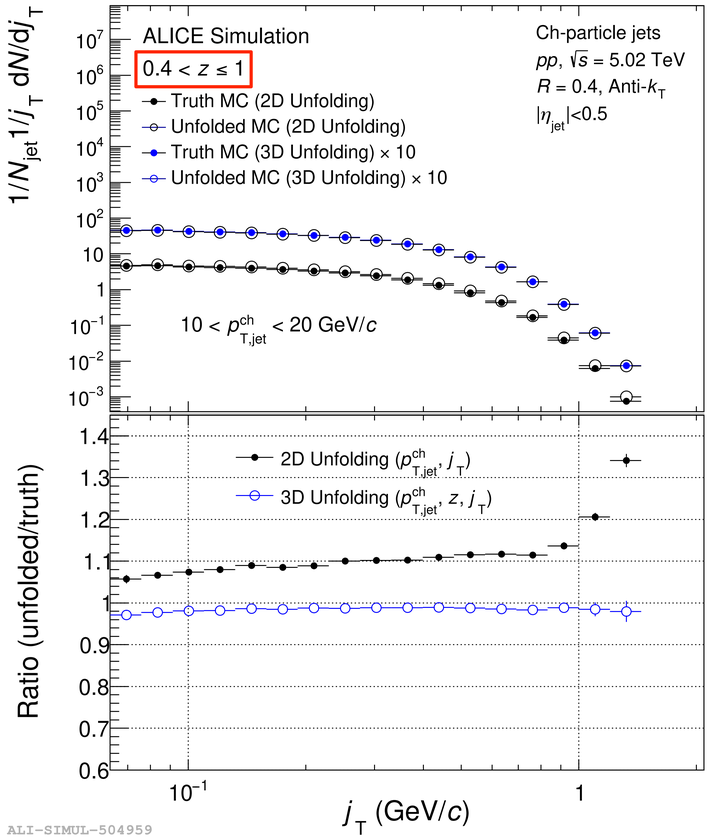
2-D unfolding



3-D unfolding

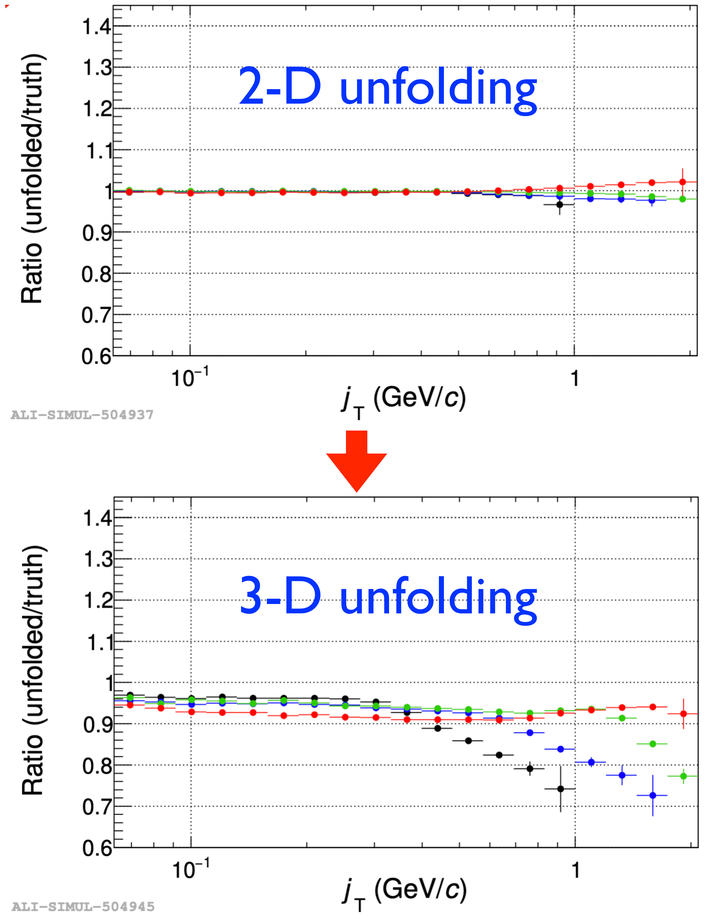


2-D vs 3-D



- 2-D and 3-D unfolding closure test results are compared to validate the 3-D unfolding

Summary & Outlook



- To study j_T distributions in various z bins, new analysis framework has been built and validation of the 3-D unfolding method has been performed
- Closure test results with 2-D (previous analysis) and 3-D unfolding methods are compared
- With 2-D unfolding method, smearing effect caused by z is not ignorable
  -> 3-D unfolding seemed to resolve the issue
- With 3-D unfolding method, analysis with ALICE data will be performed