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Heavy quarks, parton luminosity and α_s (From the NNPDF viewpoint)

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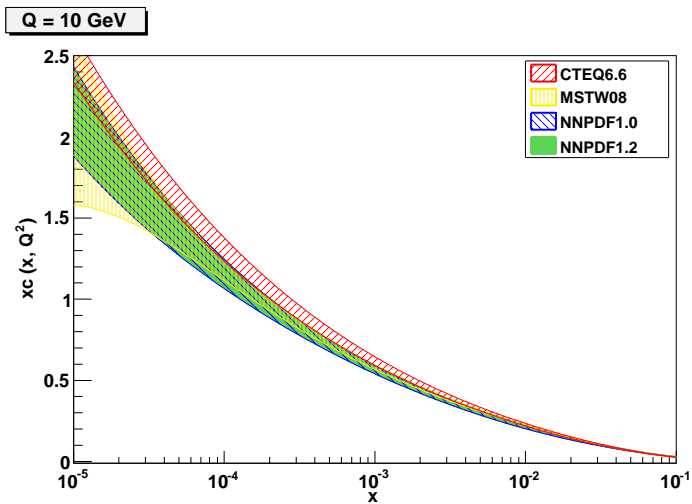
Les Houches Physics at TeV Colliders 2009
16/06/2009



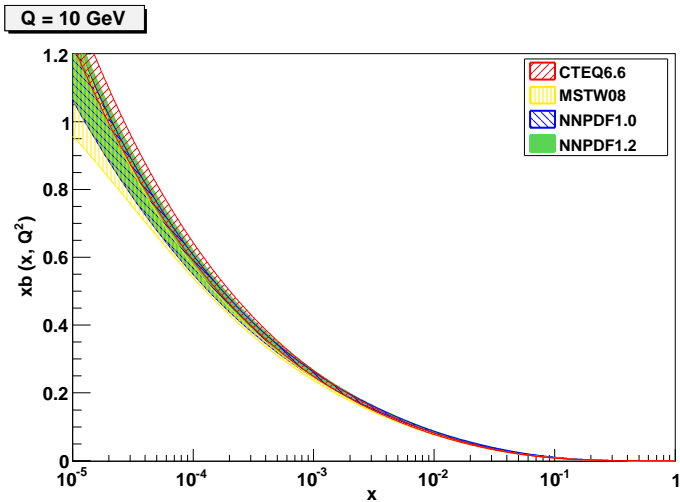
HEAVY QUARK PDFS



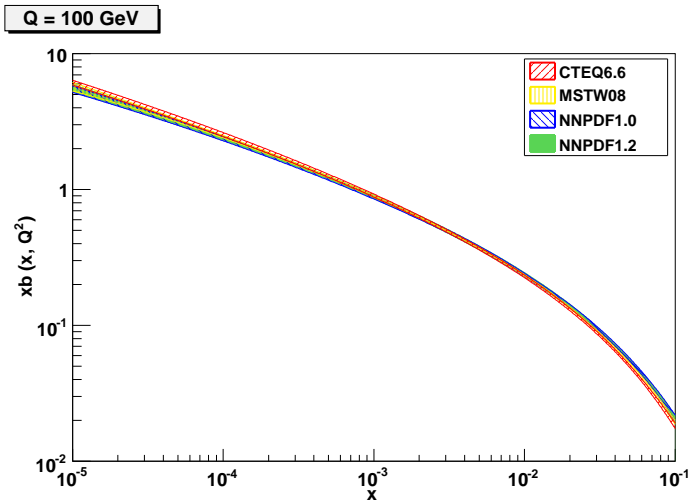
Comparison of c-quark PDFs



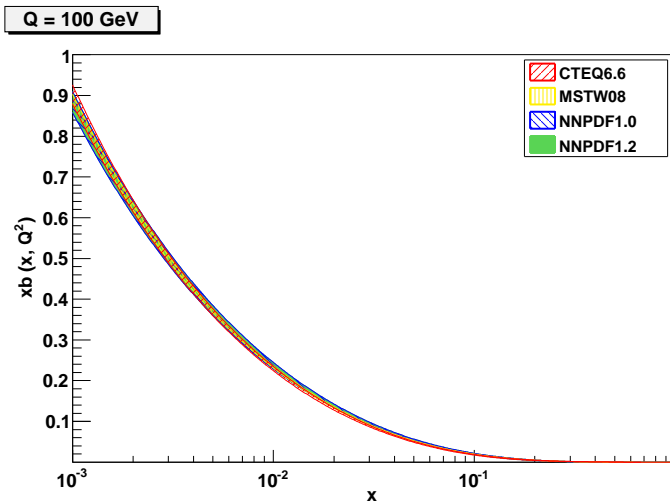
Comparison of b-quark PDFs



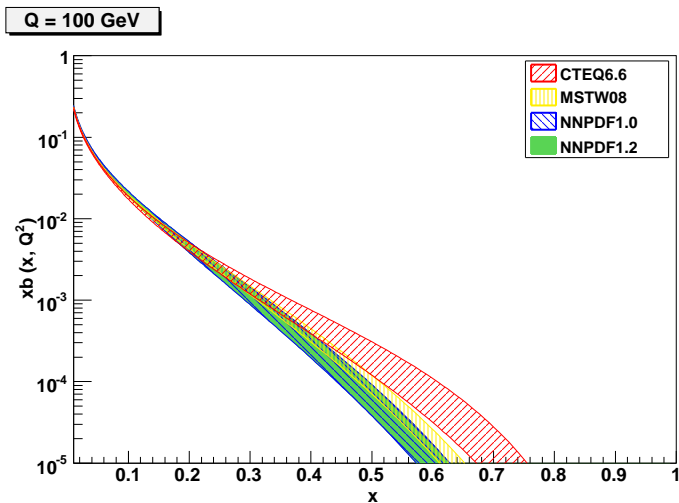
Comparison of b-quark PDFs



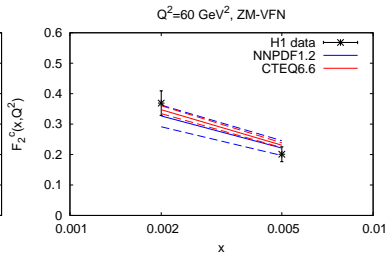
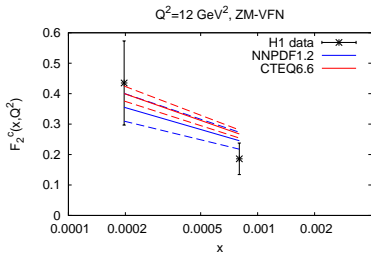
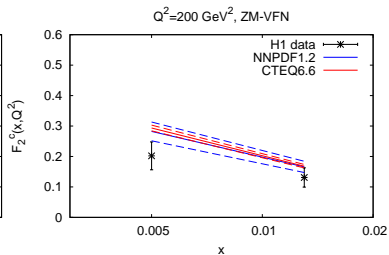
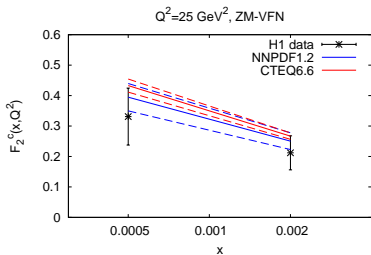
Comparison of b-quark PDFs



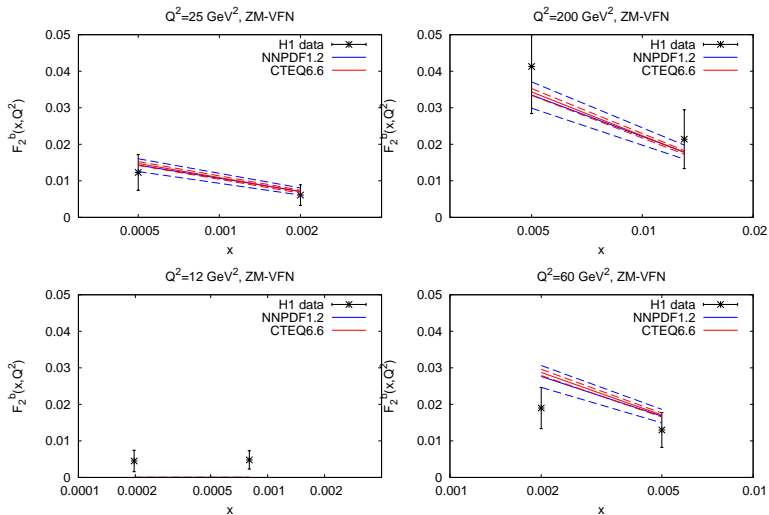
Comparison of b-quark PDFs



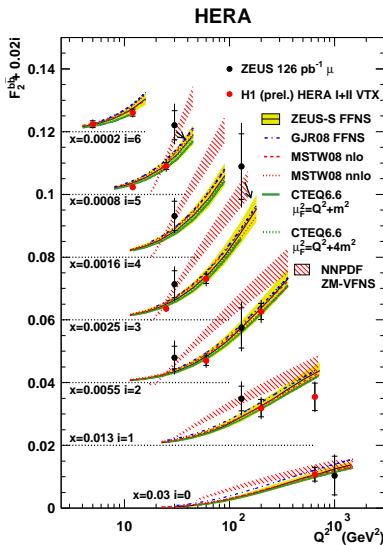
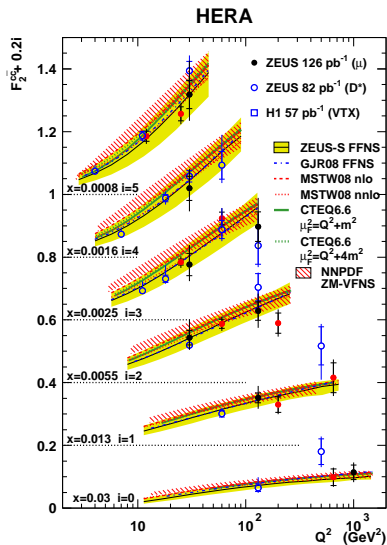
Comparison of HQ structure functions



Comparison of HQ structure functions

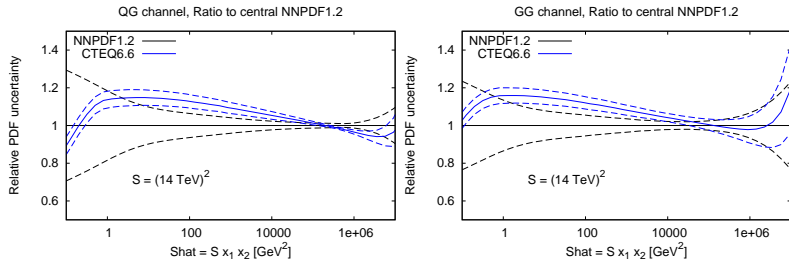


Comparison of HQ structure functions- ZEUS data



PARTON LUMINOSITIES

Parton luminosities



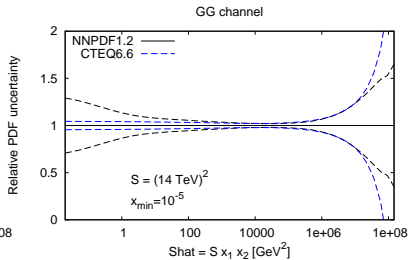
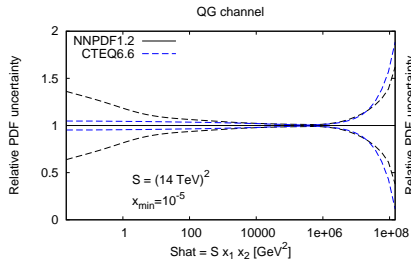
Parton luminosities defined as

$$L_{ij}(\hat{S}, \mu) = \frac{1}{S} \int_0^1 dx_1 \int_0^1 dx_2 q_i^{(A)}(x_1, \mu) q_j^{(B)}(x_2, \mu) \delta(Sx_1x_2 - \hat{S})$$

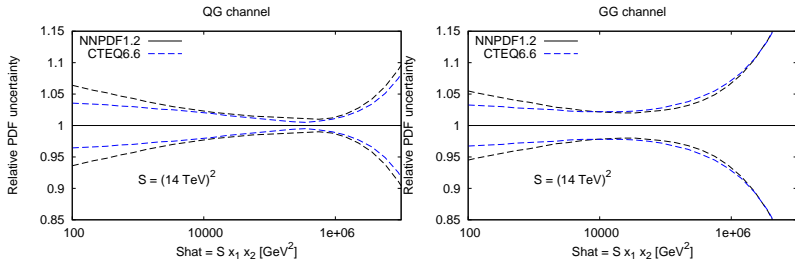
Relative differences between fluxes:

- 1 Systematic discrepancy at small-medium $\hat{S} \rightarrow$ Differences in HQ treatment
- 2 Always agreement at the $2\text{-}\sigma$

Parton luminosities



Parton luminosities



- 1 Good agreement in size of PDF uncertainties in medium and large \hat{S}
- 2 Sizable differences at small \hat{S}

$\alpha_s(M_Z^2)$ AND HIGGS PRODUCTION

$gg \rightarrow H$ production

MCFM v.5.4, $m_H = 120$ GeV

PDF set	$\sigma(gg \rightarrow H)$ [pb]
NNPDF1.0	36.6 ± 1.0
NNPDF1.2	36.6 ± 1.2
CTEQ6.6	36.3 ± 1.3

Good agreement between **NNPDF1.2** and **CTEQ6.6** for PDF uncertainties

Importance of $\alpha_s(M_Z^2)$ sizable for this process \rightarrow How to treat it?

- 1 Produce PDFs for different values of α_s and let user choice?
- 2 How to treat correlation between α_s and gluon?
- 3 Include α_s error into PDF error? Les Houches agreement?

With the NNPDF approach, one can quantify the correlation

$$\rho \left[g(x, Q^2), \alpha_s(M_Z^2) \right] = \frac{\langle g(x, Q^2) \alpha_s(M_Z^2) \rangle_{\text{rep}} - \langle g(x, Q^2) \rangle_{\text{rep}} \langle \alpha_s(M_Z^2) \rangle_{\text{rep}}}{\sigma_{g(x, Q^2)} \sigma_{\alpha_s}}$$

where N_{rep} PDF replicas have been generated, assuming a Gaussian distribution for $\alpha_s(M_Z^2) = 0.119 \pm 0.002$.



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