Strangeness and dbar-ubar studies

A M Cooper-Sarkar, Oxford

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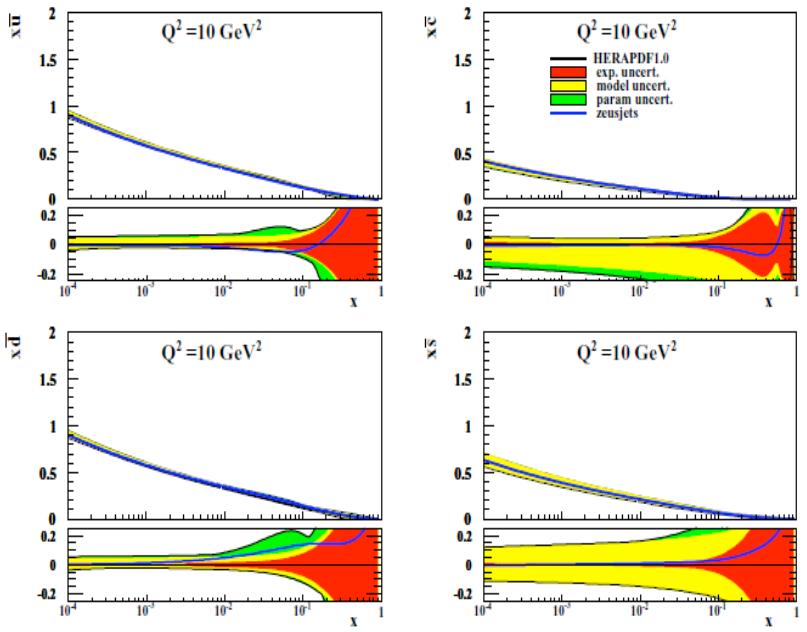
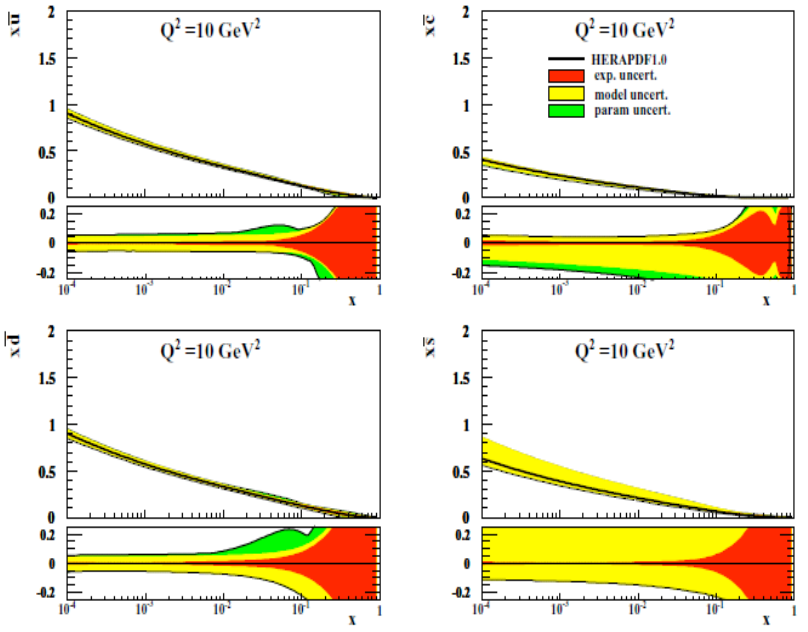
Differences in PDFs with different assumptions as to strangeness



ubar,dbar,cbar,sbar with HERAPDF1.0

Usual fs=0.23 to 0.38 variation

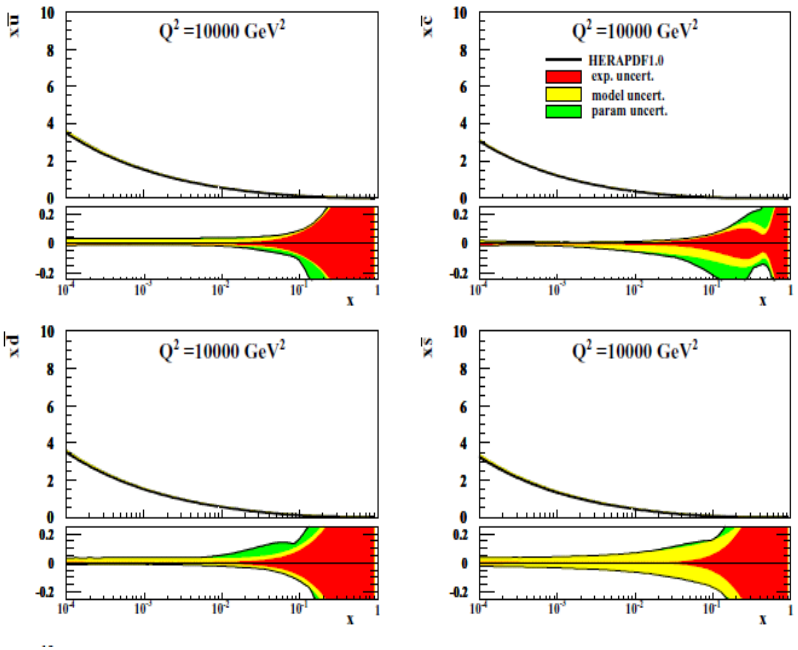


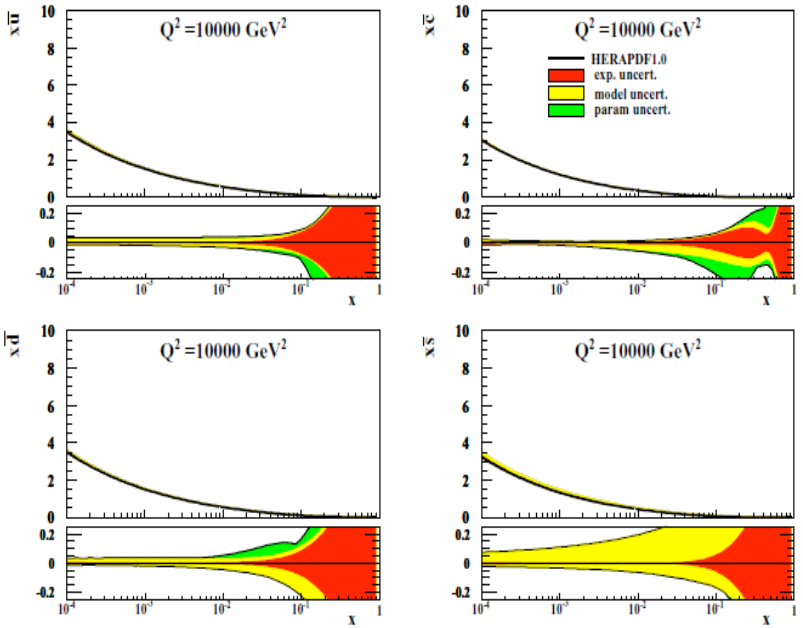
ubar,dbar,cbar,sbar with HERAPDF1.0 BUT with the upper model variation on strange fs=0.5

i.e.sbar=ubar=dbar

This is quite visible

And now at Q2=10000 GeV2





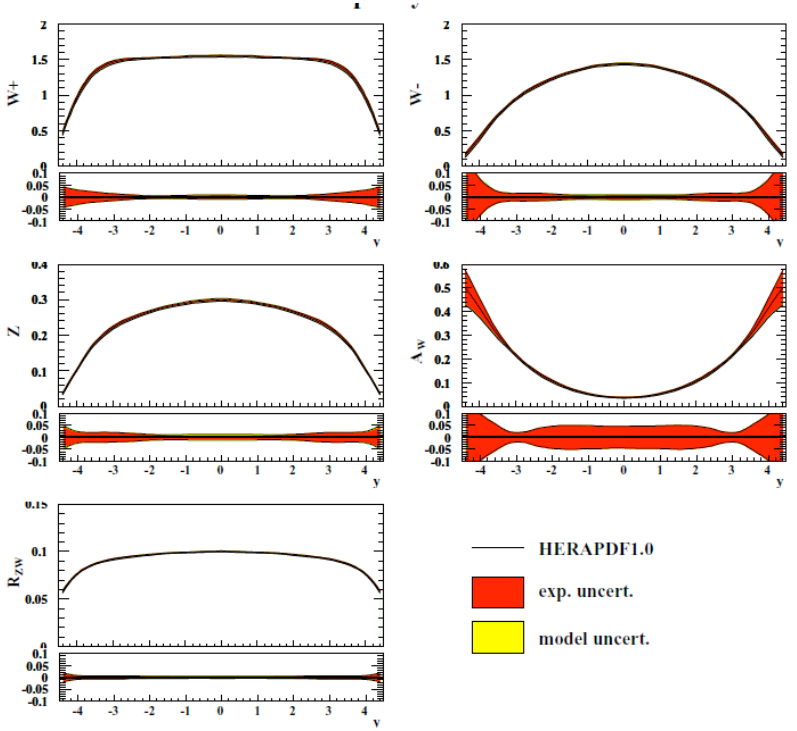
ubar,dbar,cbar,sbar with HERAPDF1.0

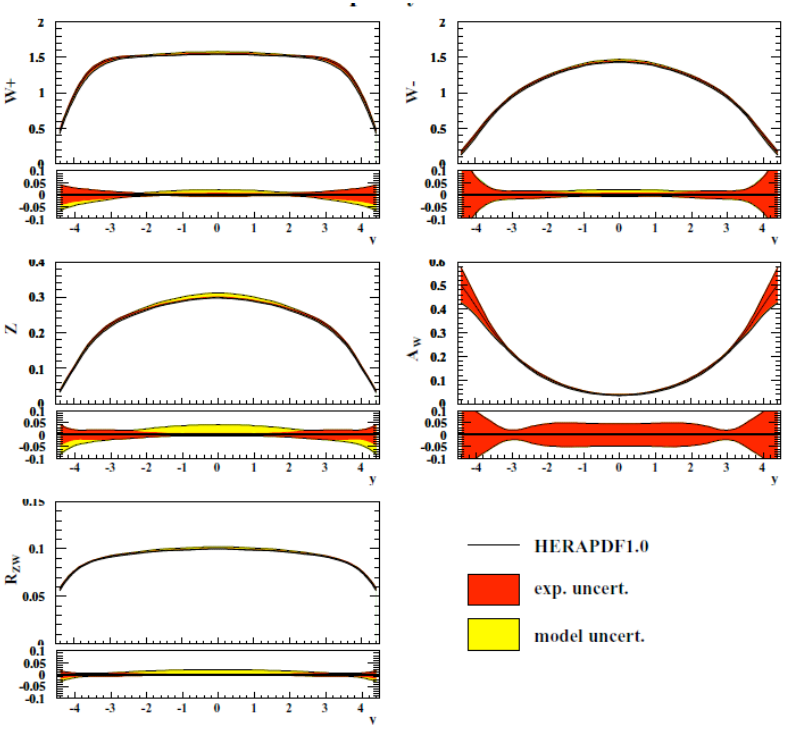
ubar,dbar,cbar,sbar with HERAPDF1.0 BUT with the upper model variation on strange fs=0.5

i.e.sbar=ubar=dbar

This is still visible but not overwhelming

Now let's look at W/Z production with different strangeness fractions
Plots include ONLY the strangeness model uncertainty
And no other model uncertainties



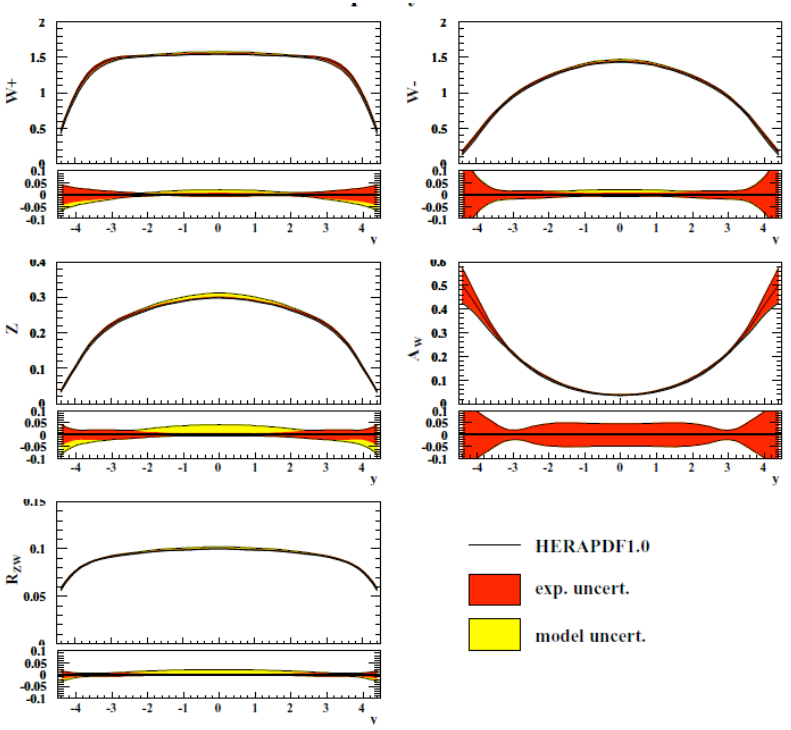


Usual strangeness model uncertainty fs=0.23 to 0.38

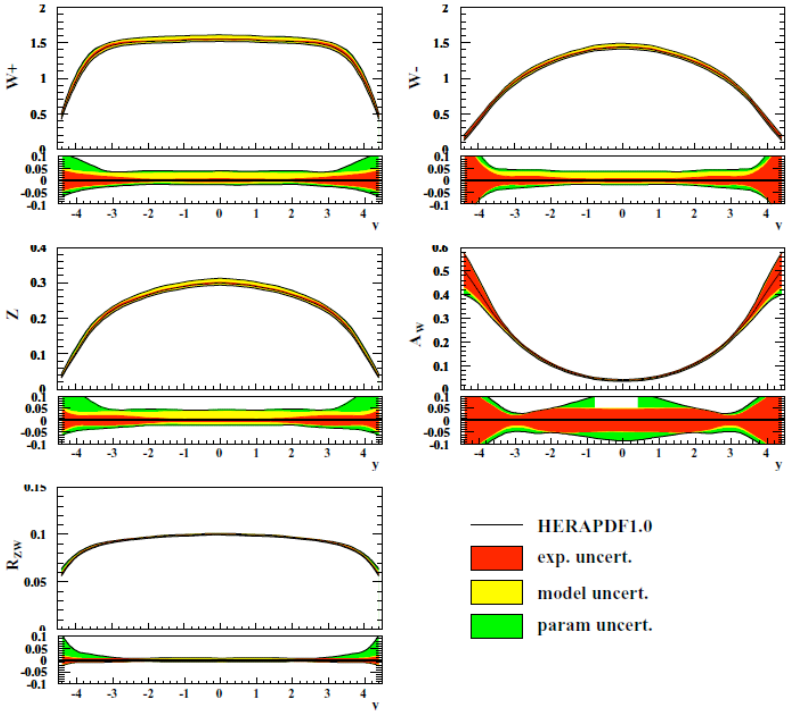
Strangeness model uncertainty fs=0.5

This is certainly noticeable on its own BUT..

Strangeness model uncertainty ONLY fs=0.5



Total HERAPDF1.0 uncertainties



But compare this extreme strangeness variation to our usual model/param uncertainties-

It will be swamped by param. uncertainty and charm mass (mc=1.65) uncertainty

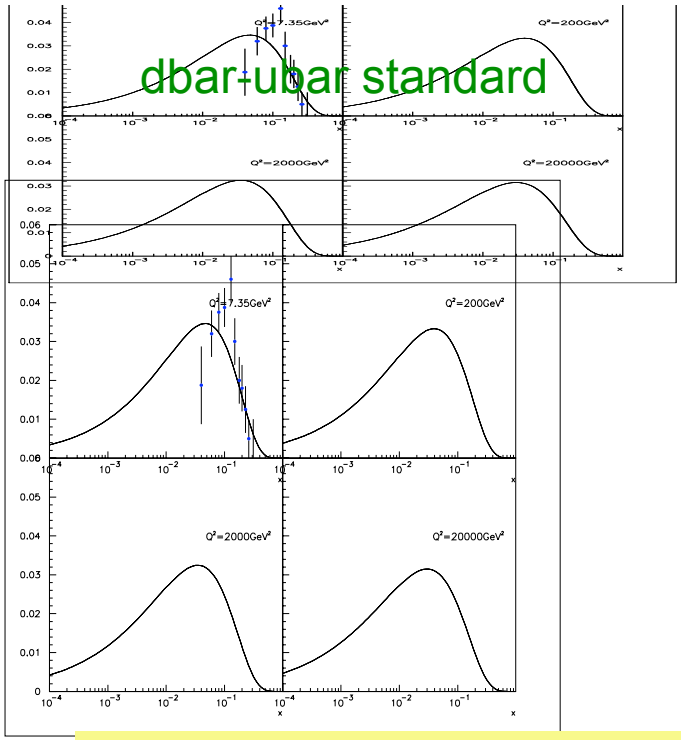
Ubar-dbar differences

I have made two toy PDFs (based on ZEUS-j) in which the only difference is dbar-ubar as $x \rightarrow 0$. The parametrisations are just like 'inbetween' except that instead of parametrising Ubar and Dbar, you parametrise (ubar+dbar) and dbar-ubar.

The dbar-ubar is not fitted but takes two variants:

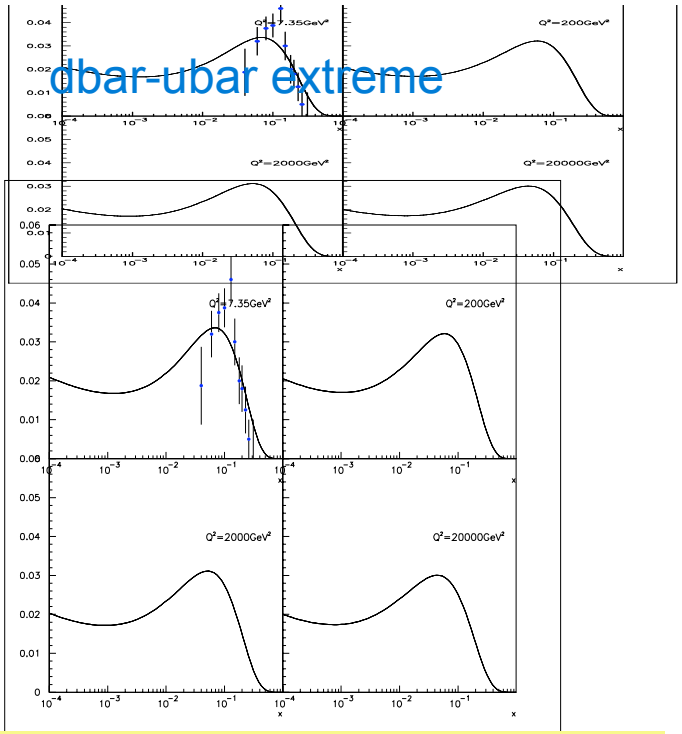
Standard dbar-ubar = $0.24\, x^{0.5}\, (1-x)^{9}$ at Q^2_0

Extreme dbar-ubar = $0.005x^{-0.16}(1-x)^{13}\,(1+100x)$ at Q^2_0



Note:

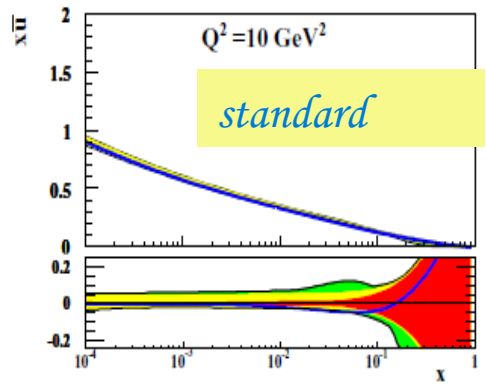
dbar-ubar measurements deduced from E866 data are superimposed

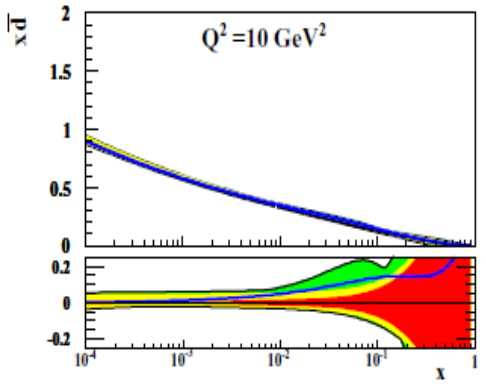


The problem with fitting dbar-ubar with parameters completely free is that we may not respect this dbar-ubar data

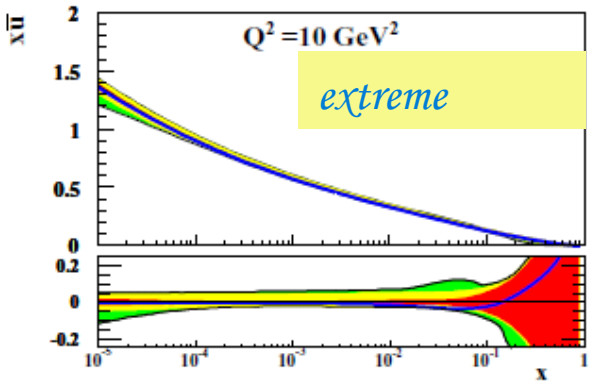
So with these dbar-ubar parametrisations, how do the regular ubar and dbar look?

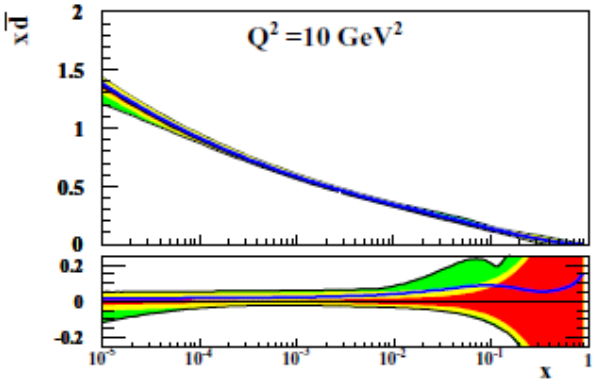
Look back at the slide before- remember HOW SMALL the measured dbar-ubar difference actually is: its ~0.04 at x=0.1 for Q2=7.35



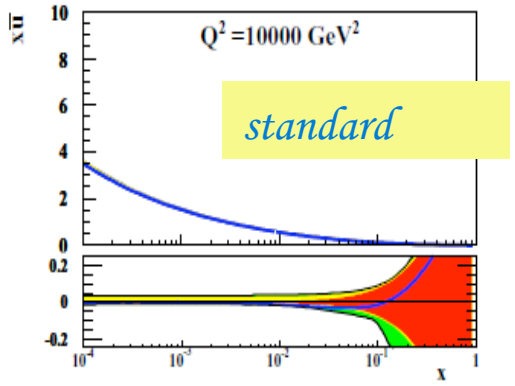


The blue lines show the the two toy PDFS superimposed on HERAPDF1.0





This is why you barely see this difference when you plot dbar and ubar themselves at this sort of scale – note the extreme parametrisation is extended to lower-x, but is still barely different



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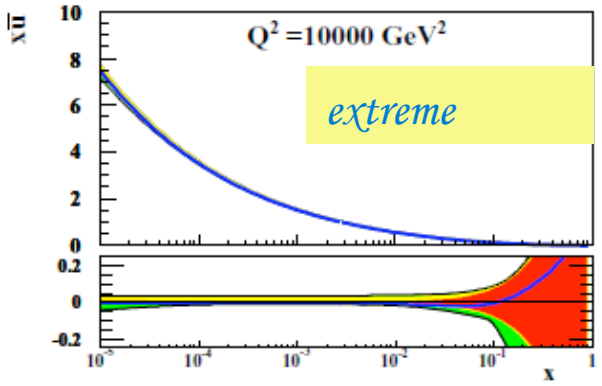
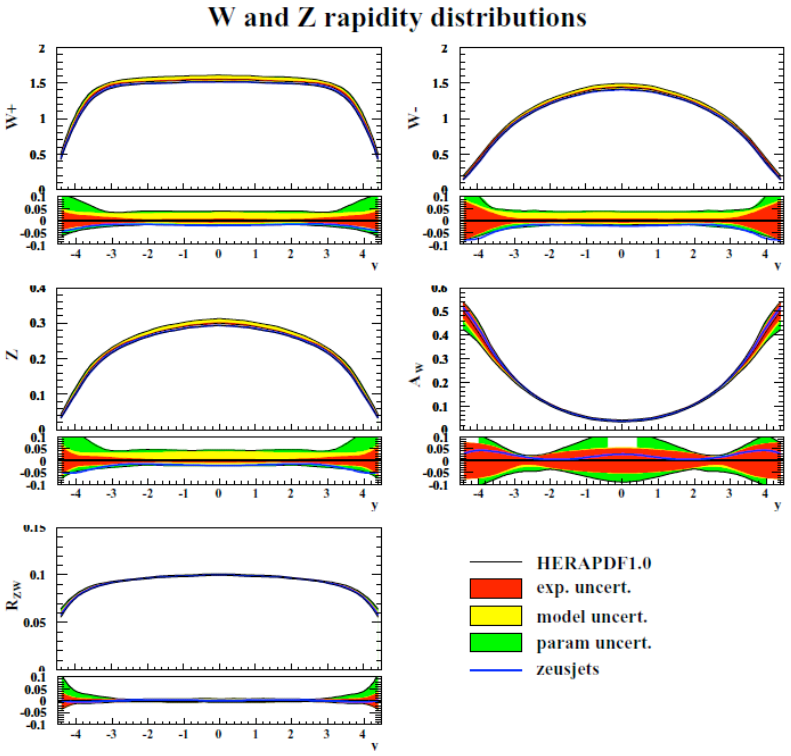
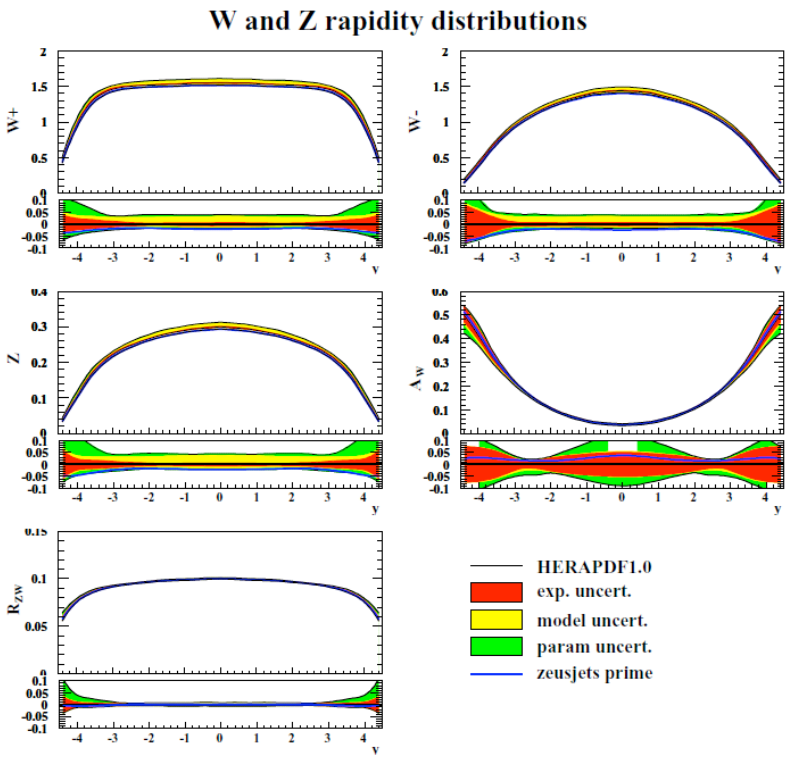


And the difference is even less significant at the W/Z scale because:

whereas ubar and dbar themselves evolve to become much larger at small x the difference between them does NOT change and thus it becomes **relatively smaller**





Thus it is no surprise that we can't tell the standard and extreme parametrisations apart at W/Z scale

These parametrisations are well within our usual HERAPDF1.0 error bands

SO one can argue that the ‘extreme’ parametrisation is Not extreme enough

BUT how extreme can one be while fitting the dbar-ubar data deduced from E866? – see slide 6