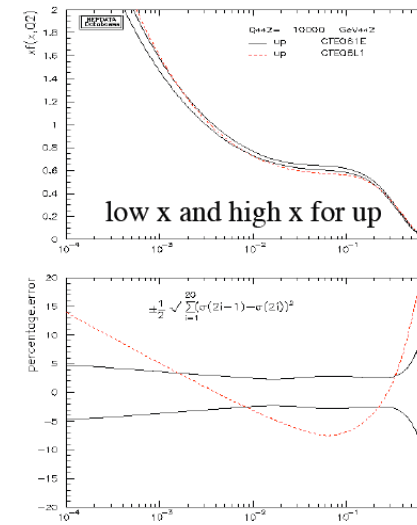
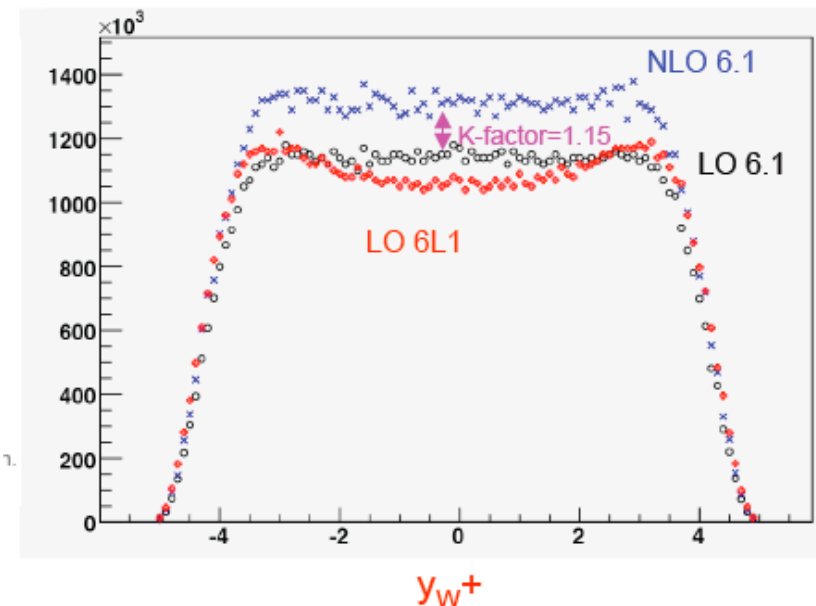


PDF's for Monte Carlos

- Experimenters tend to use LO Monte Carlos for everything, including for processes for which NLO information is available
 - ◆ see slide 2
- And what's worse, when they do use NLO tools, they reference the MC@NLO webpage rather than the original paper
- LO pdf's can create cross sections/acceptances that differ in both shape and normalization from NLO due to influence of HERA data
- Can we modify LO pdf's for Monte Carlos to reduce differences?



W^+ rapidity distribution at LHC



Two approaches

● Modified LO pdf

- ◆ relax momentum sum rule
- ◆ fit LO pdf's to some benchmark processes that explore both low x and high x physics
 - ▲ W,Z production
 - ▲ bb
 - ▲ Low-mass Drell-Yan
 - ▲ VBF Higgs
 - ▲ gg->Higgs
- ◆ how much does MSR need to be relaxed? Does this cause any problems in the Monte Carlos? Does this cause any interesting reactions from theorists in the audience?

● Split pdf's

- ◆ NLO pdf's for matrix elements in Monte Carlo
- ◆ LO pdf's for UE + parton shower
- ◆ problems with matching, parton shower approaching both scales +

- J. Huston, C. Gwenlan, A. Shertsnev, J. Pumplin, T. Sjostrand, P. Skands, P. Richardson, S. Mrenna)

First approach

- Modified LO pdf

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- ▲ W,Z production
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- ▲ $gg \rightarrow$ Higgs

- ◆ how much does MSR need to be relaxed? Does this cause any problems in the Monte Carlos? Does this cause any interesting reactions from theorists in the audience?

hep-ph/0706.2131 C. Gwenlan, A. Shertsnev, R. Thorne

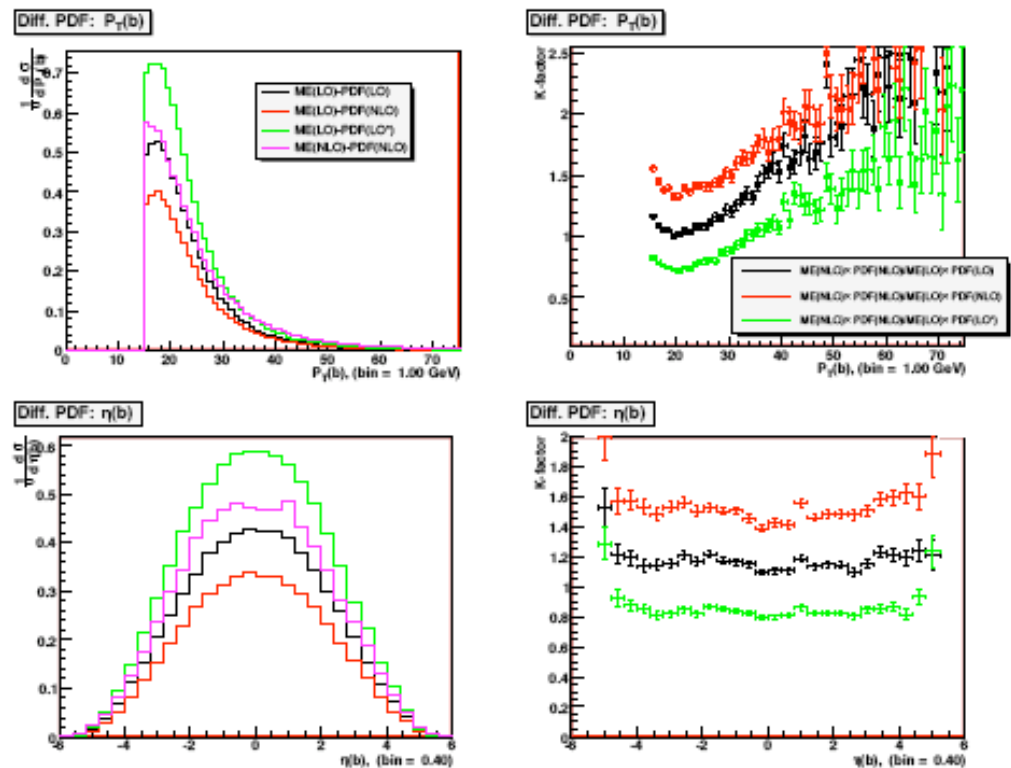
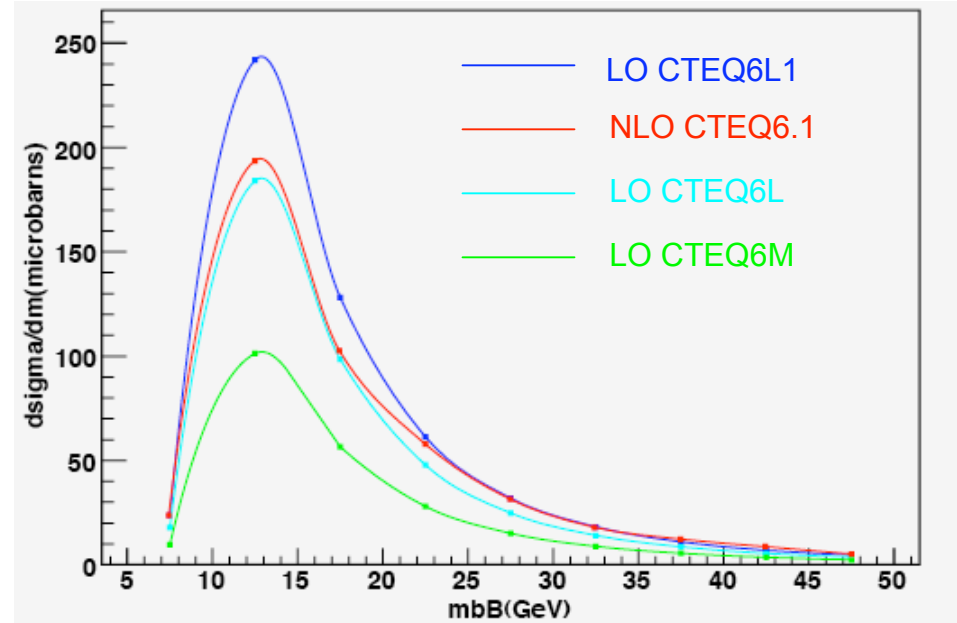


Figure 3: The b cross section at the LHC.

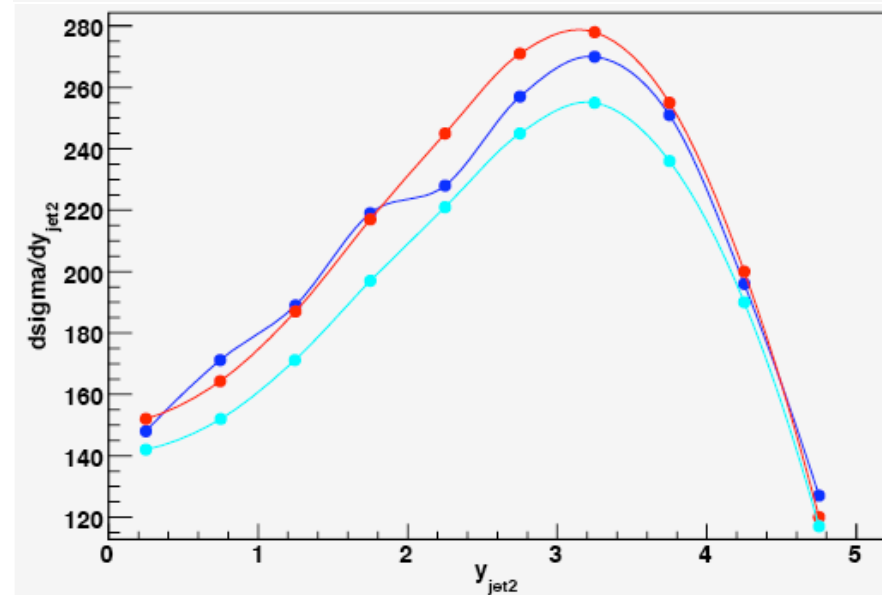
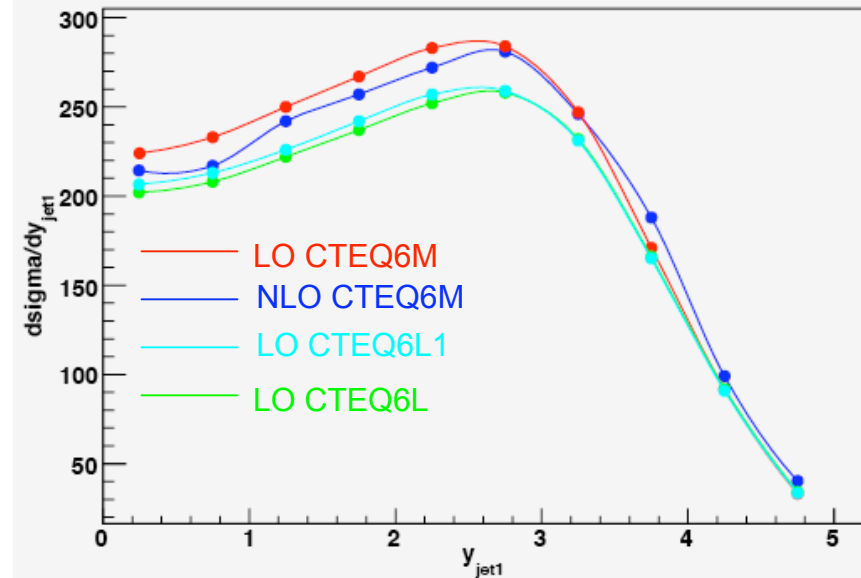
m_bB

- 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
- Use LO CTEQ6L1 cross sections, LO CTEQ6L?



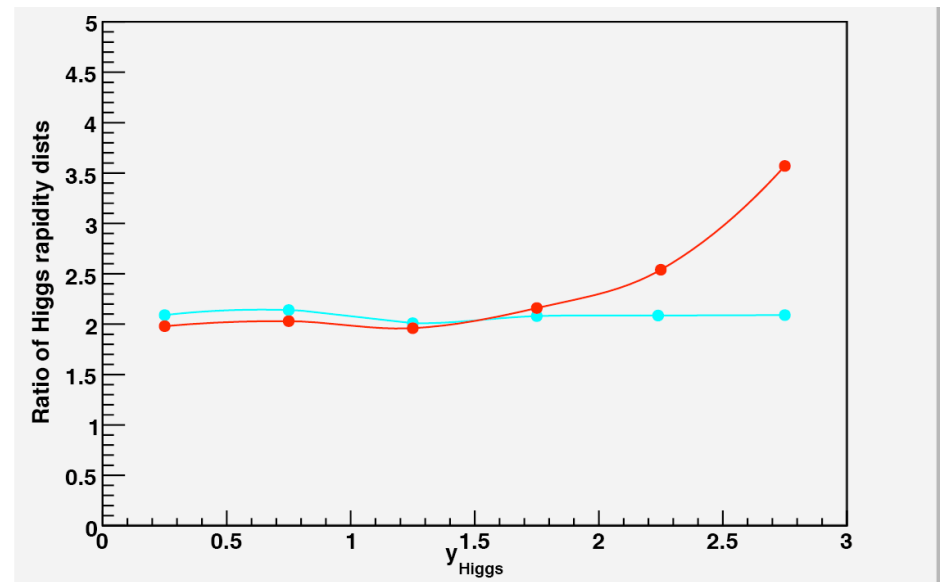
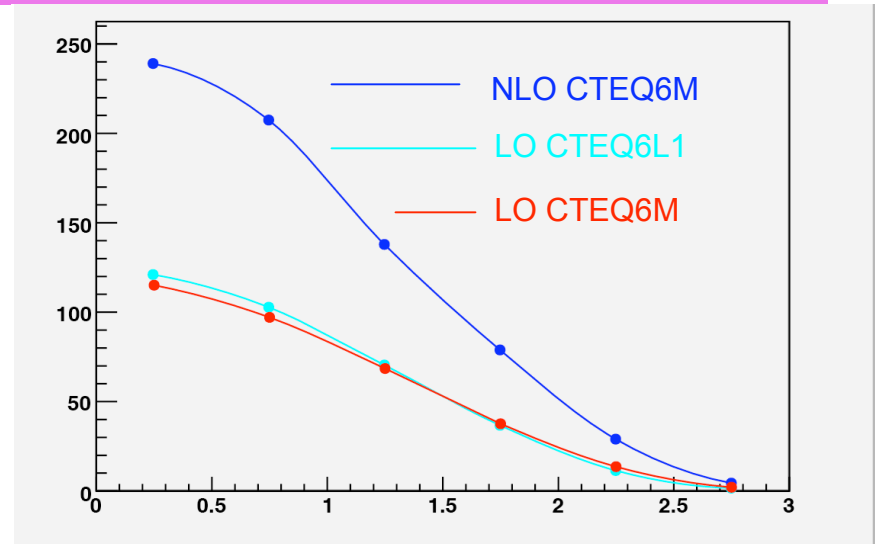
VBF Higgs

- Look at rapidity distribution of two tagging jets
- I thought that there might be some differences in shape for high jet rapidity (because in differences of high x quark distributions) but not so much



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



Now what?

- I have some useful (NLO) cross section predictions for the LHC
 - ◆ W rapidity (high/low x quarks)
 - ◆ $b\bar{b}$ mass (low x gluon)
 - ◆ Higgs rapidity (high x gluon)
- Input these as data to CTEQ fitting program
 - ◆ we have to add LO matrix elements for these processes
- Fit the data (given large emphasis) with LO pdf's, but 2-loop α_s , with and without MSR relaxation
- What if we just created LO pdf's with ab initio LO low x behaviors but NLO behavior everywhere else...and see what happens?