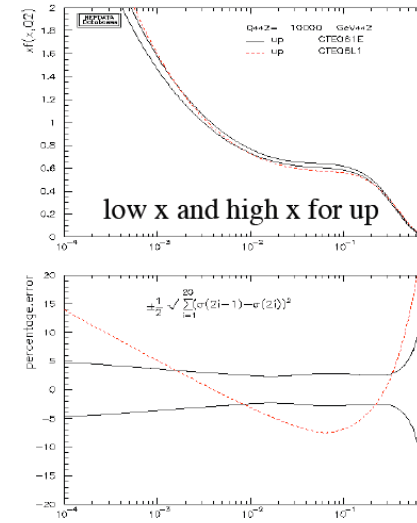

CTEQ plans for modified LO pdf's

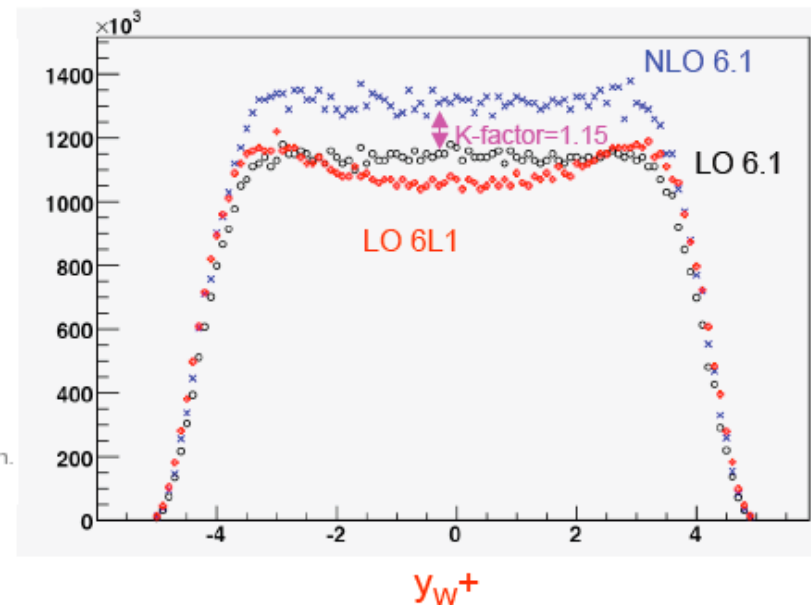
J. Huston

PDF's for Monte Carlos

- Experimenters tend to use LO Monte Carlos for everything, including for processes for which NLO calculations are available
 - ◆ in MC@NLO (full event)
 - ◆ in MCFM (parton level)
- The Monte Carlo events are generated with LO pdf's (CTEQ5L at the Tevatron, CTEQ6L at the LHC)
- ...but the errors are estimated using the NLO pdf error sets
 - ◆ almost always CTEQ6.1 error sets
- LO pdf's can create cross sections/acceptances that differ in both shape and normalization from NLO due to influence of HERA data
 - ◆ and are outside NLO error bands
- (My) Previous suggestion was to use NLO pdf's
- Now I would suggest modified LO pdf's



W^+ rapidity distribution at LHC



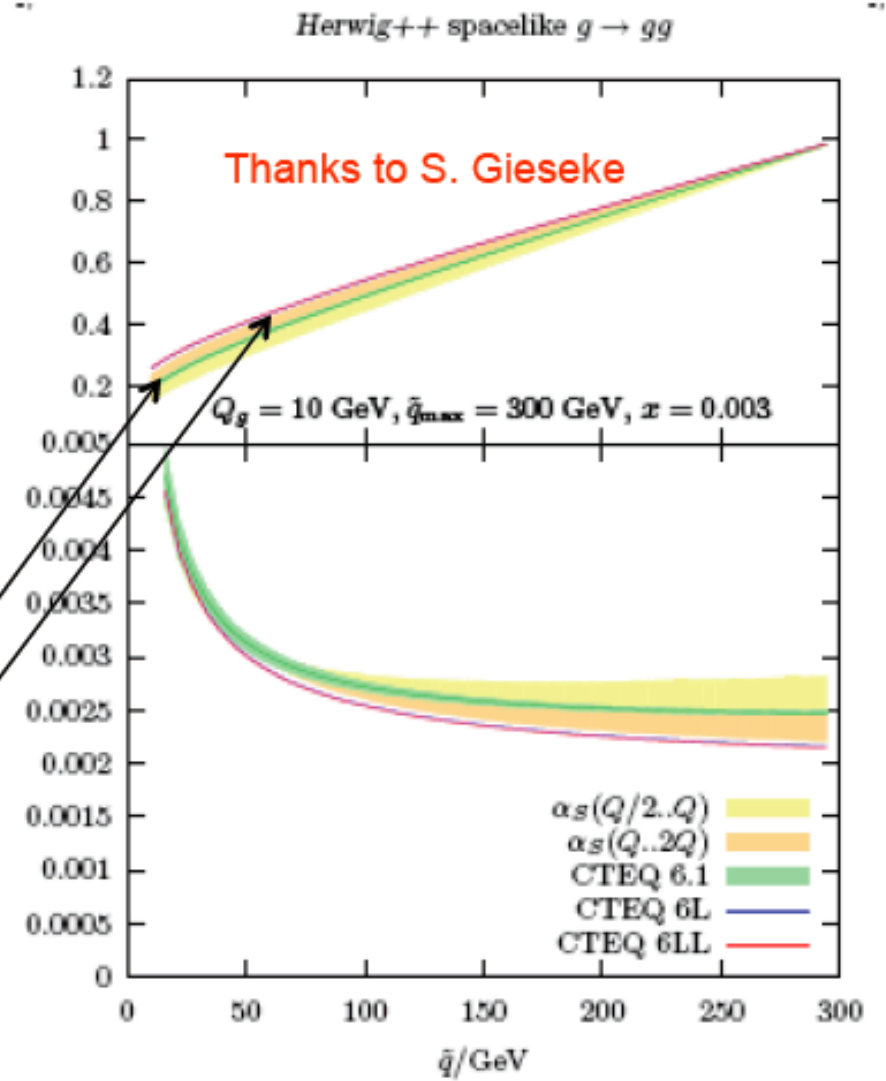
CTEQ approach (no public results yet)

● Modified LO pdf

- ◆ relax momentum sum rule
- ◆ fit with LO matrix elements (but using 2-loop α_s) to standard global pdf data set + NLO LHC predictions for some benchmark processes that explore both low x and high x physics, such as
 - ▲ W,Z rapidity distributions (first slide)
 - ▲ bB
 - ▲ Drell-Yan
 - ▲ gg→Higgs (rapidity distribution)
- ◆ result will be a central pdf at (modified) LO + a generation of corresponding error pdf's at LO using error machinery
 - ▲ similar Sudakov form factors so that pdf re-weighting can be done with minimal (or at least smaller) error
- ◆ with similar UE as generated with current LO pdf's
- ◆ a few more tricks but if I told you now, I would have to kill you

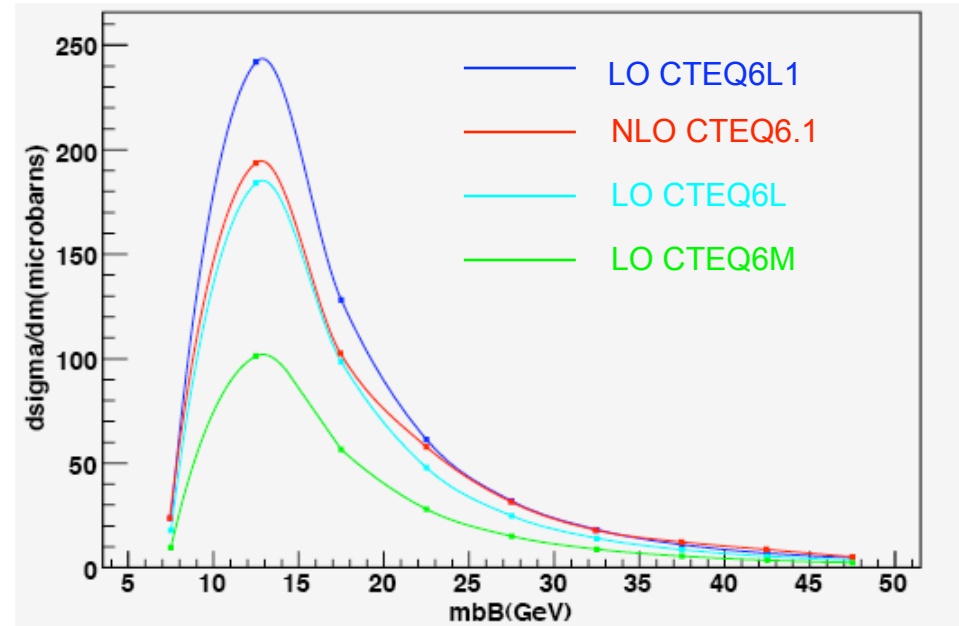
Sudakov form factors and pdf's

- Sudakov form factors form the basis for parton showers
- Typically at both the Tevatron and LHC, MC events are generated with a LO pdf and then pdf uncertainty is evaluated by performing a pdf re-weighting using the NLO error pdf's
- Works if Sudakov is the same for the LO pdf and the NLO error pdf's
- NLO pdf error band very small
- LO Sudakov outside this error band, so ISR not correct for re-weighted events generated using LO pdf
- Need to generate MC events and to evaluate pdf's with same order



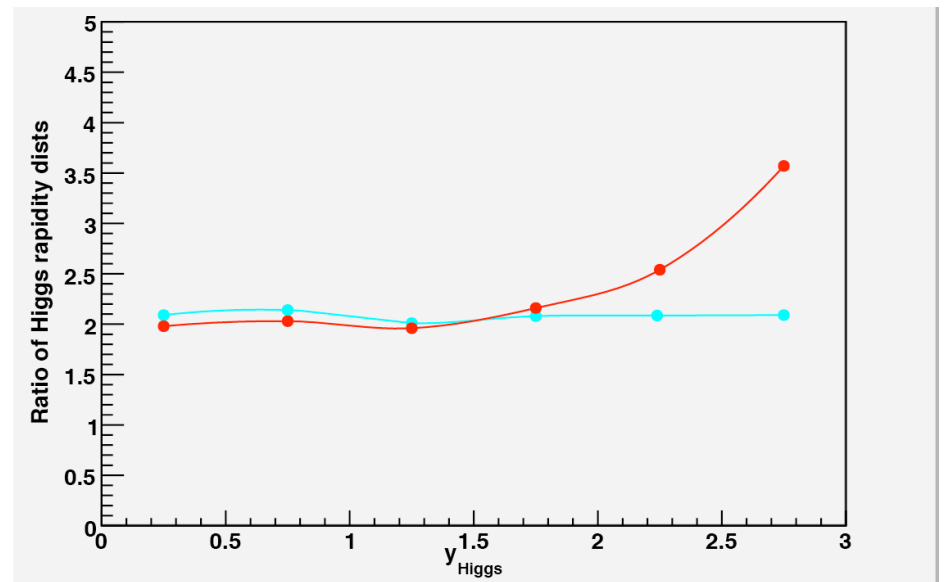
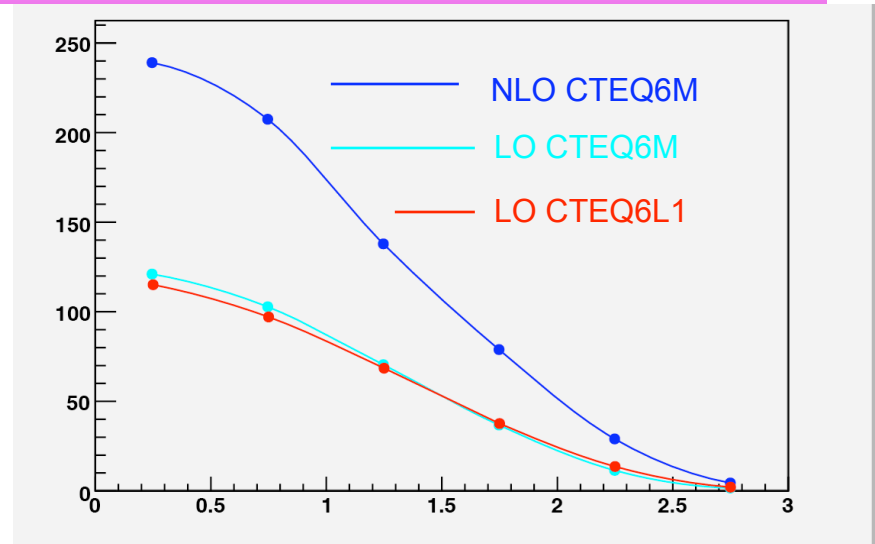
m_{bB}

- Look at bB masses at low end of range for access to behavior of low x gluon
- LO with CTEQ6L1 overshoots NLO with CTEQ6.1
- LO with CTEQ6M dramatically undershoots



gg->Higgs

- Look at the rapidity distributions for a 500 GeV Higgs to access the high x gluon
- NLO corrections large, but NLO/LO is constant as a function of rapidity if CTEQ6M used for both LO and NLO



When we will see CTEQ modified LO pdf's

- Aiming for DIS08