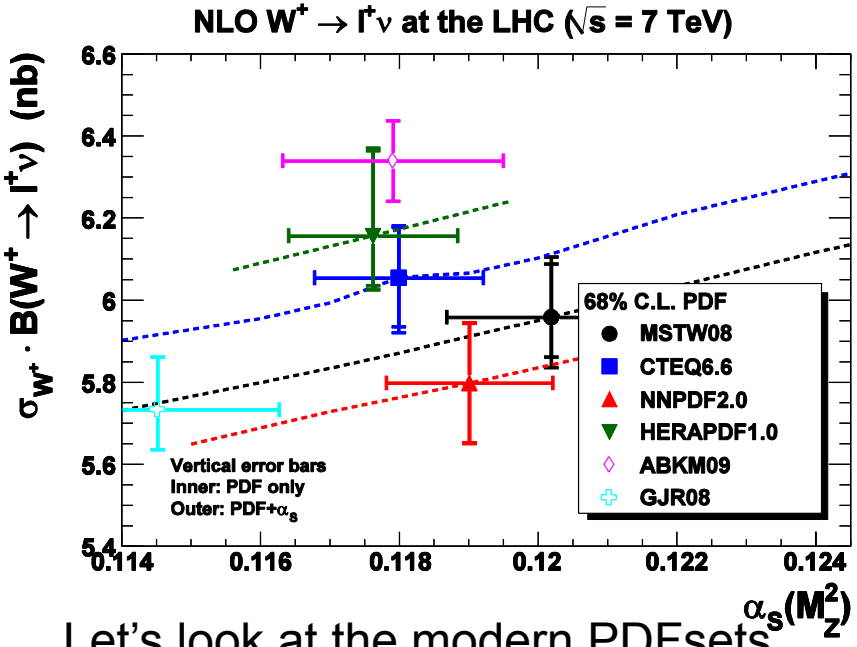
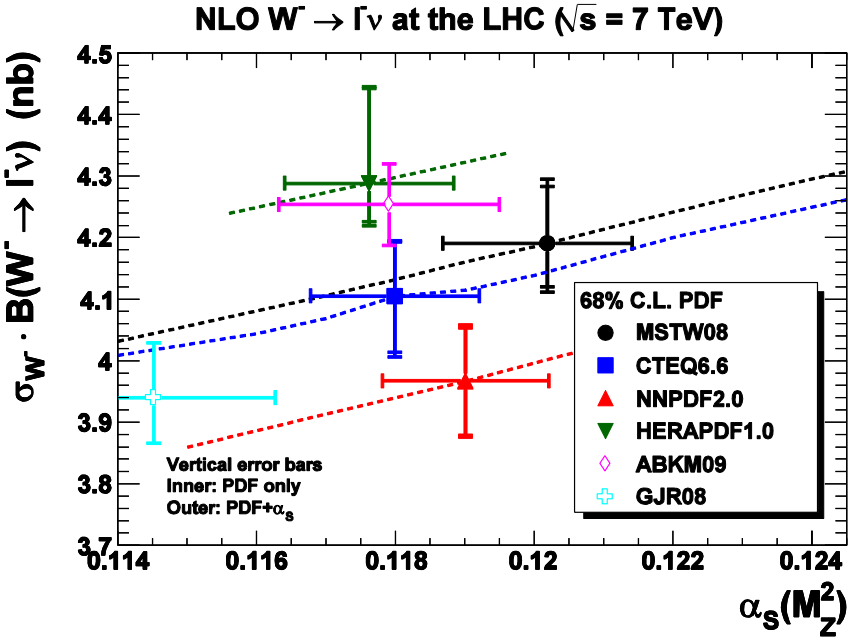
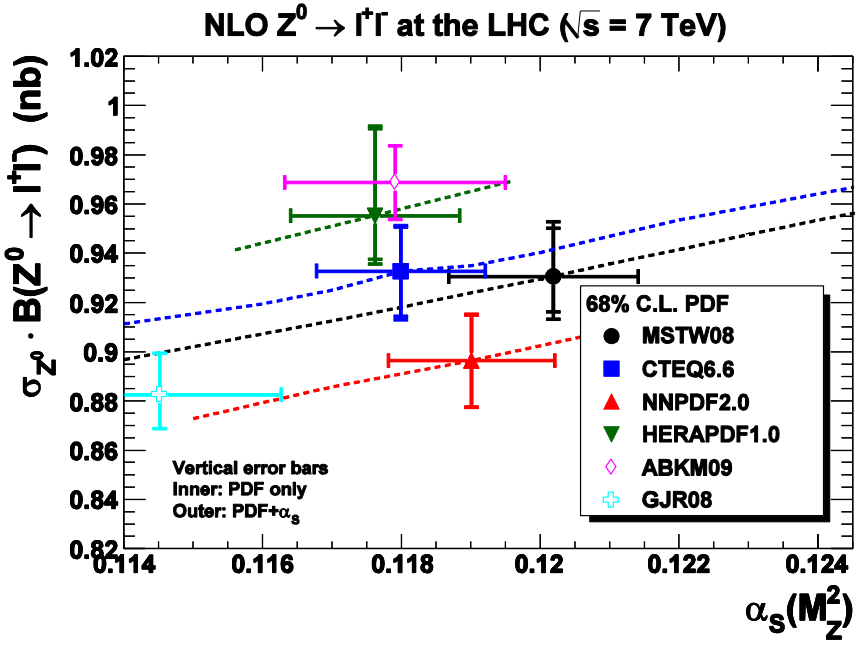
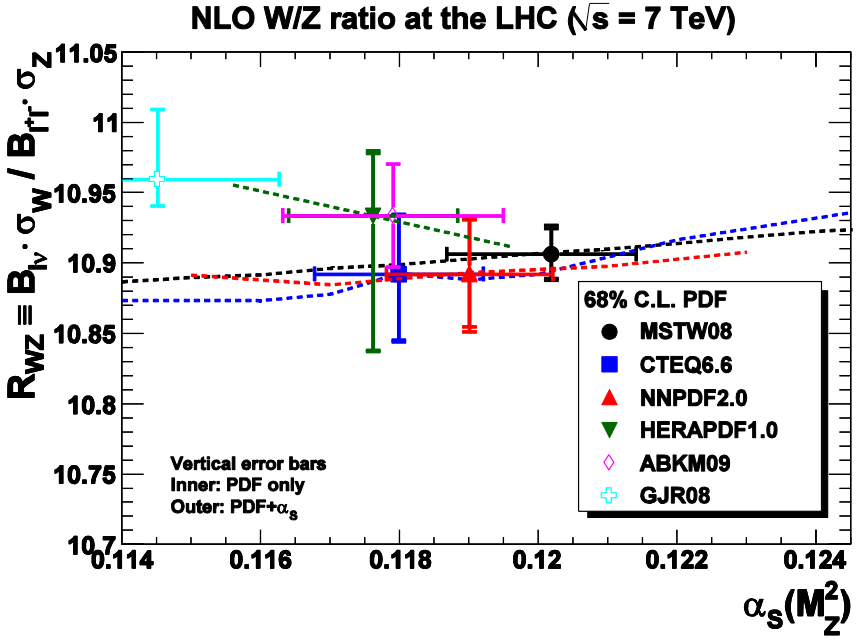


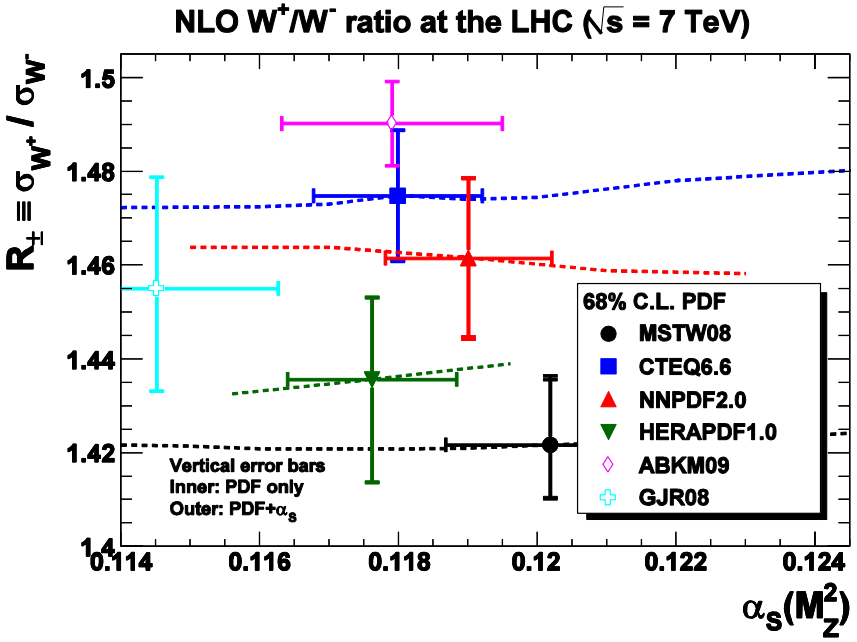


Let's look at the modern PDFsets
MSTW08
CTEQ66
HERAPDF1.0
NNPDF2.0
ABKM09
GJR08
Overall disagreement ~8% in W, Z cross-sections
The PDF4LHC recommendation is to take the envelope of the NNPDF, MSTW, CTEQ predictions --even this may not be enough!

Plots from G.Watt -MSTW







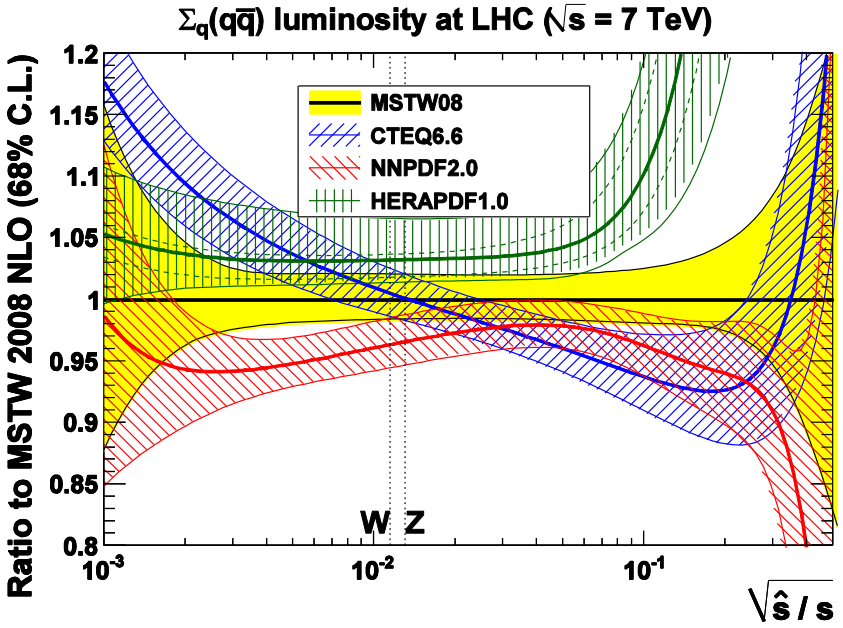
Plots from G.Watt -MSTW

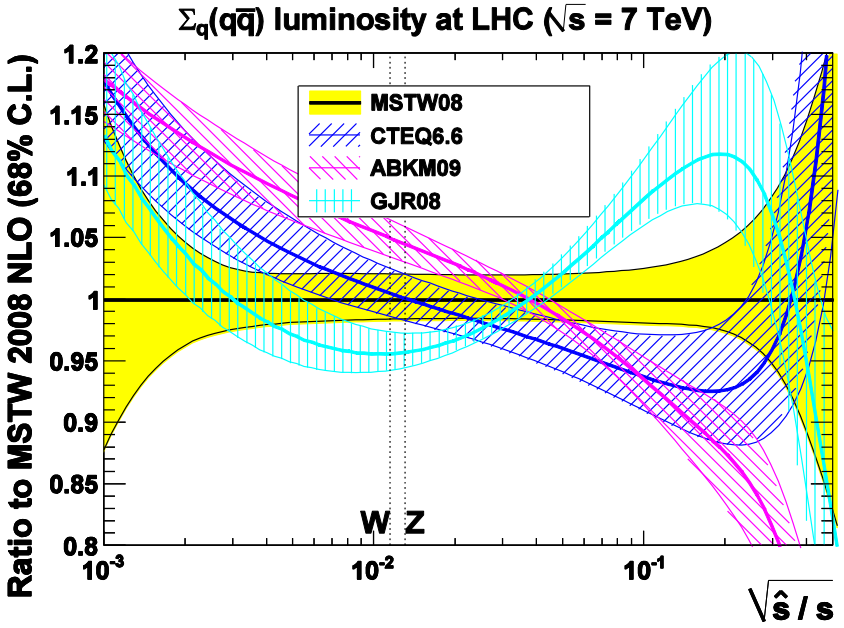
W/Z ratio is much better

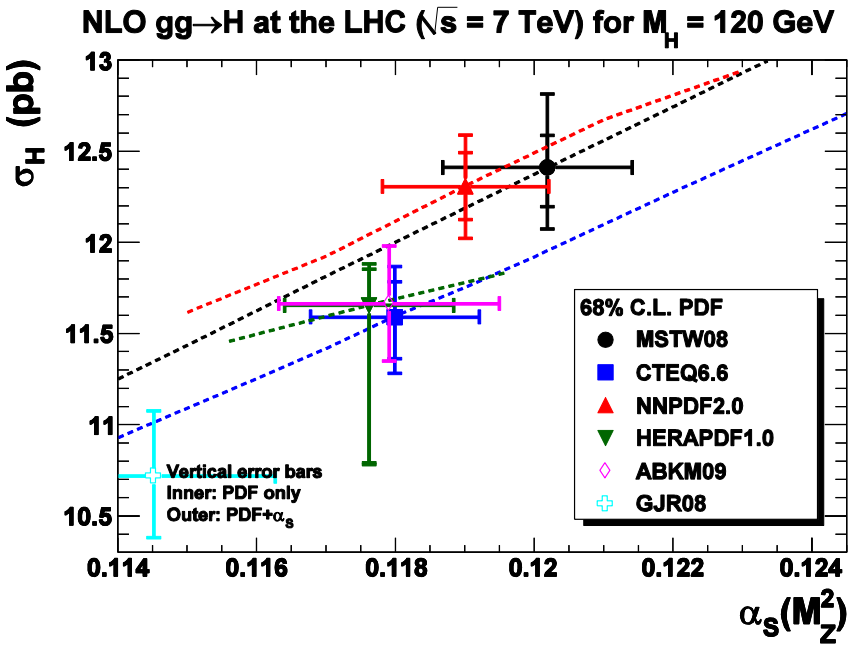
W+/W- ratio is worse—

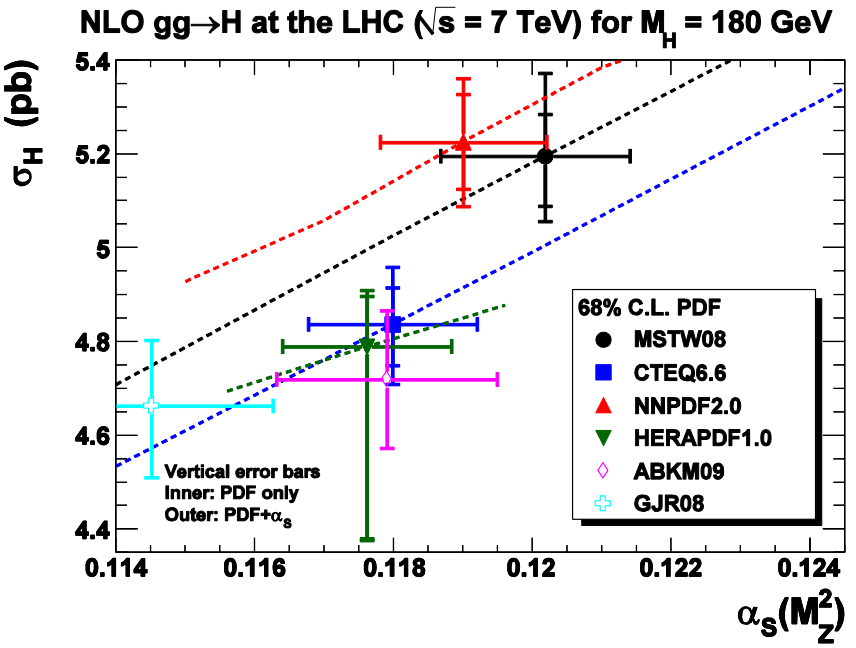
Disagreement in u/d quark shapes

The PDF4LHC group has been comparing PDFs at the level of parton-parton lumiosities





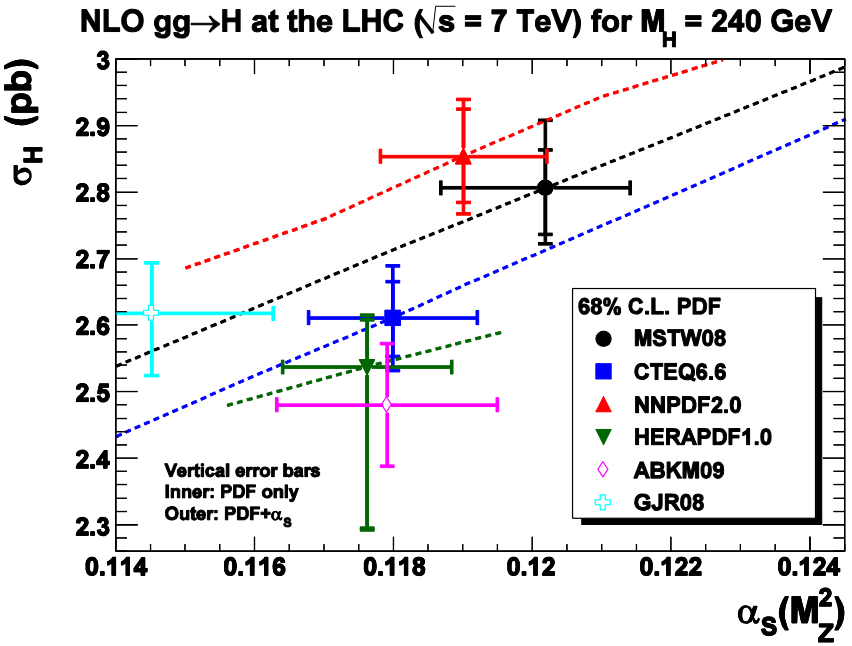


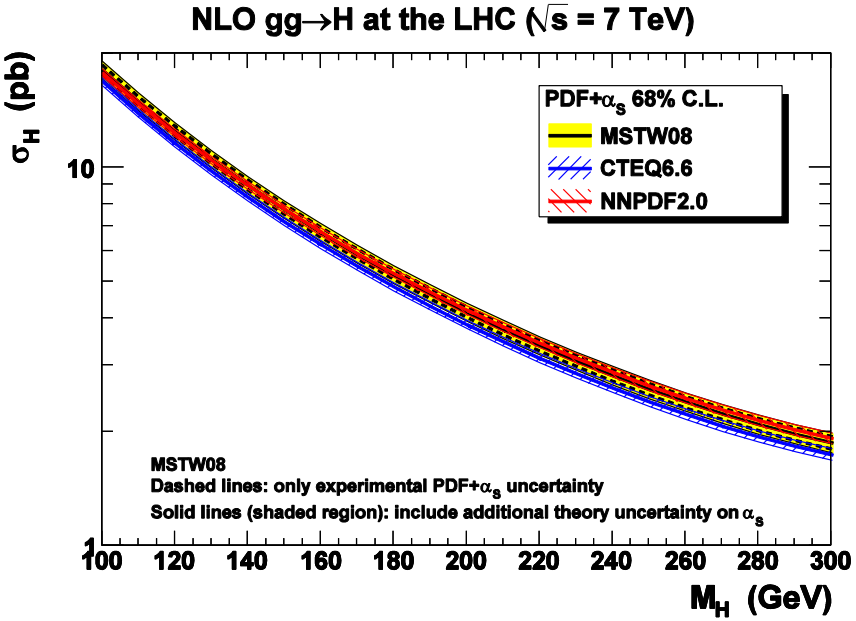


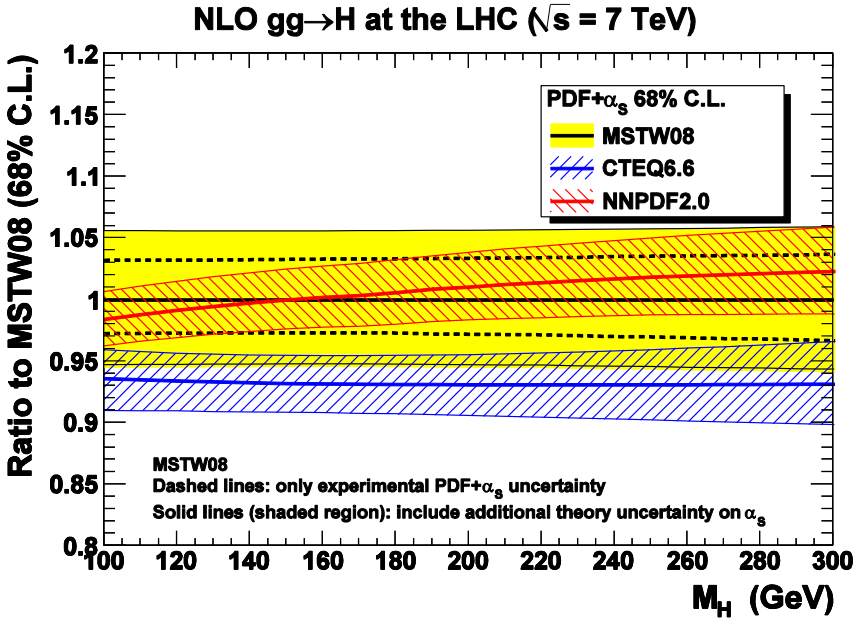
Plots from G.Watt -MSTW

And then there are the gluon-gluon induced cross-sections

Spread in Higgs production cross-sections is now > 15%
Dependence on alphas is also increased







Plots from G.Watt -MSTW

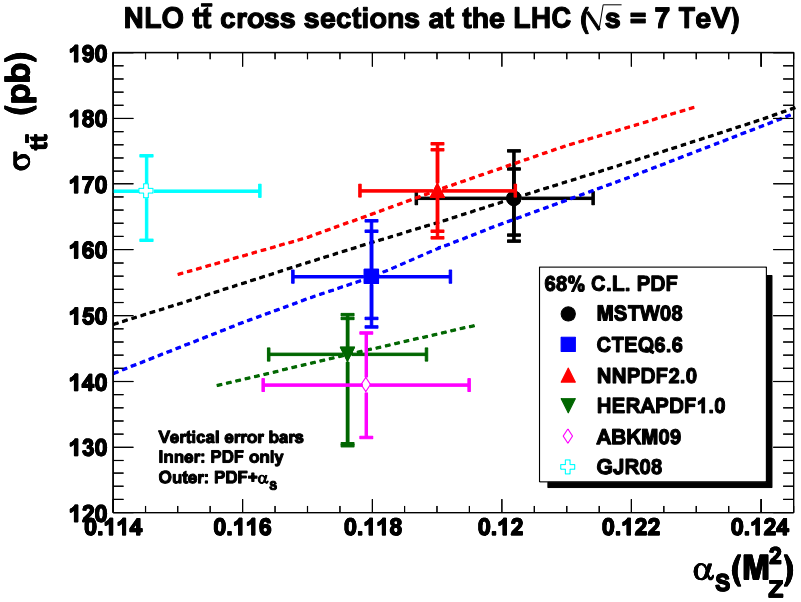
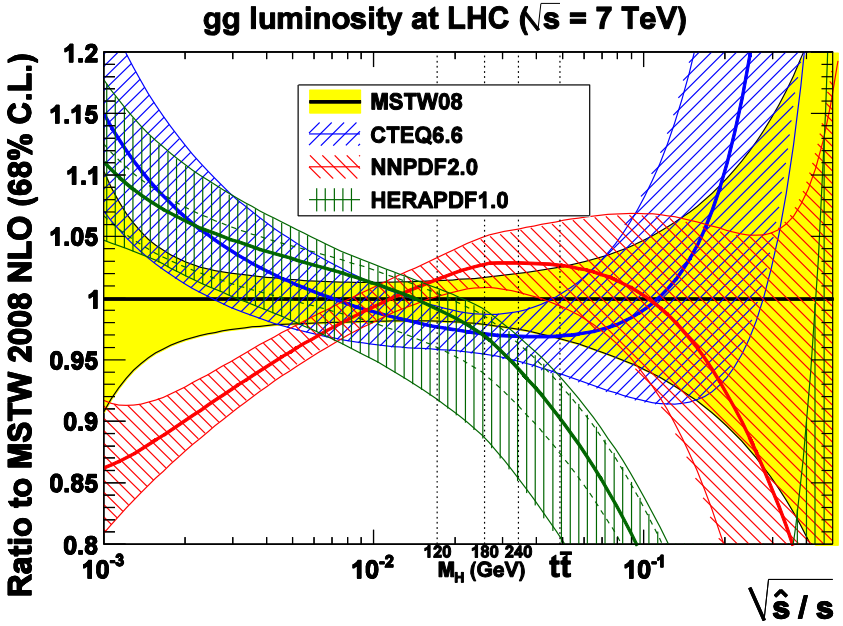
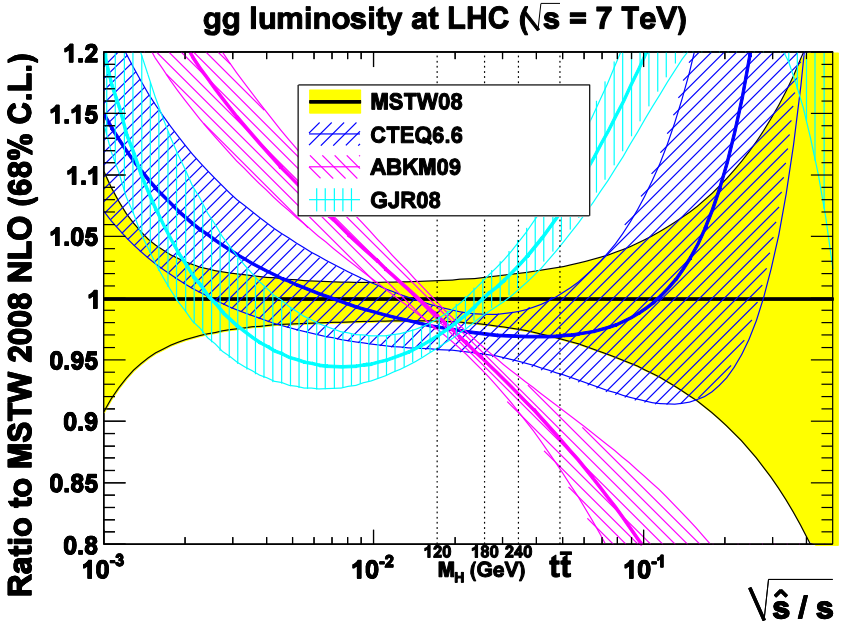
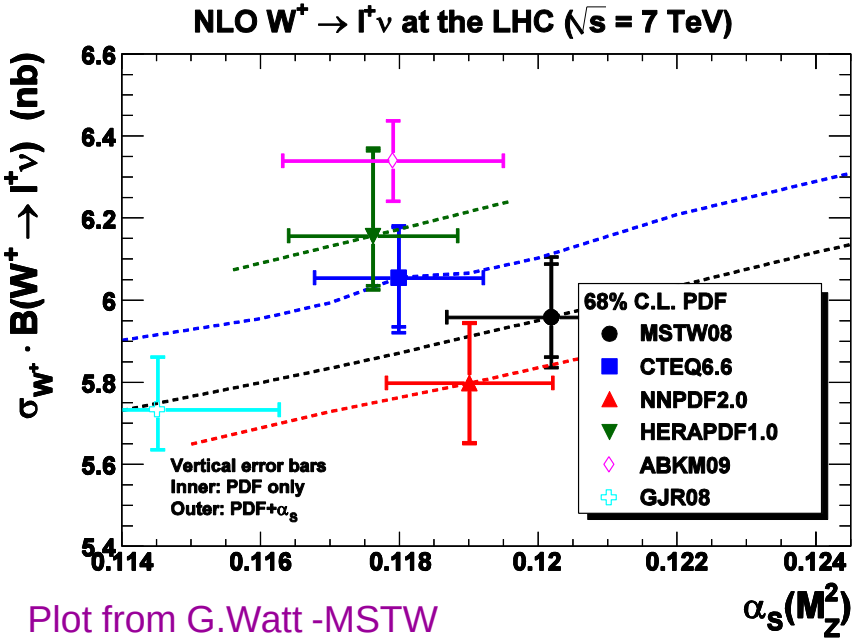


Illustration of uncertainty band for MSTW due to PDFs alone within the dotted lines and total uncertainty due to PDFs +alphas is the full yellow band





Plots from G.Watt -MSTW



Plot from G.Watt -MSTW

Can we understand these differences?

Talks by all groups TODAY (TUESDAY) on current PDFs and updates

Recently the PDF4LHC group has been considering the role that the uncertainty in the value of $\alpha_S(M_Z)$ plays in the overall uncertainty of predictions

This is not a large effect for W/Z production

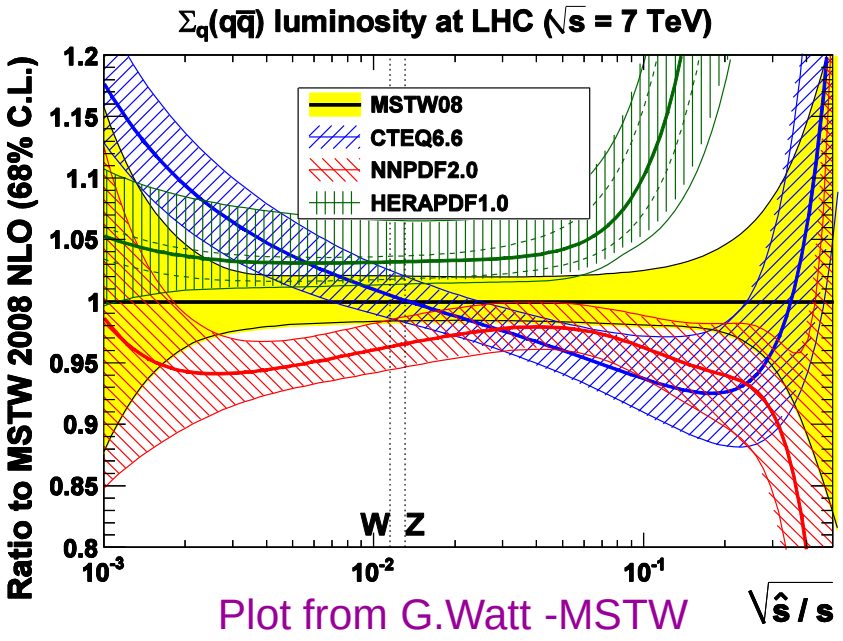
But the value of m_c AND the scheme used to account for heavy quark production are.. WEDNESDAY

We will also consider areas of disagreement with data

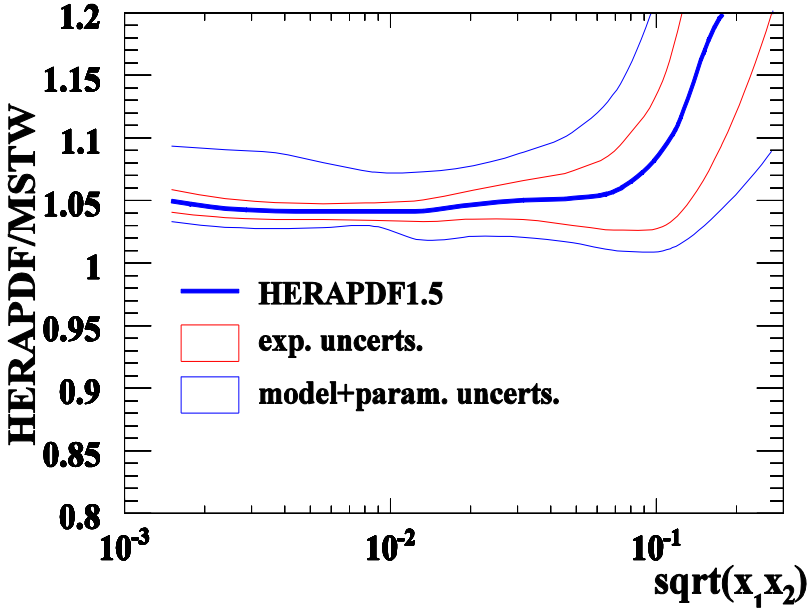
1) are ALL PDFs are including data at low-x, Q2 which are not really well described by (N)NLO DGLAP.. WEDNESDAY

2) Tevatron lepton asymmetry data is not well fitted..THURSDAY

And we ill consider PDFs for MC's– THURSDAY



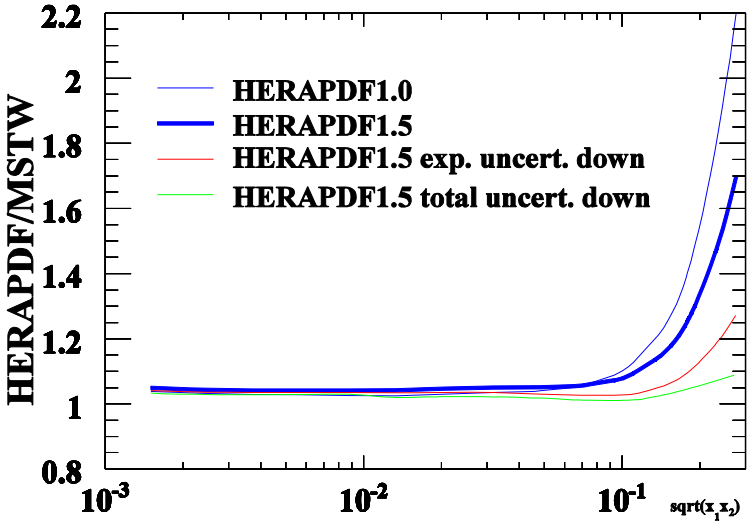
Plot from G.Watt -MSTW



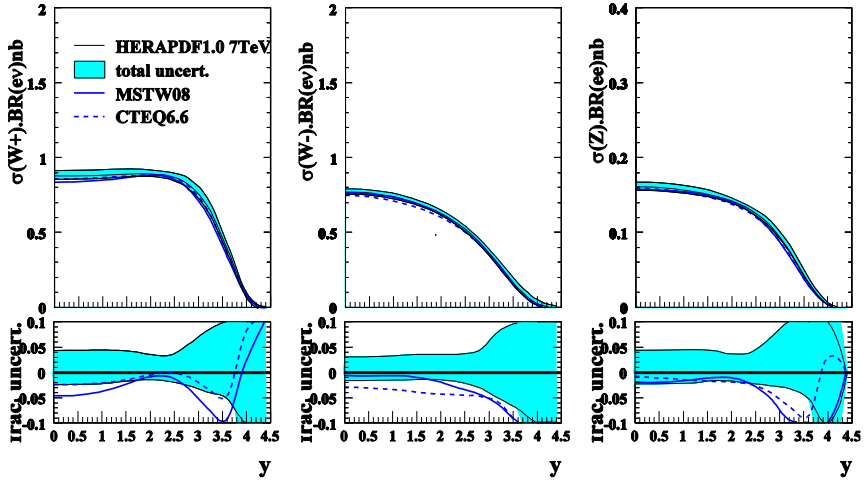
HERAPDF1.0 has a rather high q-qbar luminosity at high scale.

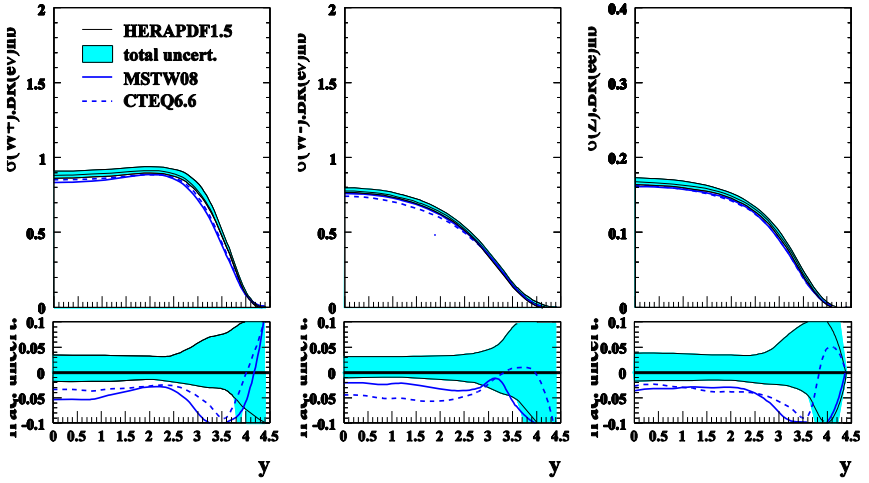
This is reduced in HERAPDF1.5

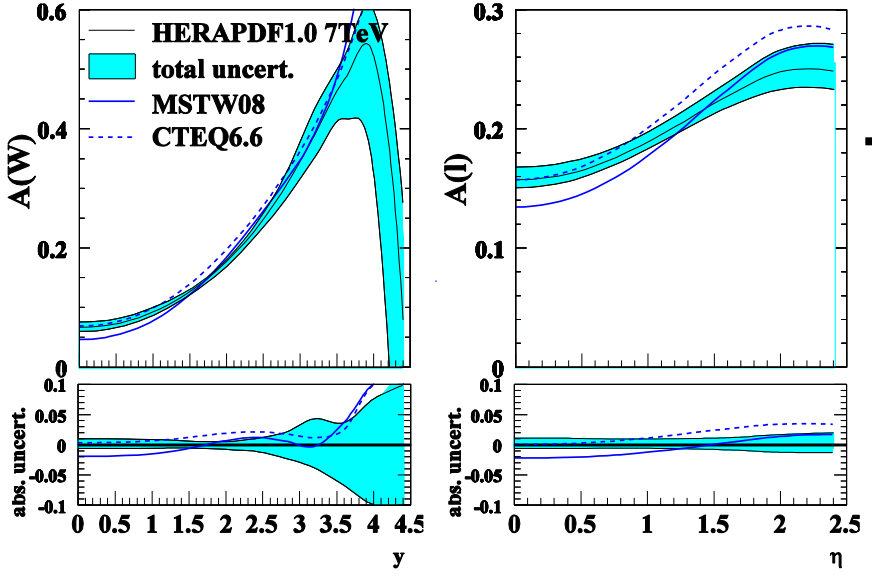
It is now closer to MSTW within uncertainties



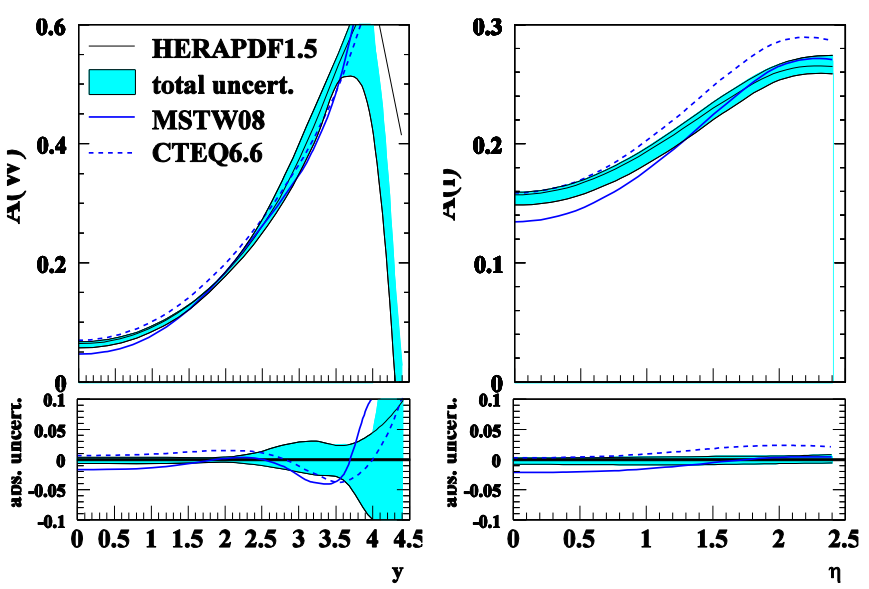
HERAPDF1.5
LHC and Tevatron predictions



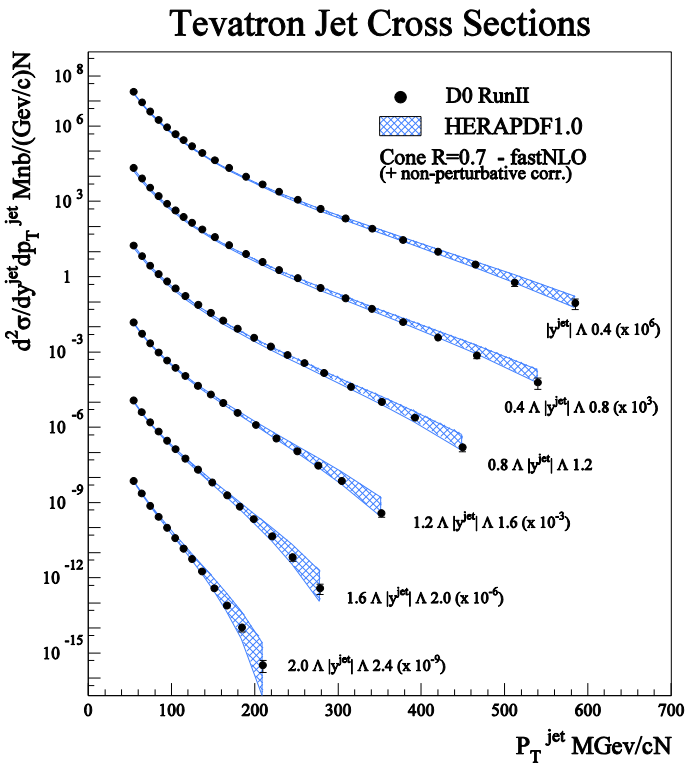


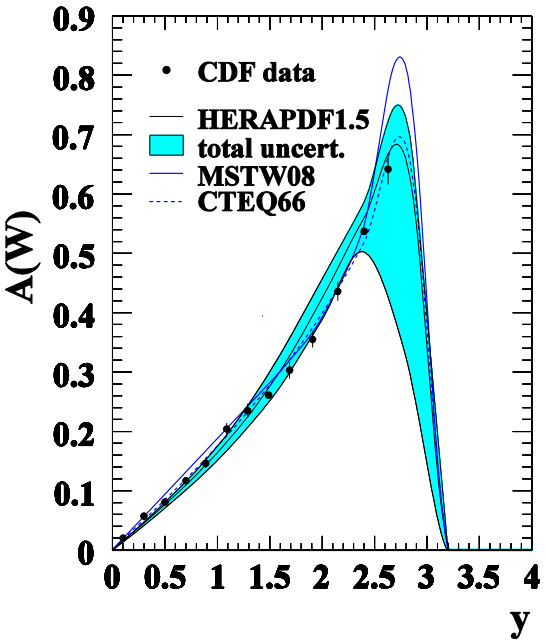


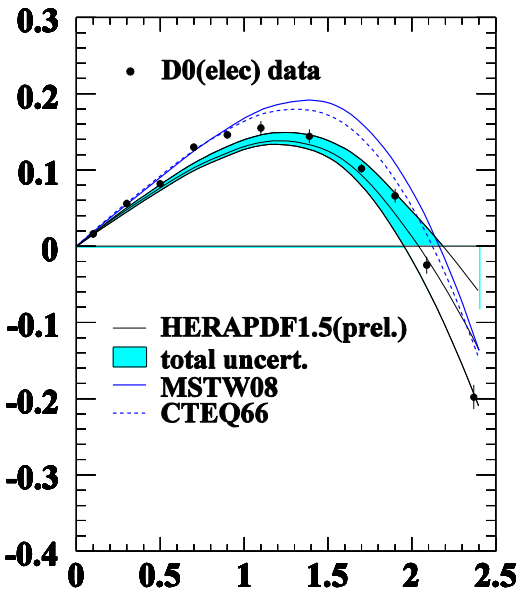
1.0

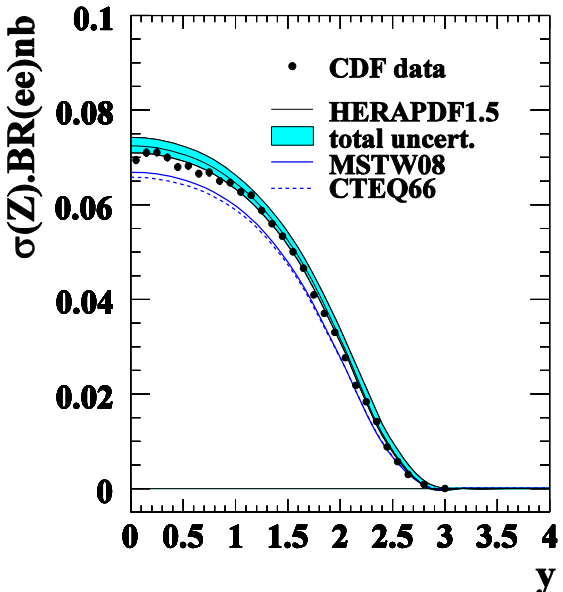


The reduced high-x error on HERAPDF1.5 PDFS results in a reduced error at high rapidity for W/Z production at the LHC



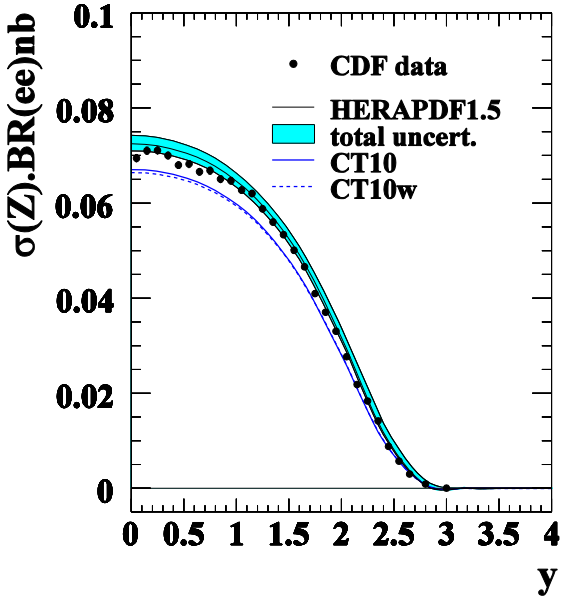


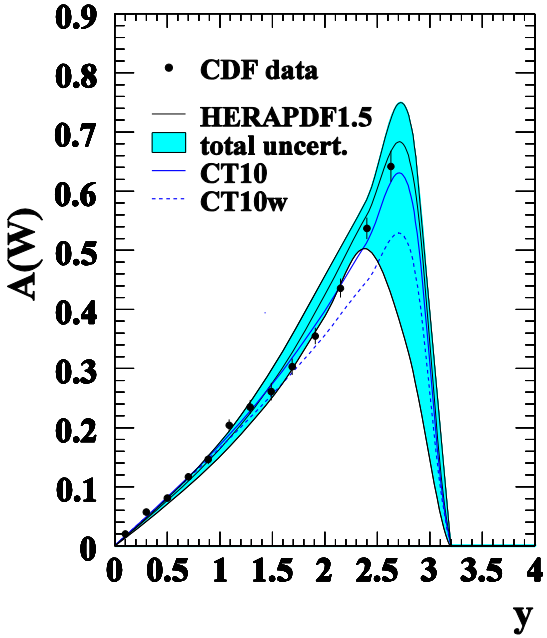


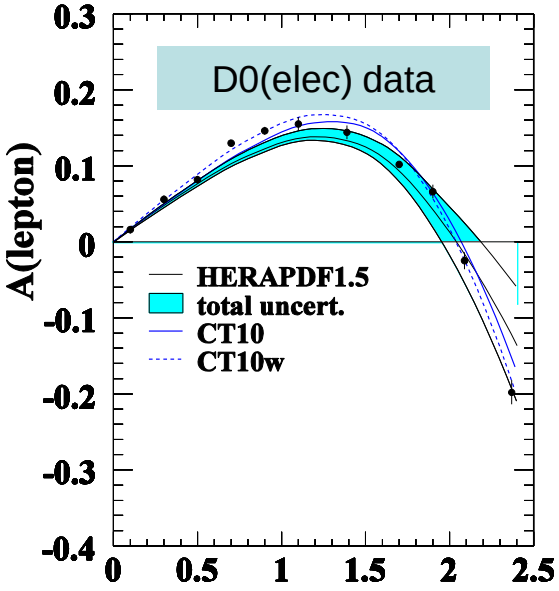


Lastly let's not forget the Tevatron

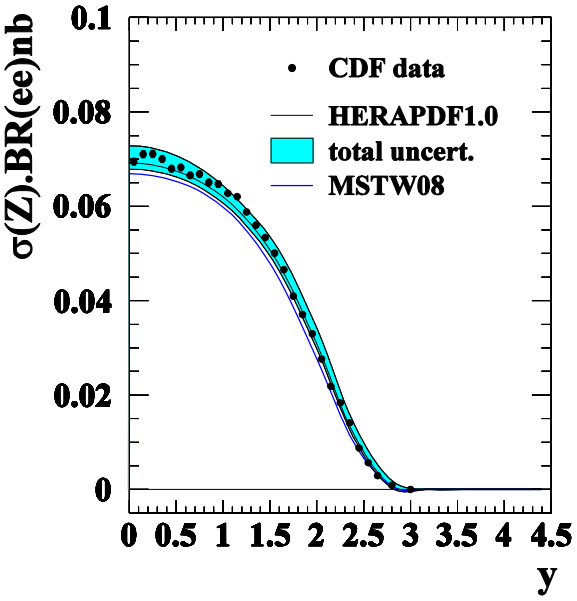
Back-up HERAPDF1.5 compared to CT10

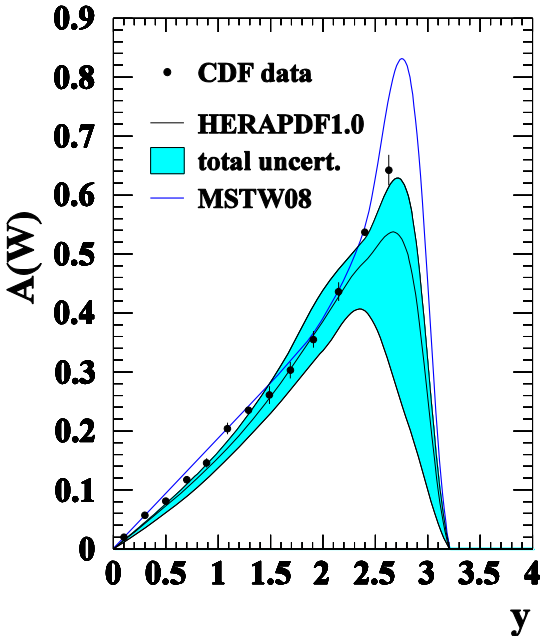






extras

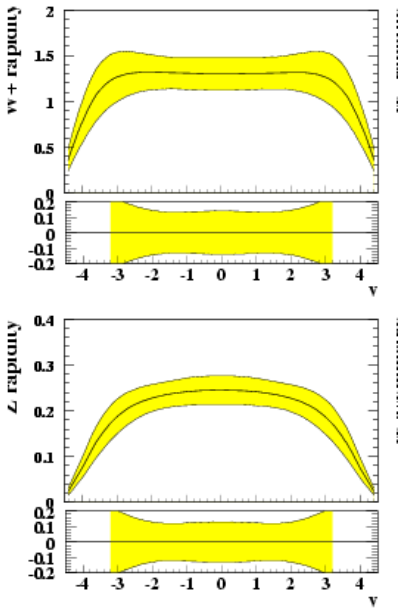




Back up HERAPDF1.0

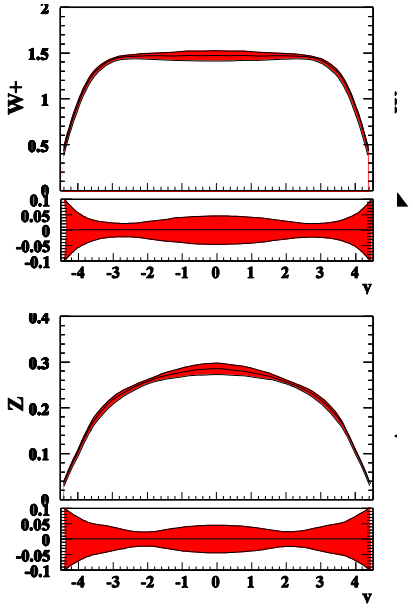
Consequences for W and Z production at the LHC

Look at predictions for W/Z rapidity distributions: Pre- and Post-HERA

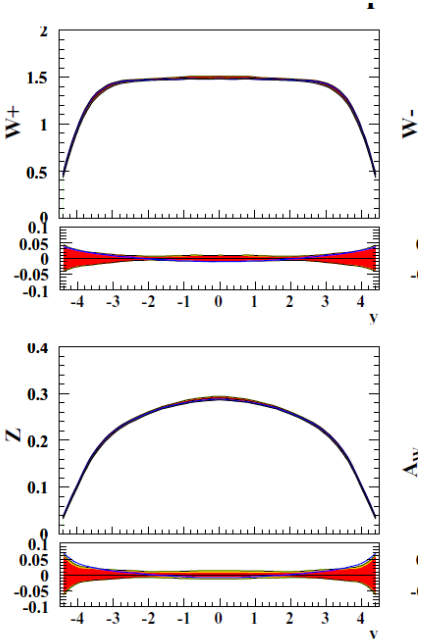


Note difference in scale for fractional errors

Just fixed target DIS data ~15% uncertainty



Separate HERA data sets~5% uncertainty

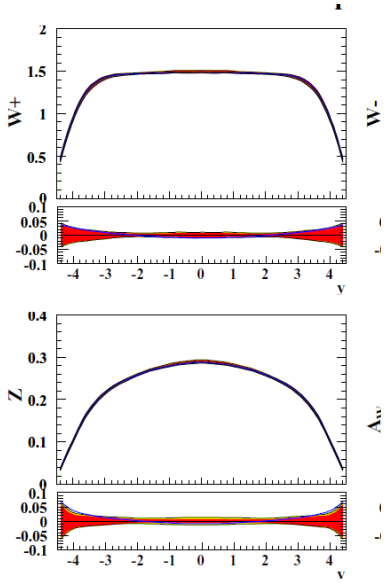


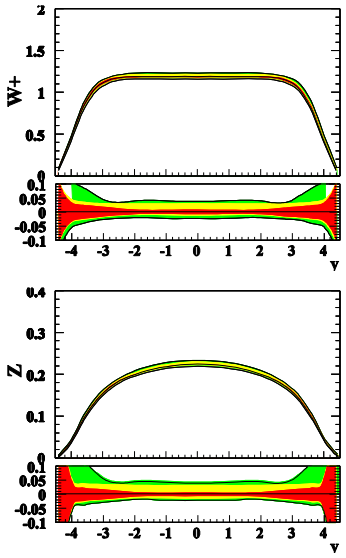
Combined HERA data set~1.5% uncertainty

Why such an improvement ?

It's due to the improvement in the low-x sea and gluon At the LHC the q-qbar which make the boson are mostly sea-sea partons And at $Q^2 \sim M_Z^2$ **the sea is driven by the gluon**

These illustrations at 14 TeV



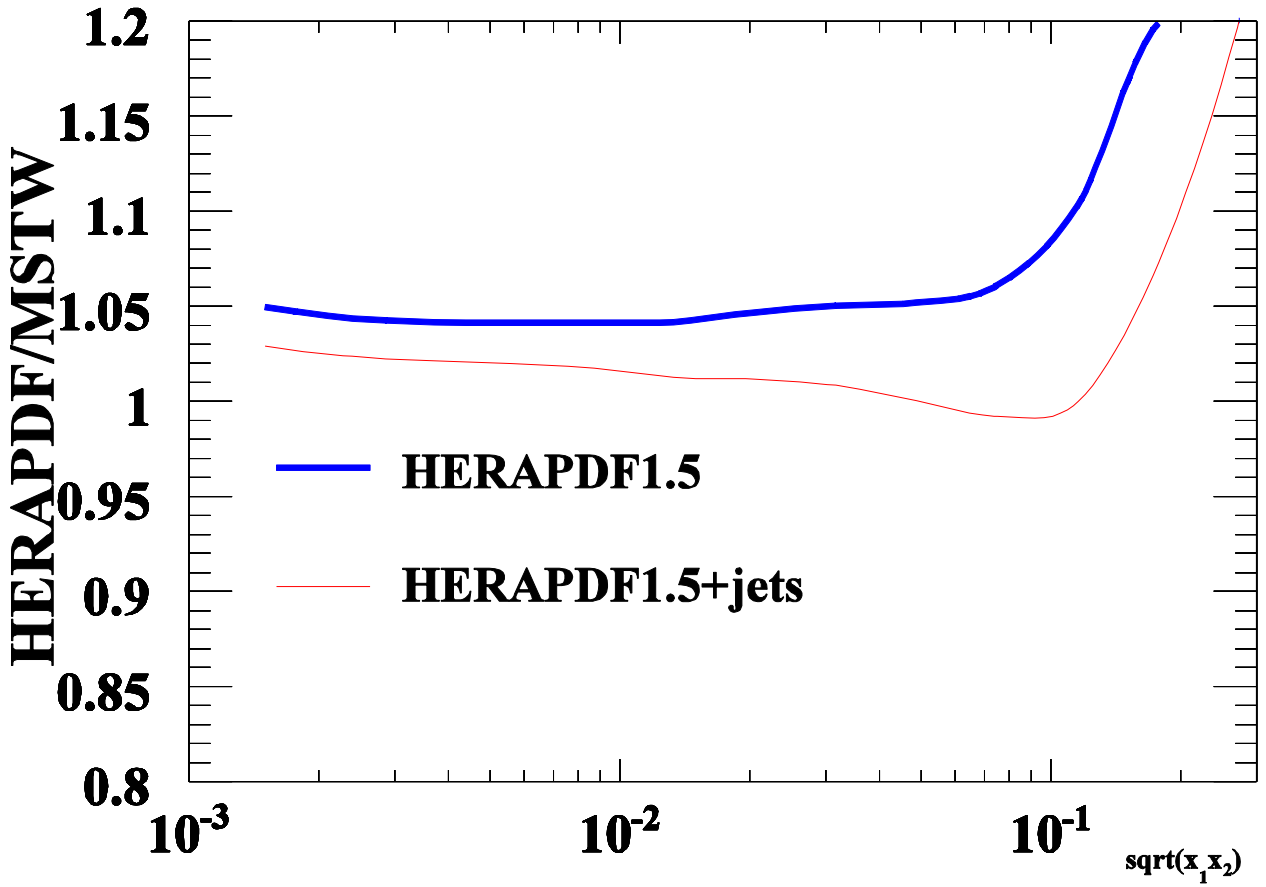


Model errors are the most signficant in the central region: m_c, m_b, fs, Q^2_{min}

m_c =1.35 – 1.65 GeV is the dominant contribution… but this can be improved if F2(charm) data are used…..

However PDF fitting should also include consideration of model errors and parametrisation errors

HERAPDF1.0 experimental plus model errors plus parametrisation


HERAPDF/MSTW
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
10^{-3}
10^{-2}
10^{-1}
sqrt($x_1 x_2$)
HERAPDF1.5
HERAPDF1.5+jets