

PDF Reweighting in the search for Z-prime

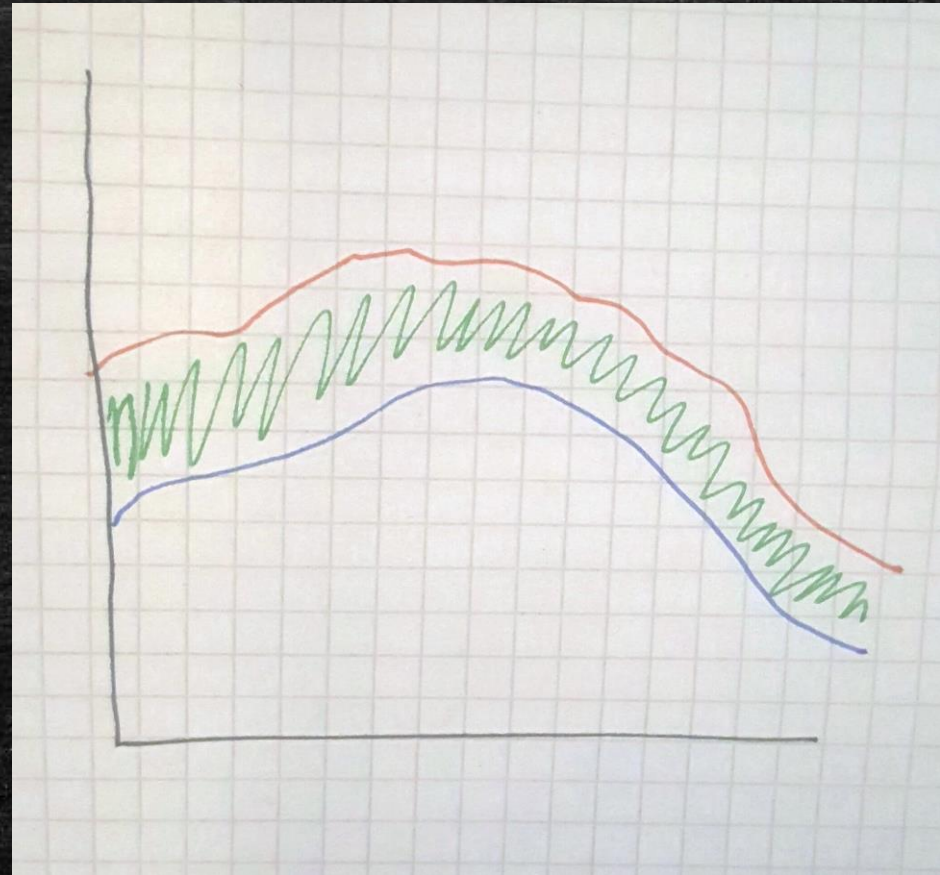
Annette

If you remember...

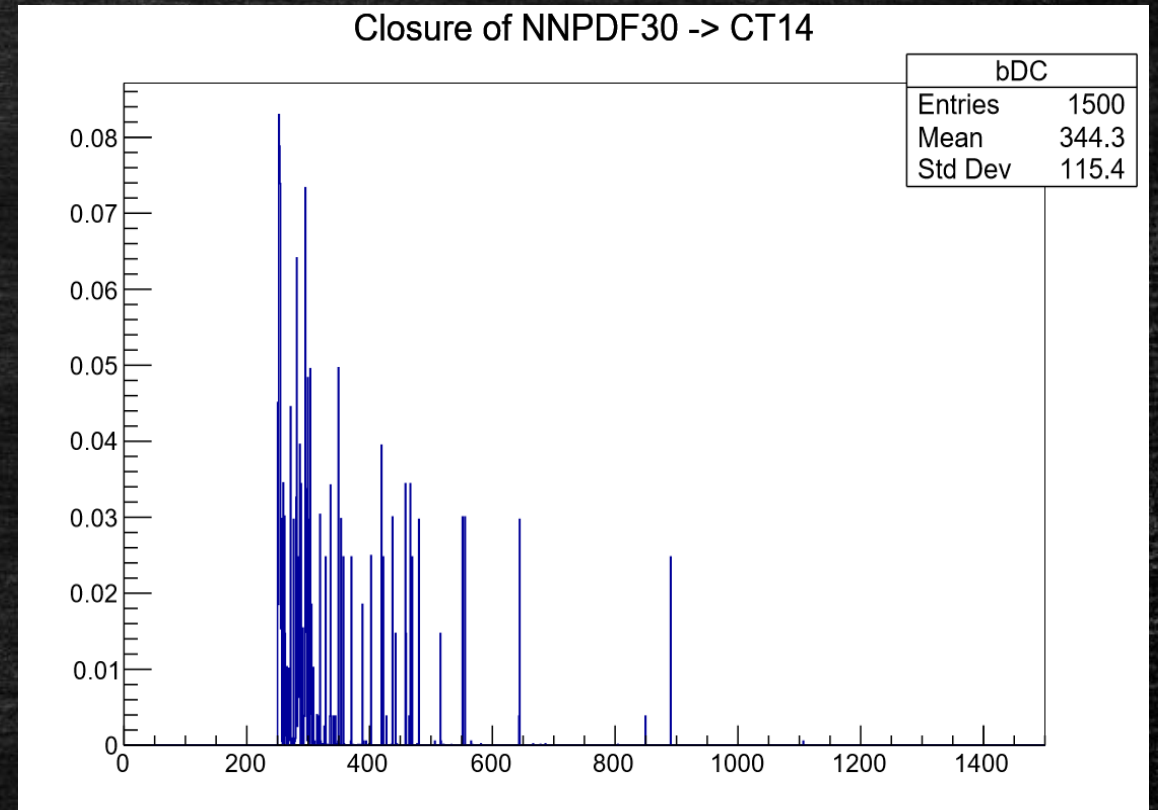
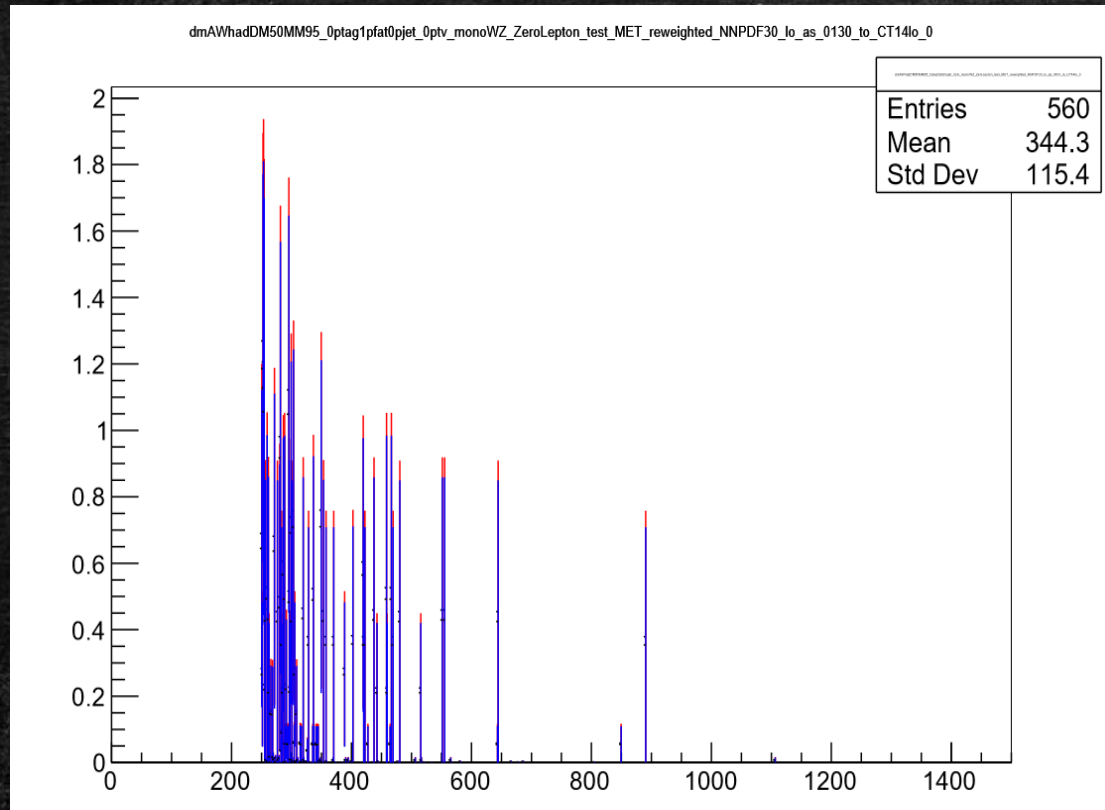
- PDF (parton distribution functions) are the probabilities of finding a quark or gluon with a certain momentum fraction of the proton's total momentum.
- Reweighting is converting from one PDF to another PDF:
 - 1) You run events to generate PDF set A (the base PDF)
 - 2) Multiply PDF set B by a weight calculated from PDF set A in your reweighting algorithm
 - 3) Produces "reweighted" PDF set B
 - 4) The nice thing is that you don't have to generate events twice, once to generate PDF set A and once to generate PDF set B; you only ran events once to produce PDF set A

Closure Tests

- Base PDF is blue
 - Reweighted PDF is Red
 - Amount of closure is green
-
- PDF sets:
 - NNPDF30
 - CT14
 - MMHT2014



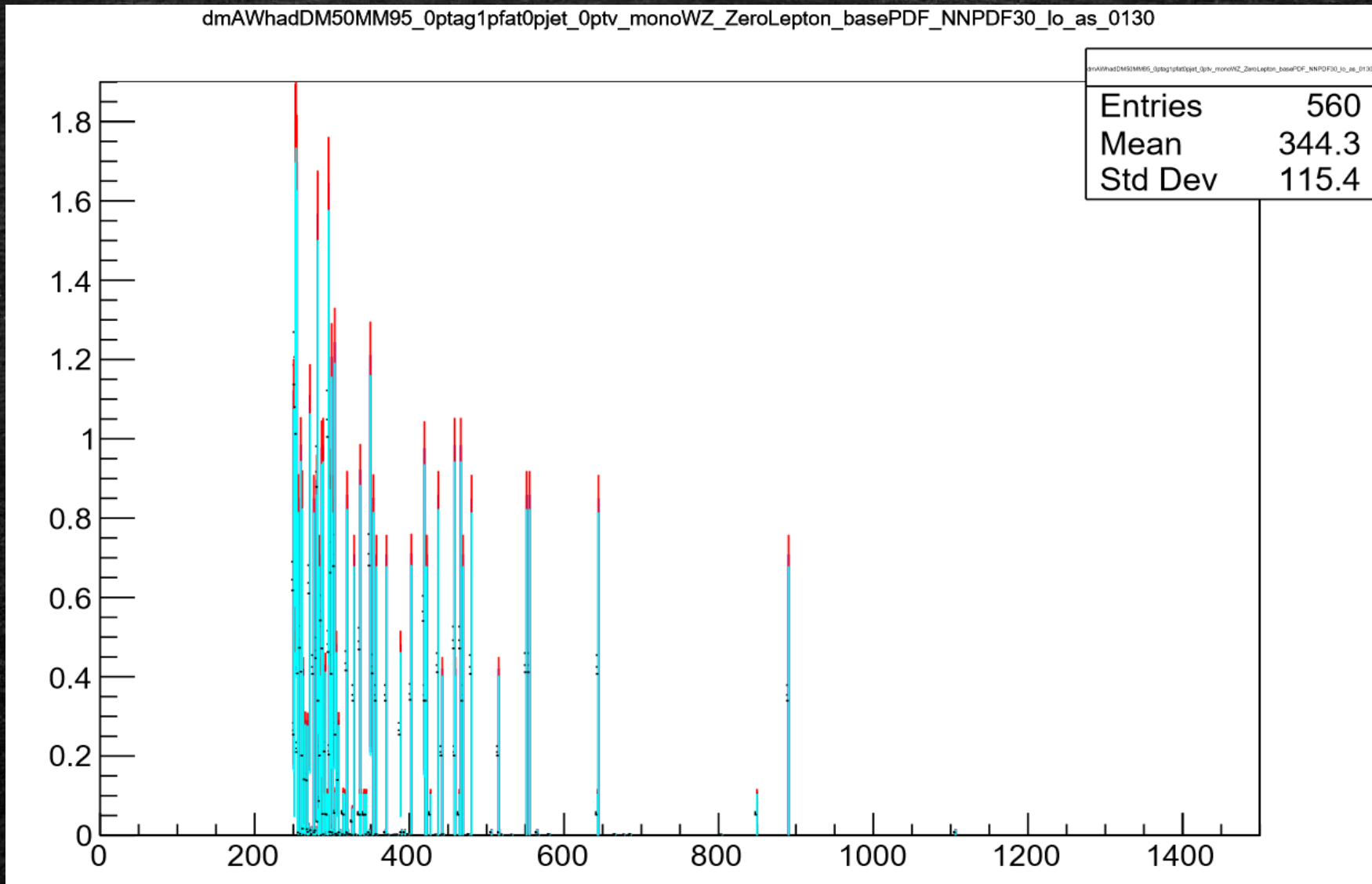
Reweighting from NNPDF30 to CT14lo



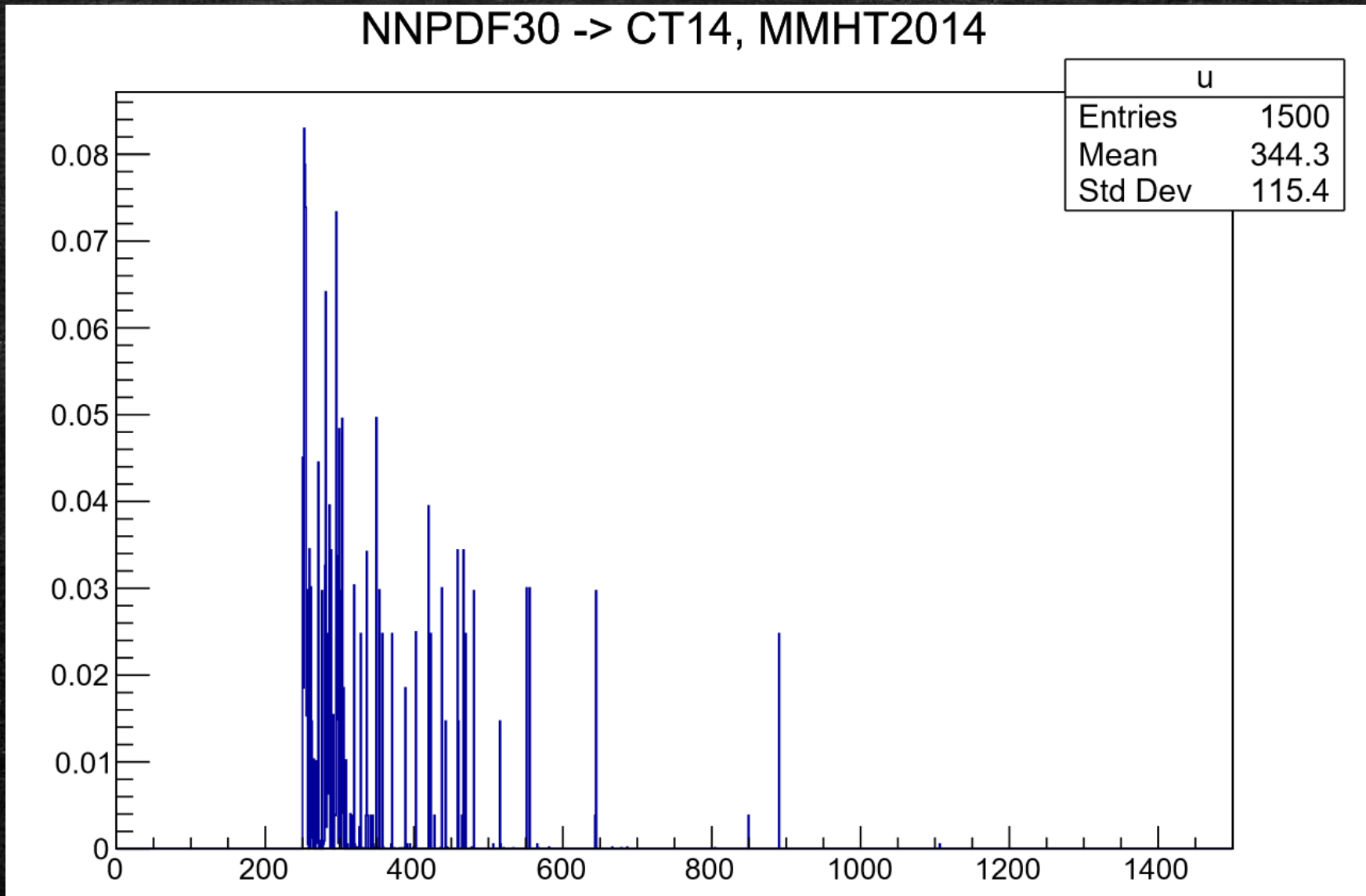
PDF Uncertainties

- Find the variation in each bin, the bin difference, which is the uncertainty in pdf choice
- Find the uncertainty of each variation due to bin width choice, the error bars, which checks for bias
- We expect the bin width uncertainty to be smaller than the pdf choice uncertainty
- Combined these are the systematic PDF uncertainties which play a small role in the overall cross section uncertainties

Plot of NNPDF30, CT14, MMHT2014



Plot of maximum bin difference



Significance

We want this cross-sectional uncertainty because when we generate signal events for the dark matter candidate Z' using Monte Carlo simulation, we need to be able to say how much we believe these events will happen in actuality, when we collect data.

Next Steps

- Make plots feel pretty
- Finish pdf uncertainties calculations by computing the bin width uncertainty
- Apply code to CxAODs generated by Jimmy

-Thanks to Jimmy and Andy