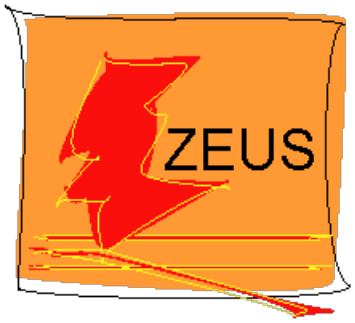

ZEUS-prel-19-001

H1prelim-19-041

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NNLO QCD fits to HERA jets and extraction of α_s

Update

A. Cooper-Sarkar, K. Floyd

Hadronisation uncertainty revisited

BLACK LIVES MATTER

- Handronisation uncertainties to be treated half-correlated and half-uncorrelated in PDF fits
  - Preliminary:

$$\alpha_s(M_Z^2) = 0.1150 \pm 0.0008(\text{exp})^{+0.0002}_{-0.0005}(\text{model/parameterisation})$$
$$\pm 0.0006(\text{hadronisation}) \pm 0.0027(\text{scale}) \ .$$

- In fact for preliminary hadronisation uncertainties treatment was inconsistent → we need proper treatment for final results

Hadronisation uncertainty revisited

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- REMINDER: previous result with additional low-p_T bins and still inconsistent treatment of hadronisation correction uncertainties:

$$\alpha_s(M_Z^2) = 0.1157 \pm 0.0008(\text{exp})$$

- Uncertainties of hadronisation corrections half-hals treated as
  → nuisance parameters in fits (half/sqrt(2))
  → uncorrelated uncertainties (half/sqrt(2))
- In some older jet data hadronisation correction uncertainties look a bit unreliable
- "Prescription" after discussion within H1 and ZEUS editorial board:
  - New H1 data sets → exact hadronisation uncertainites
  - ZEUS and old H1 data sets → conservative 2% uncertainty for all Q^2 and p_T bins

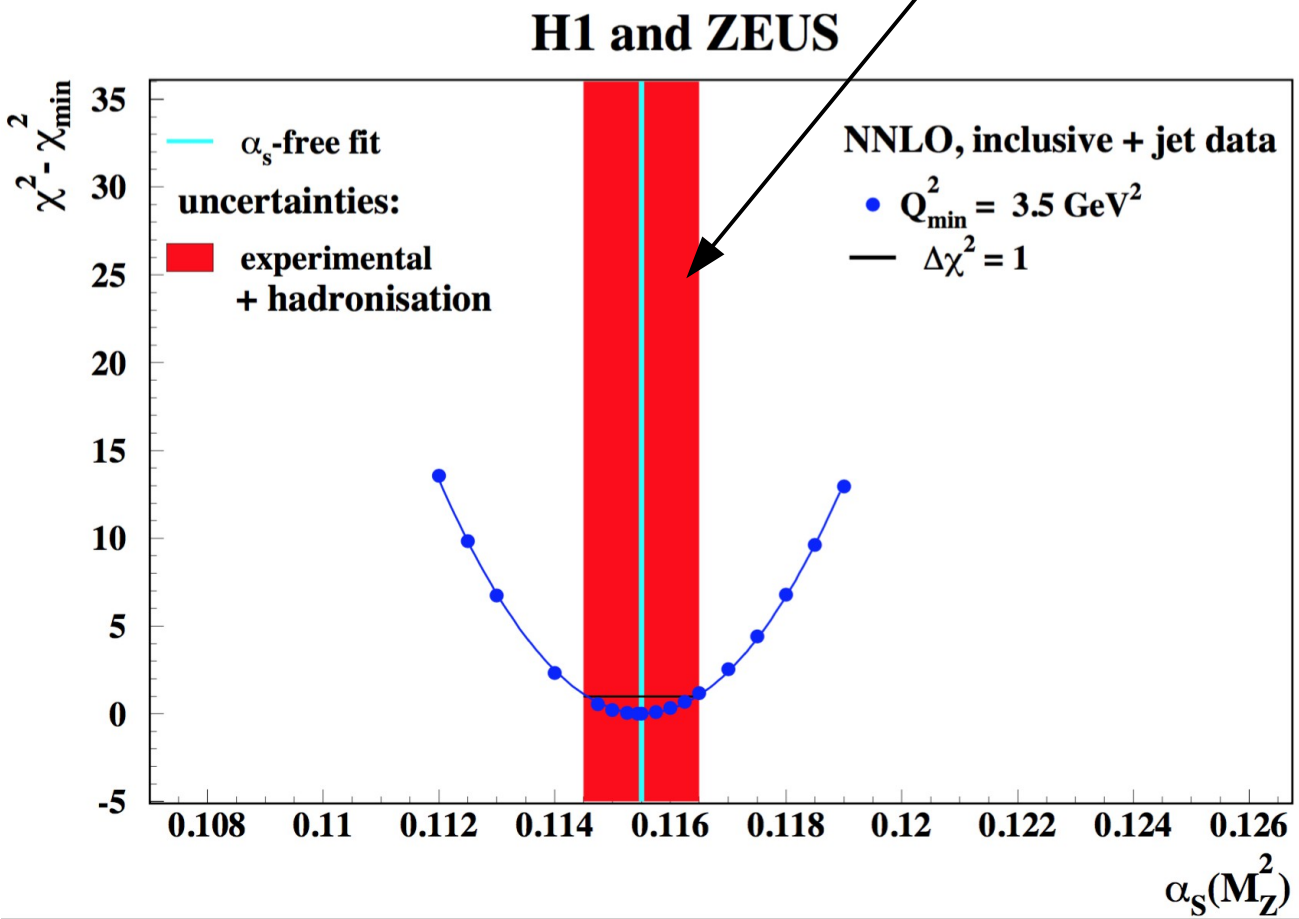
New α_s fits/scans

- New value from α_s-free fit and α_s scan

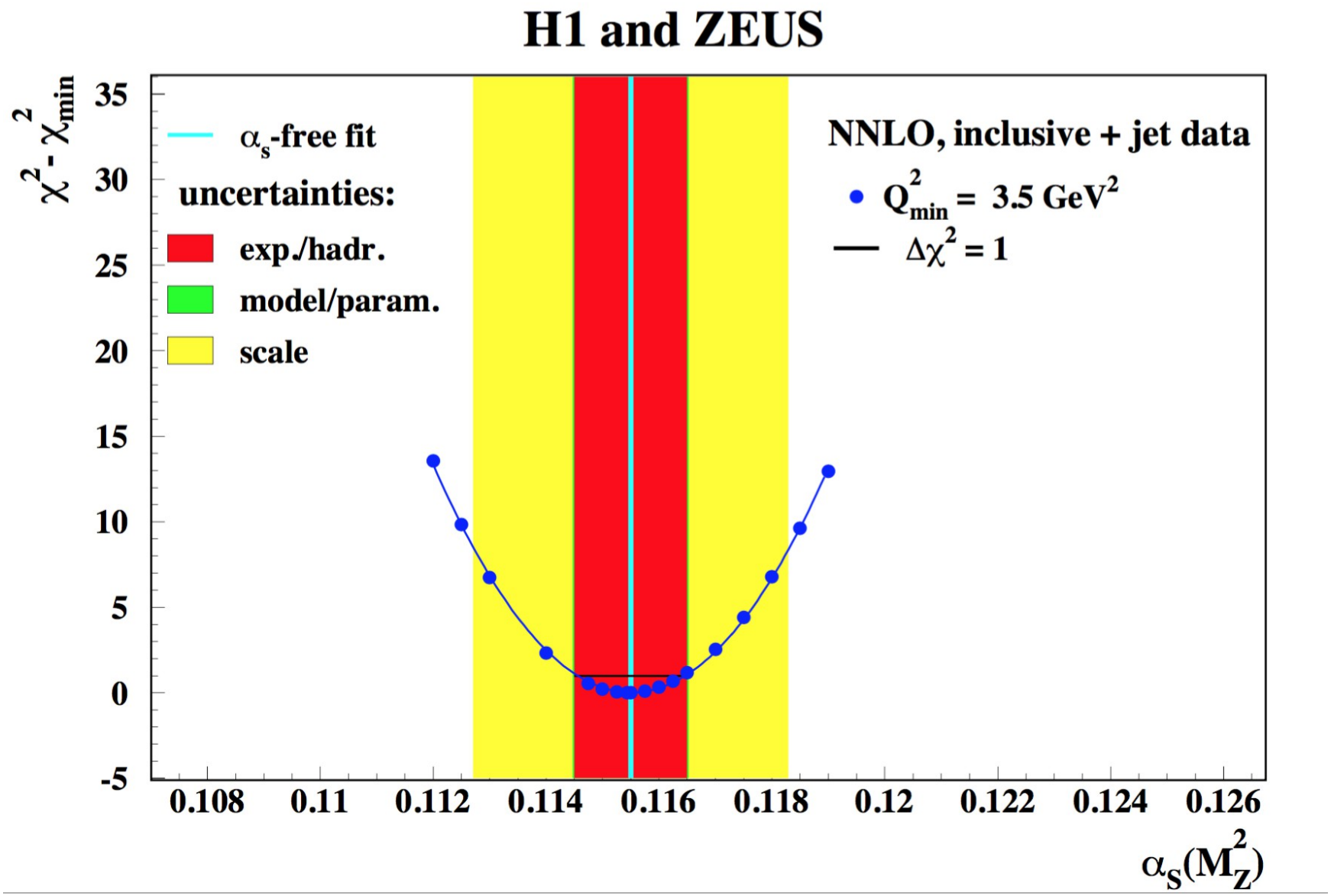
$$\alpha_s(M_Z^2) = 0.1155 \pm 0.0010(\text{exp+hadr})$$

0.001=sqrt(0.0008²+0.0006²)

old exp old hadr

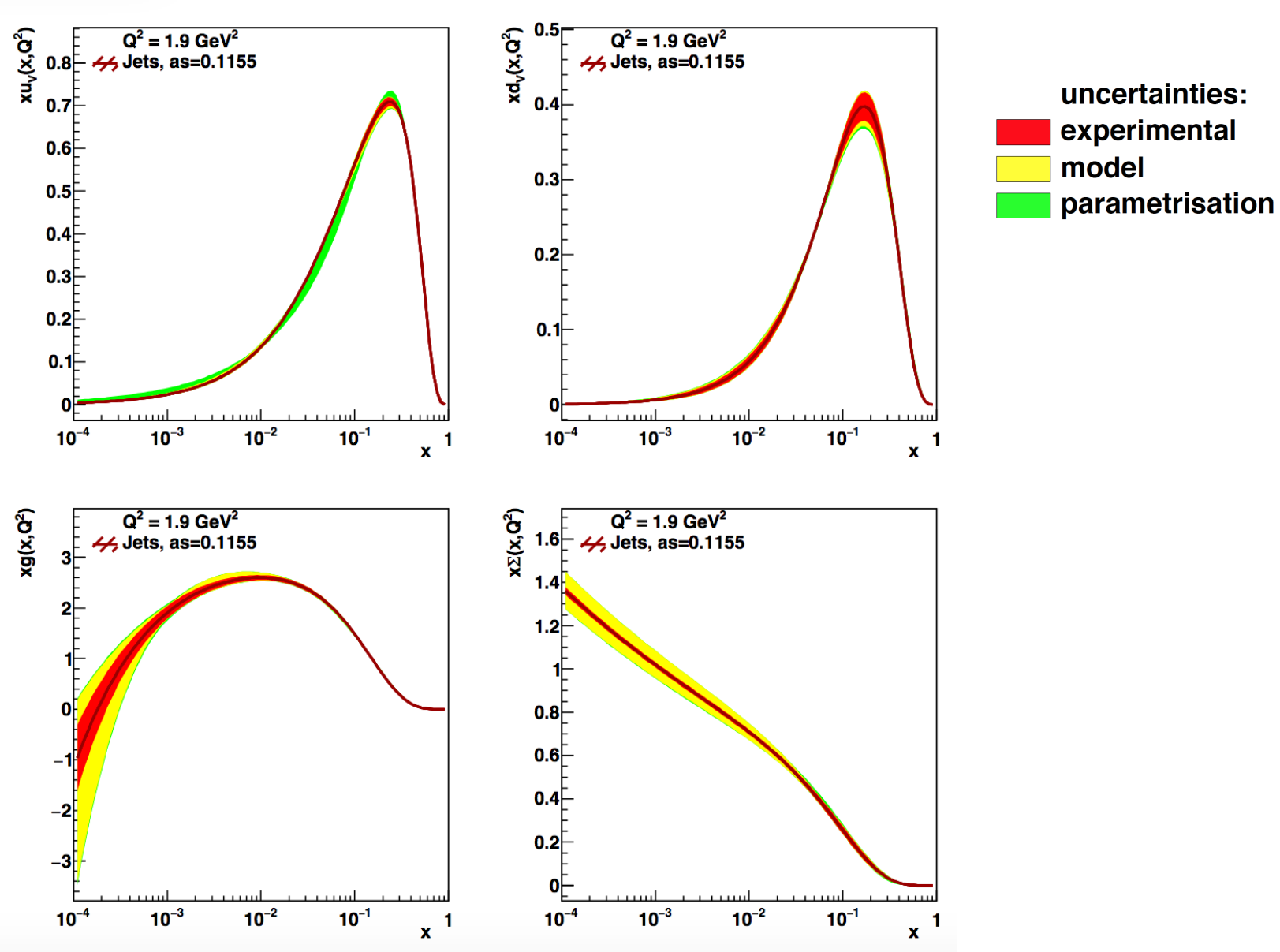


Full uncertainties → still being finalised



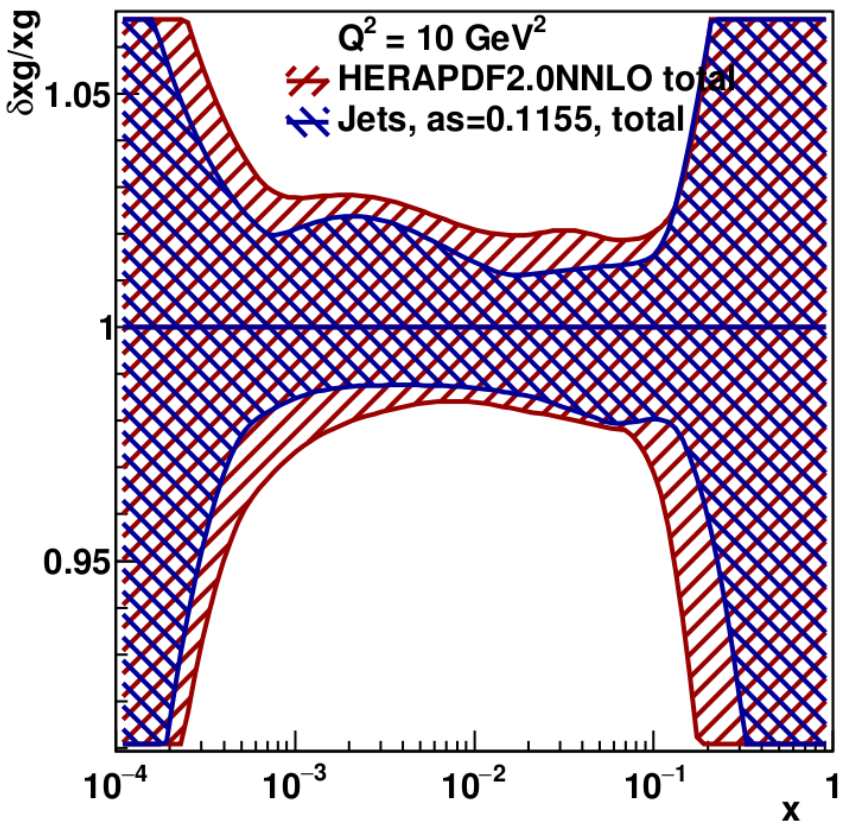
Full uncertainties → still being finalised

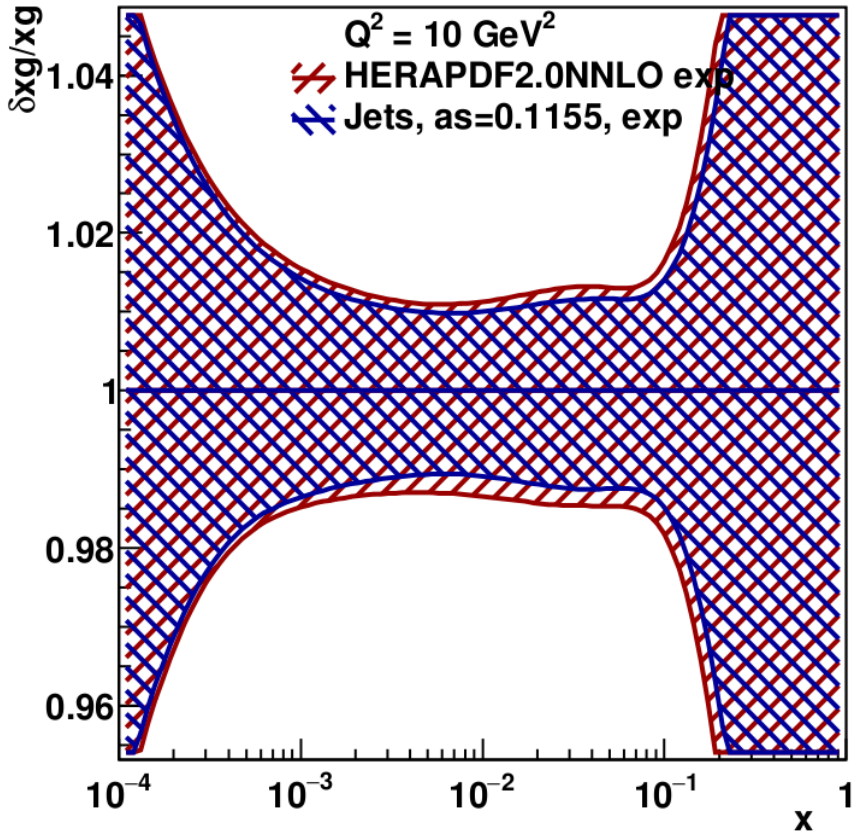
- NOMINAL FIT with fixed $\alpha_s = 0.1155$



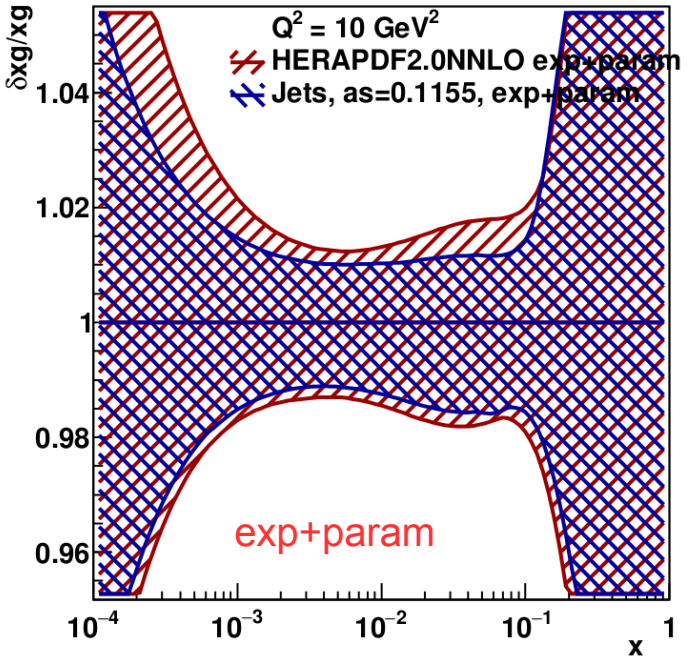
Uncertainties → improvement in comparison to HERAPDF2.0 NNLO

- Improvement in total uncertainty
  - Very small improvement in experimental part - expected

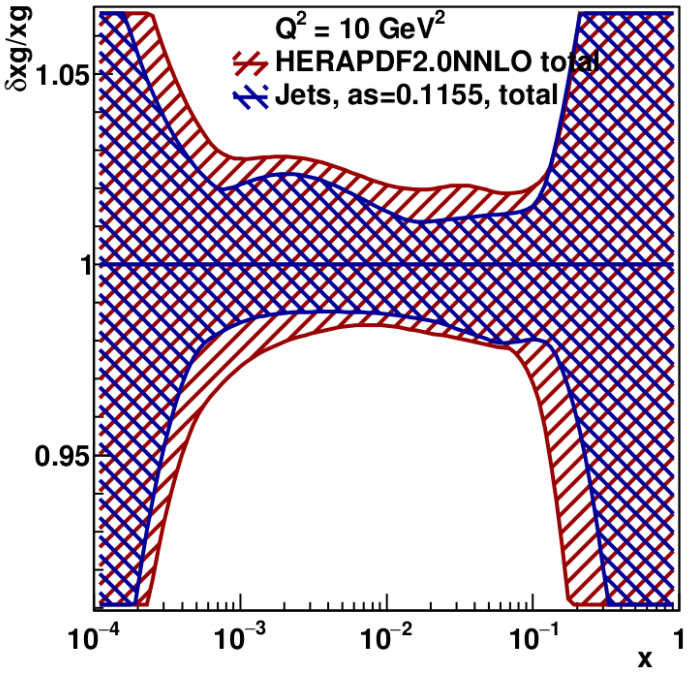




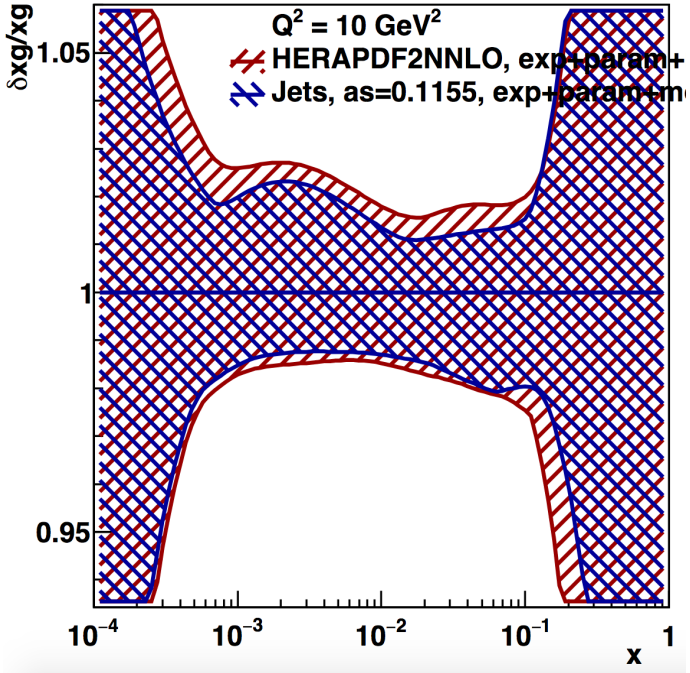
Uncertainties → improvement in comparison to HERAPDF2.0 NNLO



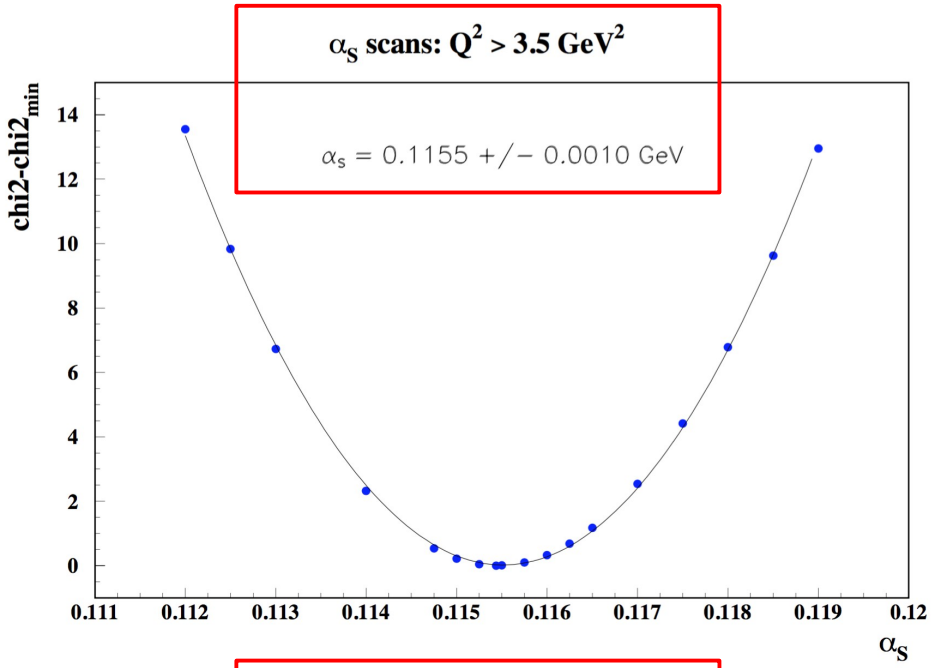
- Improvement in total uncertainties comes from model and parameterisation parts
  - Least important HF uncertainties (ranges of mc and mb masses)



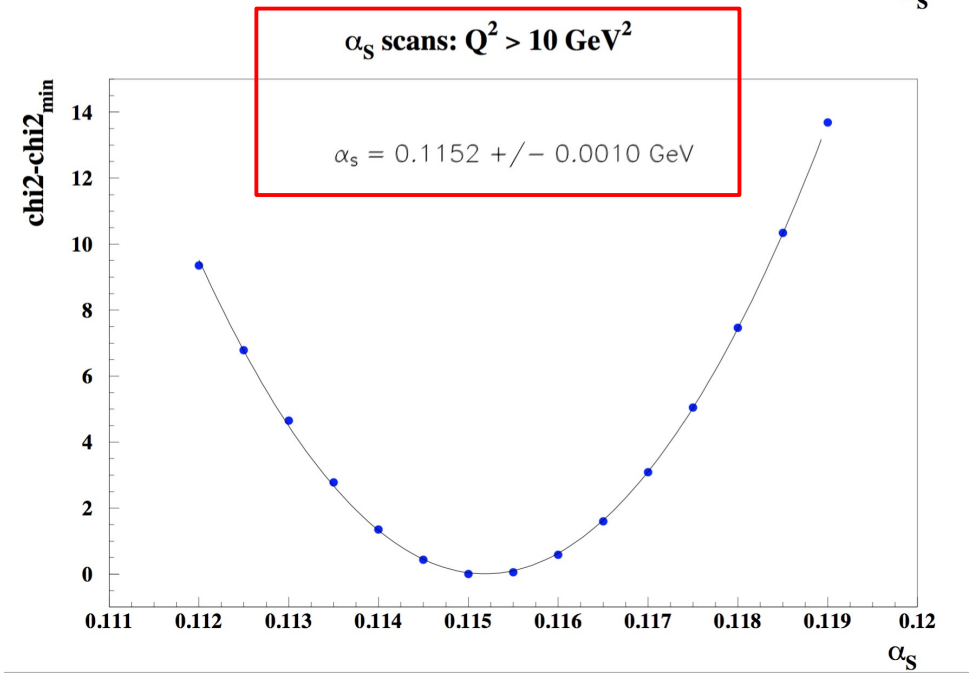
exp+param+model-noHF

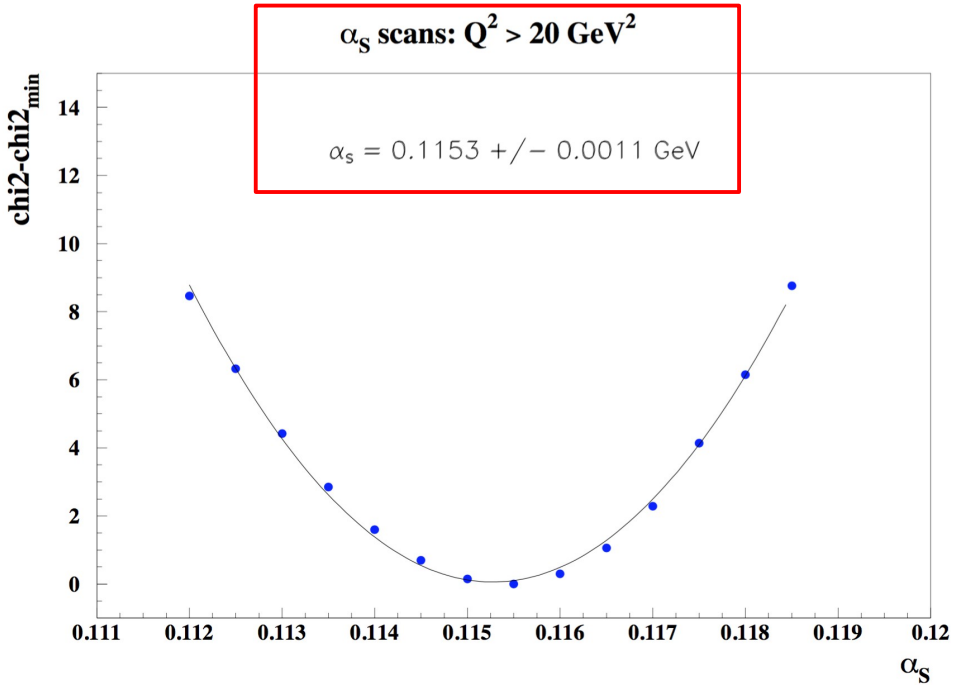


α_s dependence on Q^2 cut (DIS data)

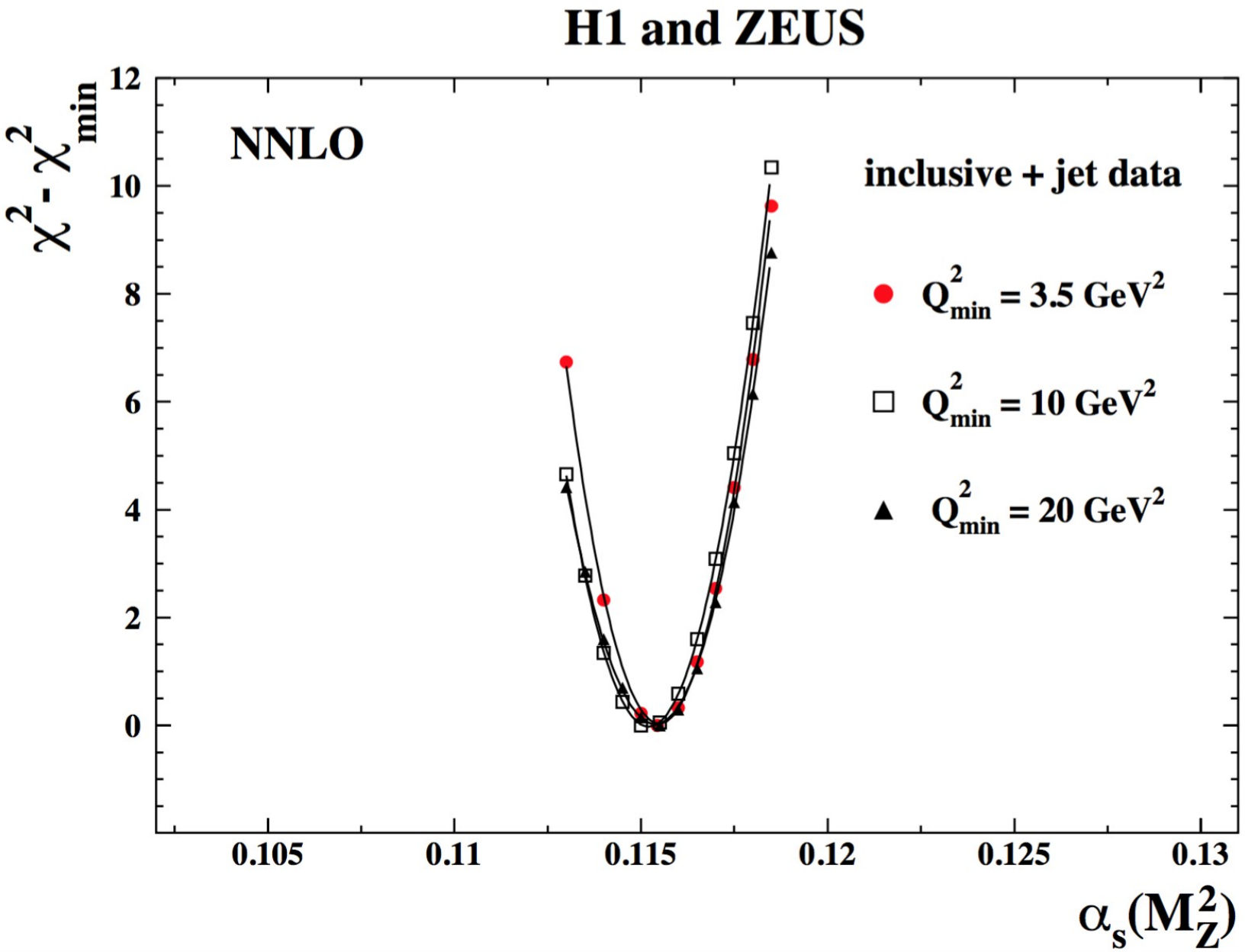


- α_s values consistent





α_s dependence on Q^2 cut (DIS data)



"Scale uncertainty" for gluon PDF → we were asked to investigate this

The 9-point scale variations, 7-point does not consider the red ones

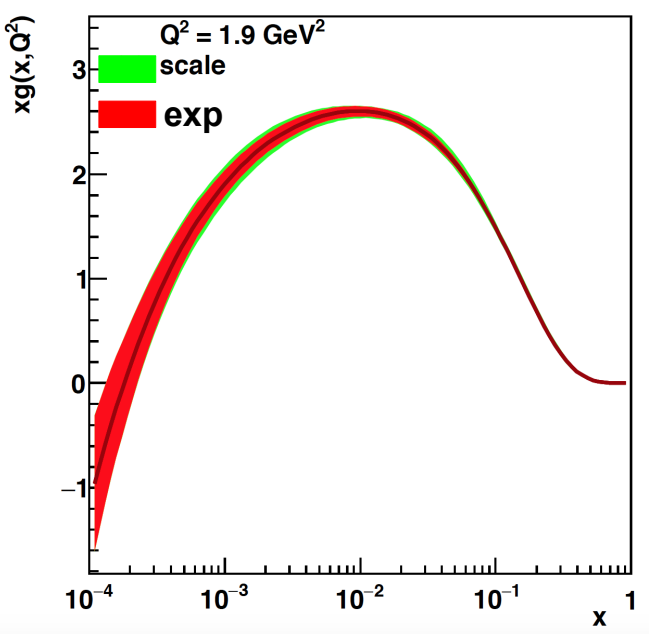
μR	μF=0.5	μF=1.0	μF=2.0
μR =0.5	1646.3	1645.3	1645.44
μR =1.0	1595.9	1594.9	1595.2
μR =2.0	1606.9	1602.4	1601.2

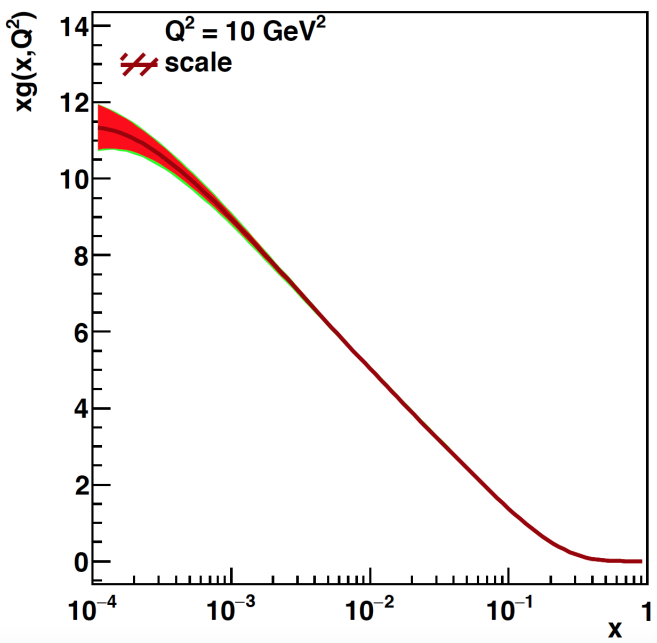
Central fit is in the centre(!)
All fits with μR varied down have poor chisq
μF barely makes a difference, μR is what matters
This is all for $\alpha_S(M_Z)$ =0.1155

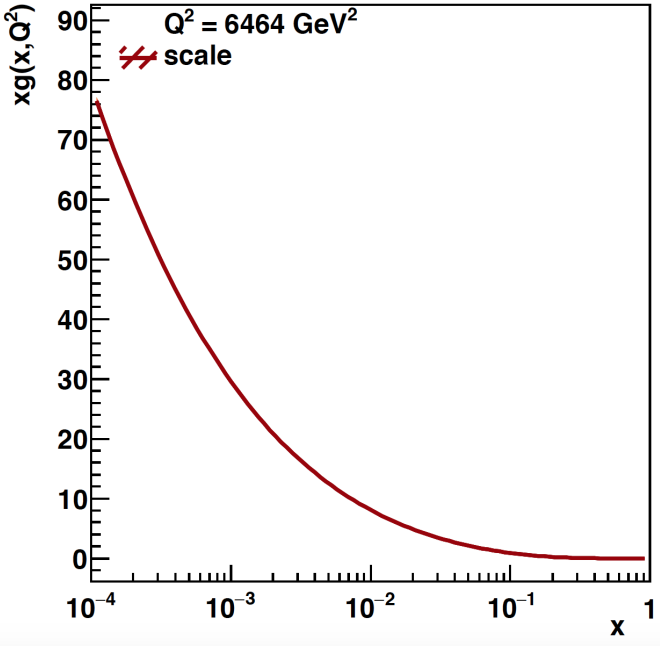
This is not the favoured value of $\alpha_S(M_Z)$ for the other scale choices. Their Chisq decreases for their own favoured values ~0.112/0.119 – but by only ~5 to10 points—the chisq for μR =0.5 is still BAD.

"Scale uncertainty" effect on gluon PDF

- Scale uncertainty drawn for gluon PDF as envelope **(in green)**

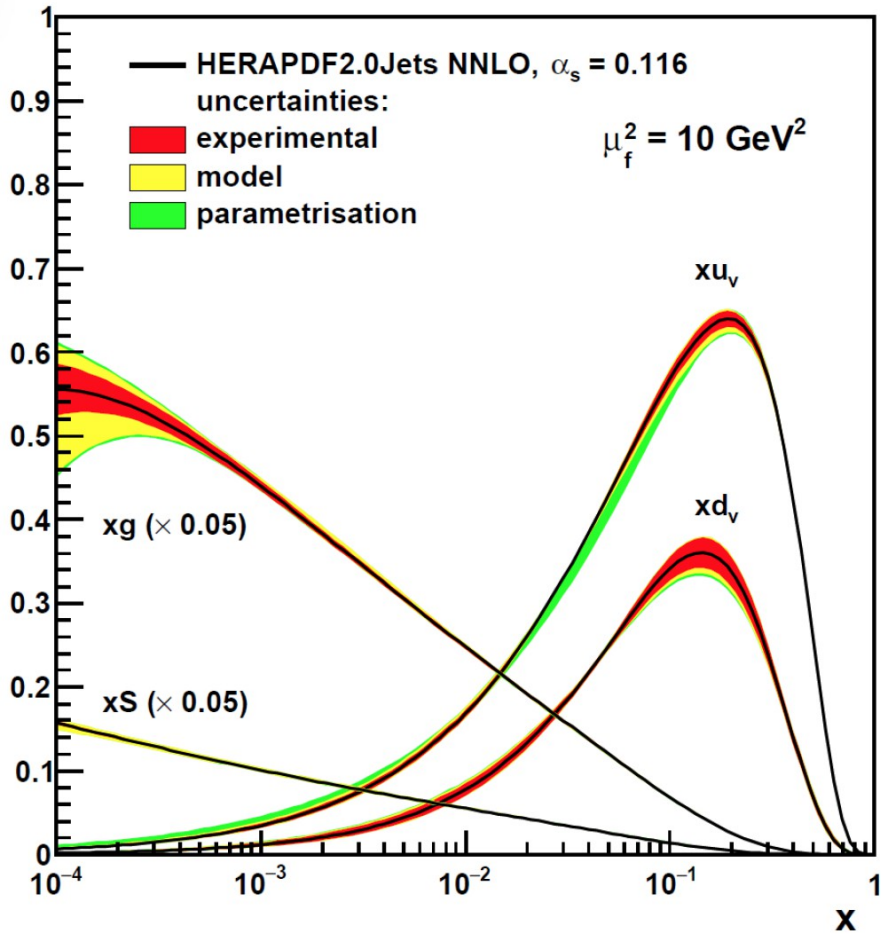


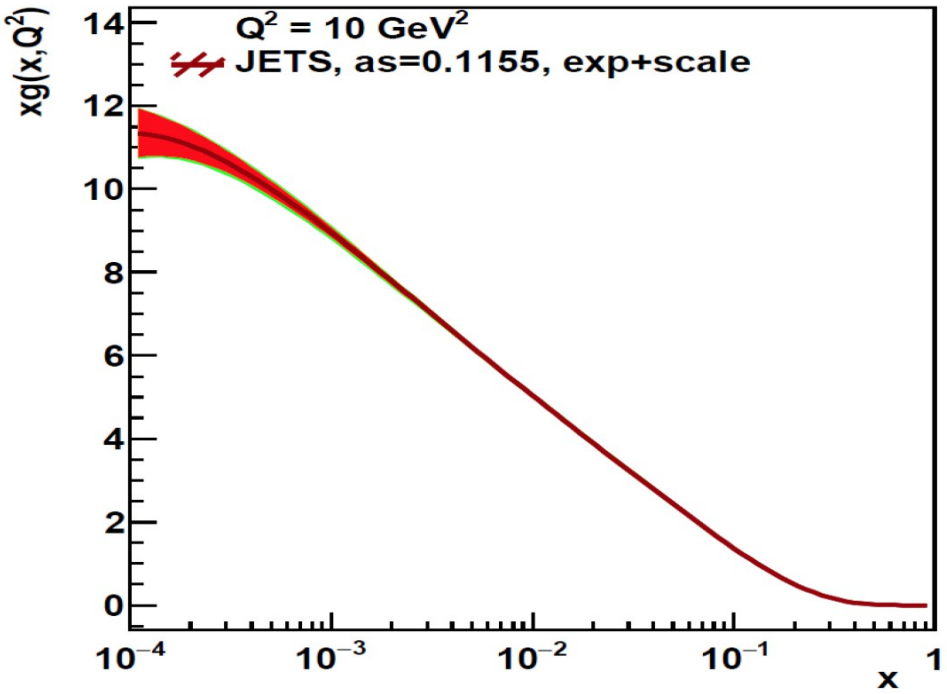




- Very small effect, invisible for hight scales
- Authors don't think they want scale uncertainty like this presented in the paper → consulting theorists,T. Gehrmann agrees with authors

"Scale uncertainty" effect on gluon PDF





Thank you for your attention :)