

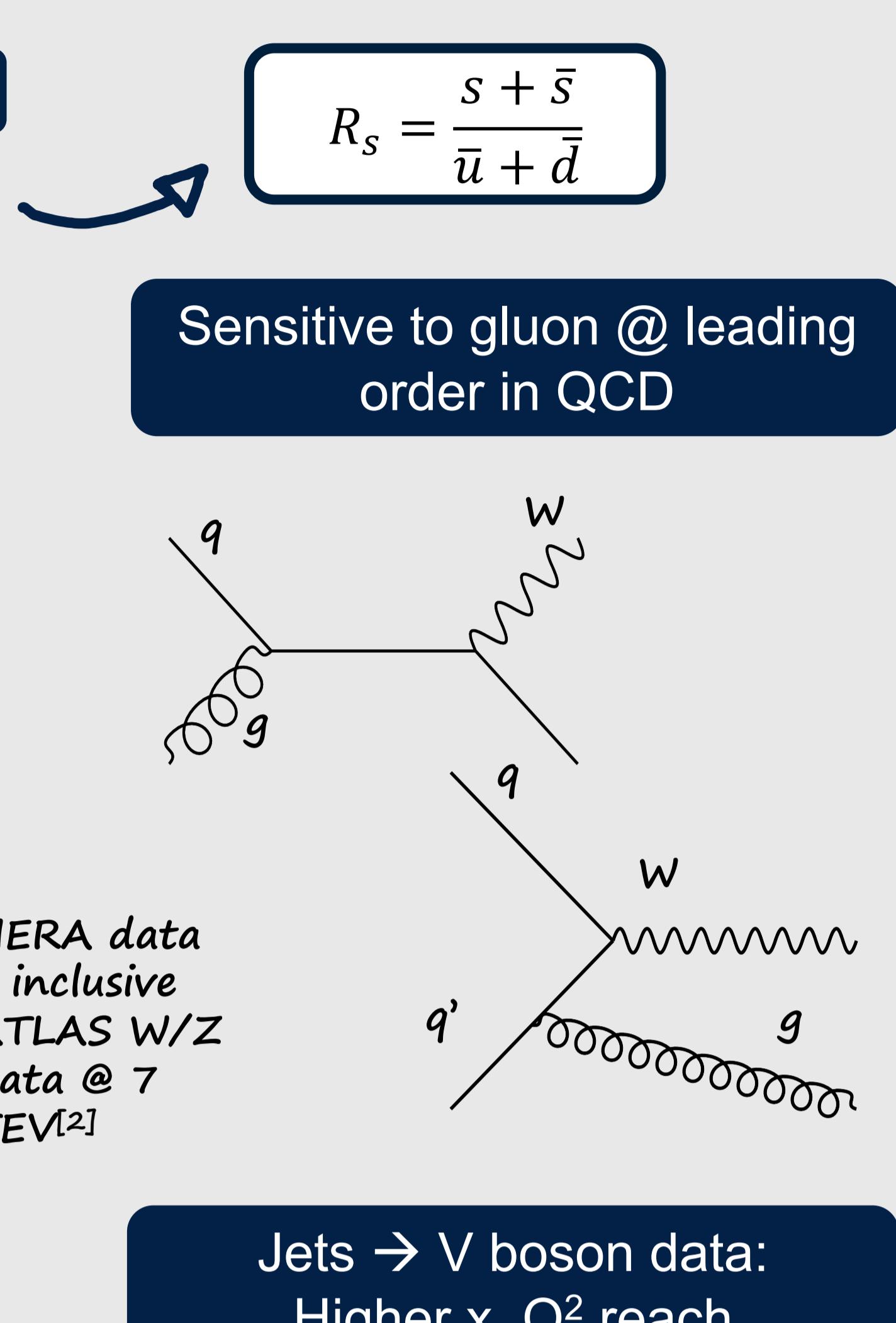
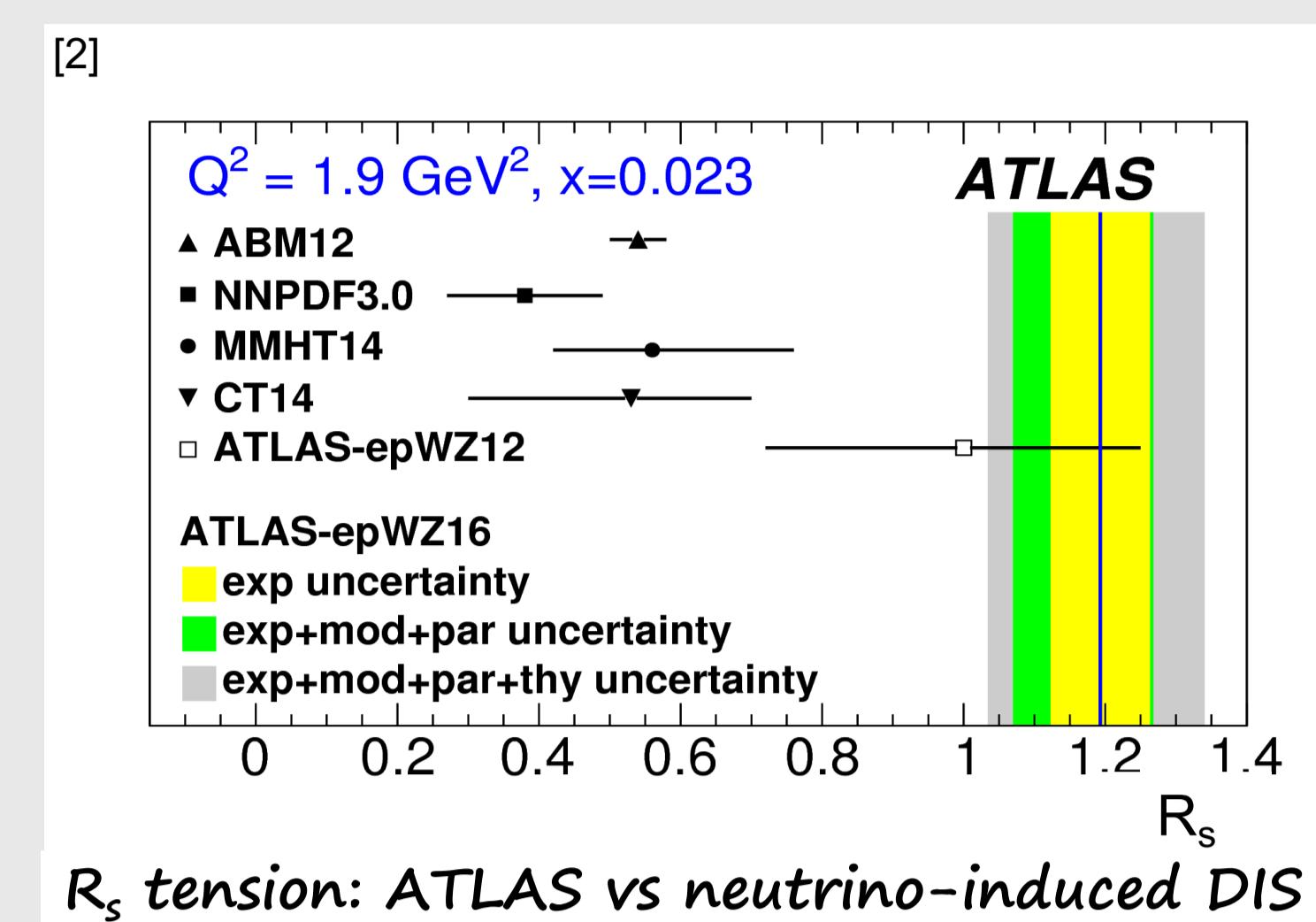
The impact of ATLAS V+jet measurements on PDF fits^[1]

Eimear Conroy on behalf of the **ATLAS** collaboration

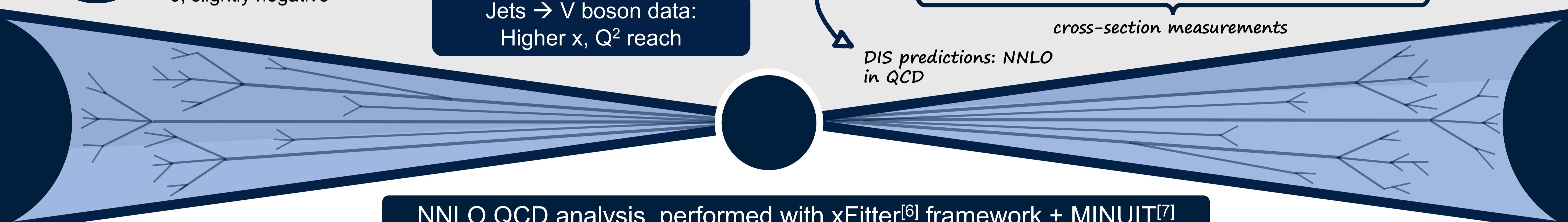
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1. The motivations

Quark flavour: Fit strange sea directly



HERA data + inclusive ATLAS W/Z data @ 7 TeV^[2]



3. The technicalities^[1]

Parameterisation

Scales

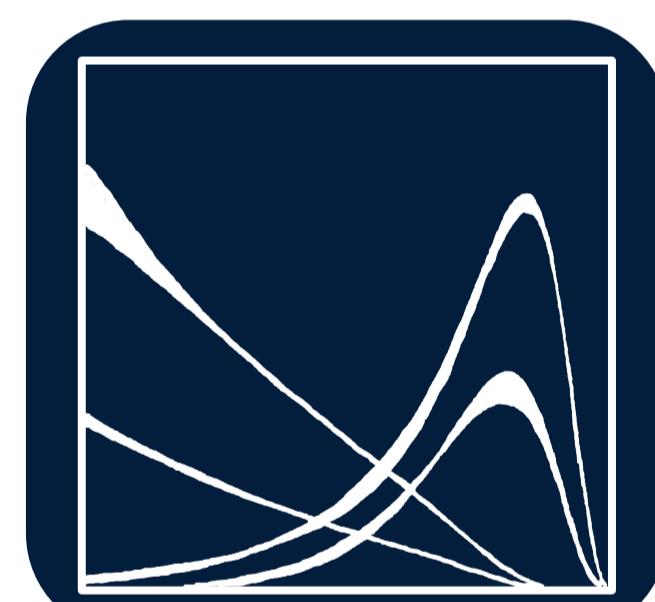
$Q^2_0 = 1.9 \text{ GeV}^2$ starting scale evolved with DGLAP

$Q^2_{\min} = 10 \text{ GeV}^2$ (avoid region with poor HERA χ^2)

General form: $xf(x) = Ax^B(1-x)^C(1+Dx+Ex^2)e^F$ (extra gluon term: $-A'_g x^{B'_g}(1-x)^{C'_g}$)

Constrained by:

- Momentum sum rule
- Number sum rule
- $\bar{u} = \bar{d}$ as $x \rightarrow 0$



HERAPDF2.0^[8]
+ E_{uv}, D_g
= 16 free parameters

Chi-square definition

$$\chi^2 = \sum_{ik} \left(D_i - T_i \left(1 - \sum_j \gamma_{ij} b_j \right) \right) C_{stat, ik}^{-1} (D_i, D_k) \left(D_k - T_k \left(1 - \sum_j \gamma_{kj} b_j \right) \right)$$

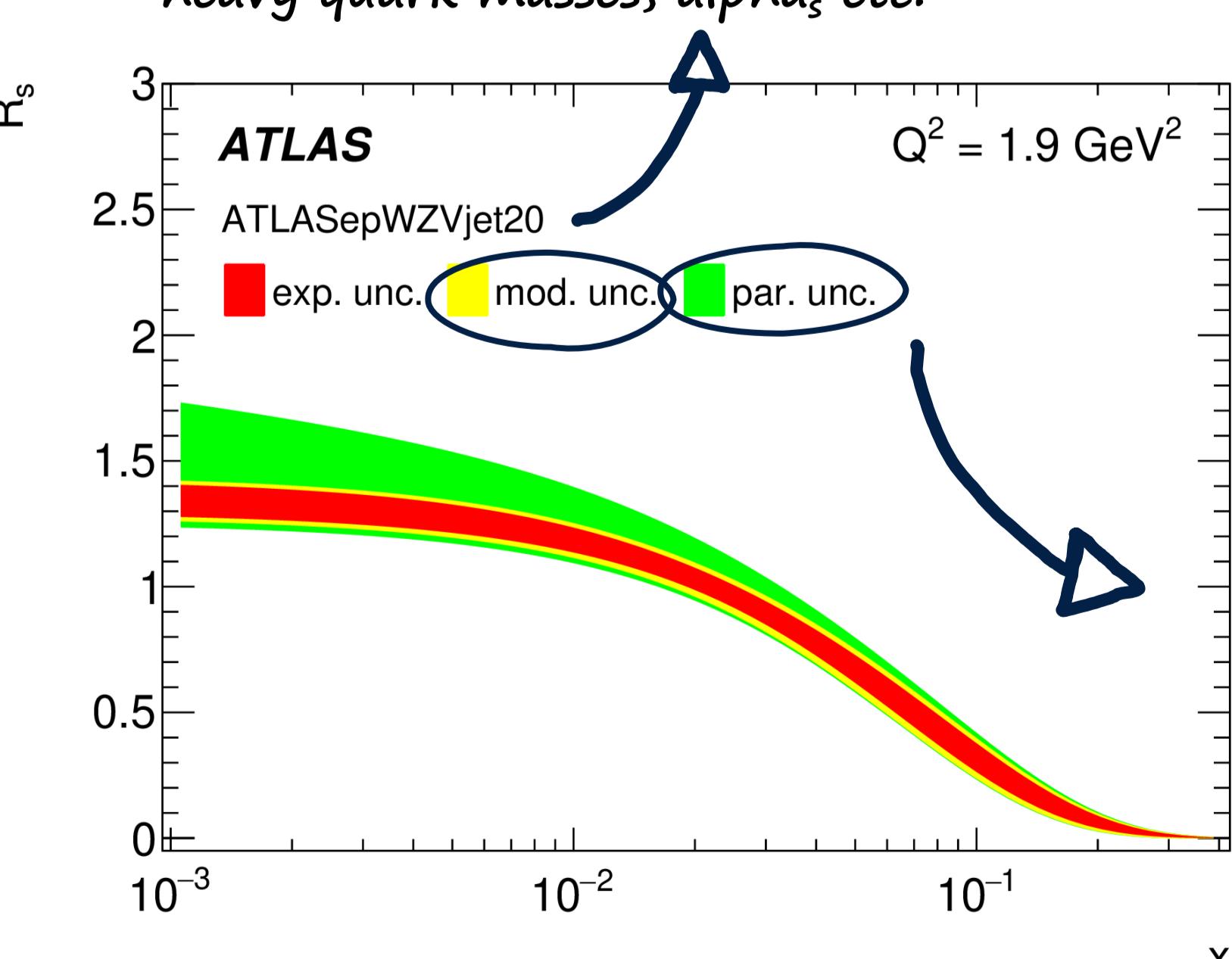
Correlated term

$$+ \sum_j b_j^2 + \sum_i \log \frac{\delta_{i,uncor}^2 T_i^2 + \delta_{i,stat}^2 D_i T_i}{\delta_{i,uncor}^2 D_i^2 + \delta_{i,stat}^2 D_i^2}$$

Log penalty (bias correction)

D: Data point T: Theory prediction $\delta_{uncor(stat)}$: Uncorrelated statistical (systematic) uncertainties on D
 γ : Correlated systematic uncertainties b: Nuisance parameters C_{stat} : Statistical correlation matrix

Vary theoretical assumptions: Q^2_{\min}, Q^2_0 , heavy quark masses, α_s etc.



Uncertainties

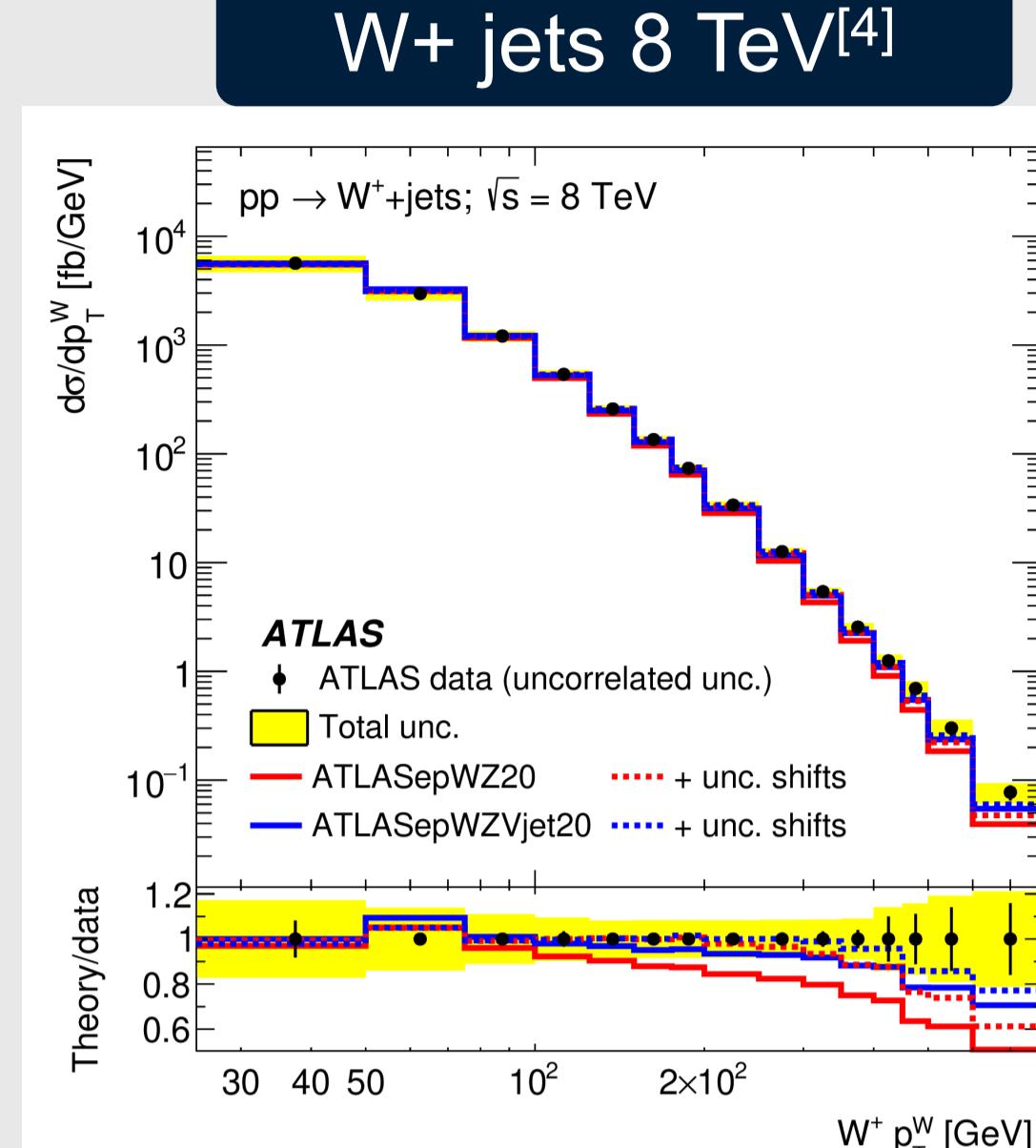
- Experimental
- Model
- Parameterisation

Add extra D, E, F parameters (low-x sea), relax constraints

2. The datasets

$d\sigma/dp_T^W$ spectrum

W+ jets 8 TeV^[4]



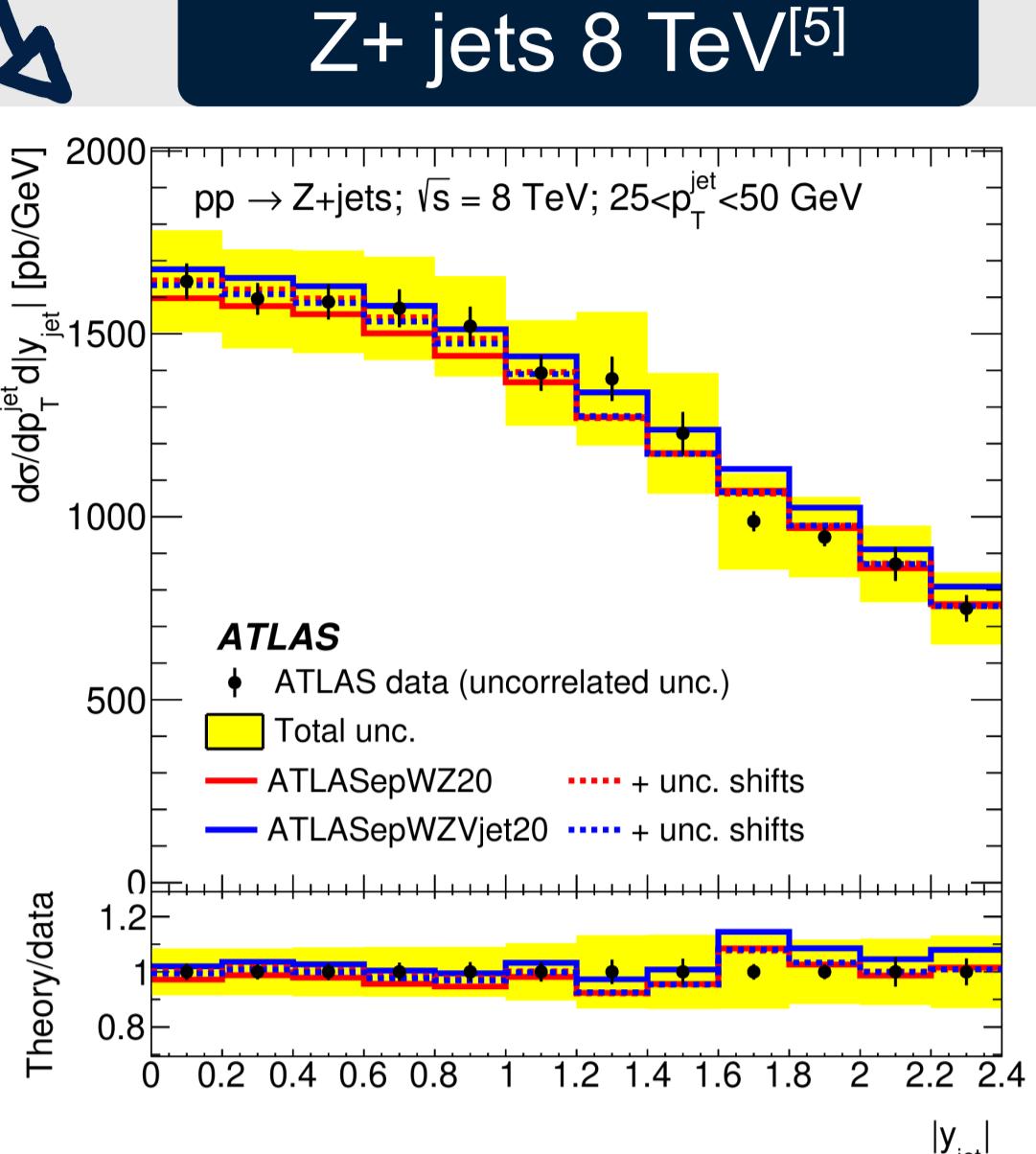
Adding V+jet data to PDF fit ...

better data description @ high p_T

normalization change only

$d\sigma/dp_T^{\text{jet}} d|y_{\text{jet}}|$ spectra

Z+ jets 8 TeV^[5]

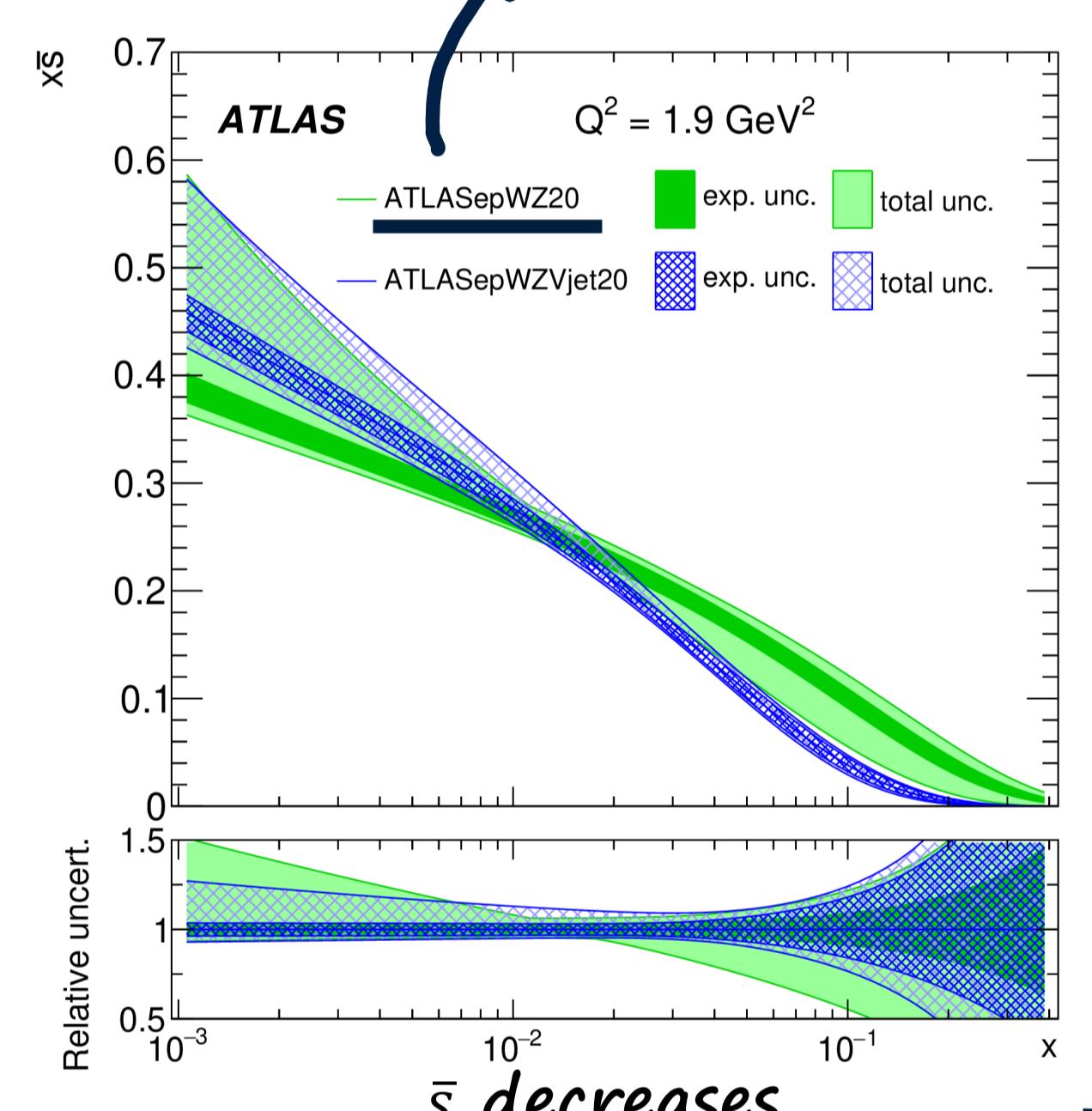


kfactors: NLO QCD predictions \rightarrow NNLO & LO EW predictions \rightarrow NLO



4. The results^[1]

identical fit without Vjets data

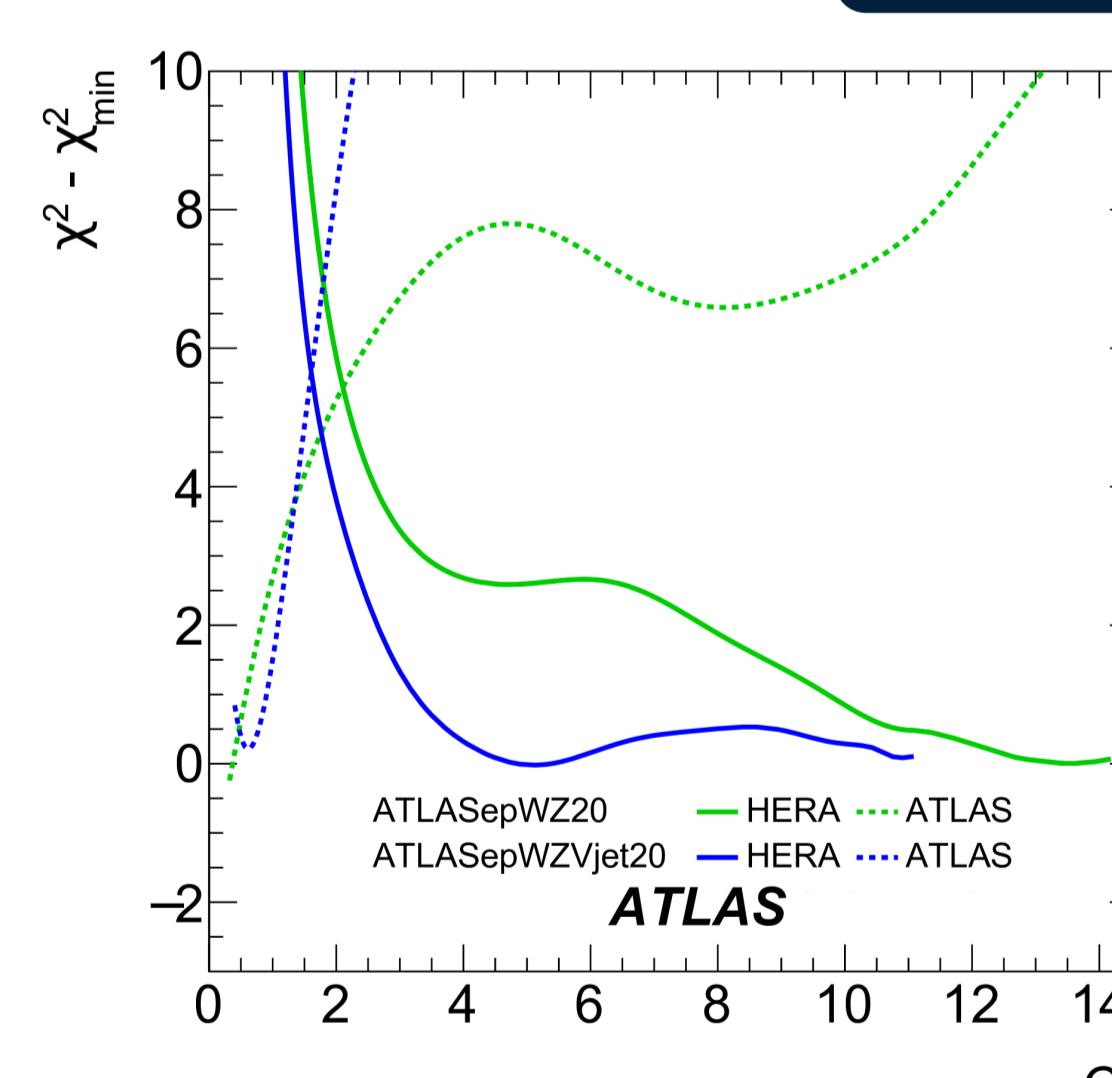


V+jet data in fit \rightarrow at high x ...

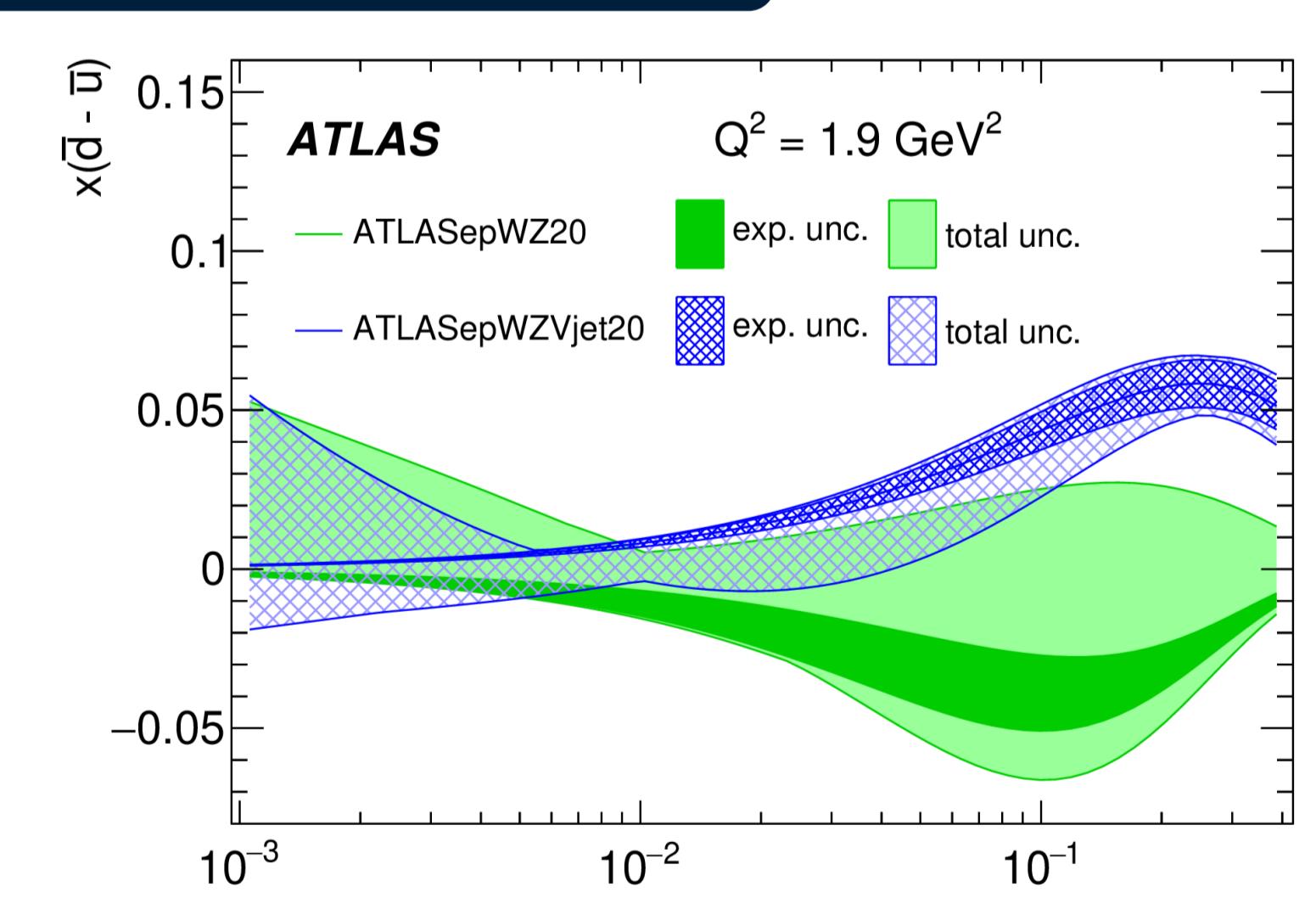
HERA constrains sum

uncertainties constrained

($\bar{d} - \bar{u}$) at high x ...



ATLAS preference for large \bar{d} (C_d small) ...



$\dots \rightarrow (\bar{d} - \bar{u}) > 0$

R_s

Tension remains with global fits but reduced vs previous ATLAS fits

R_s

Includes ATLAS inclusive W, Z data

