QCD fits with 8 TeV W asymmetry data

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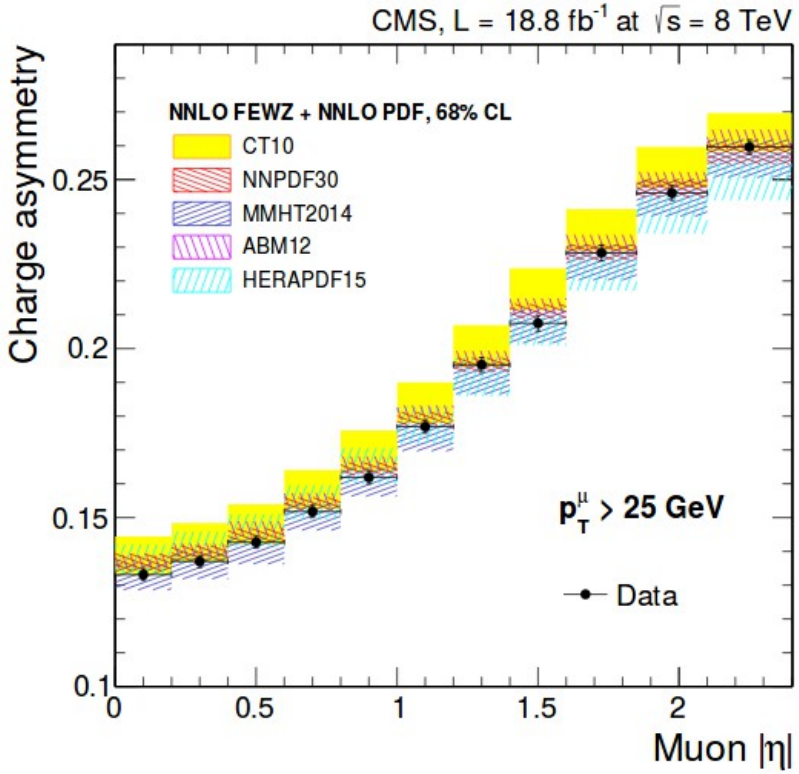
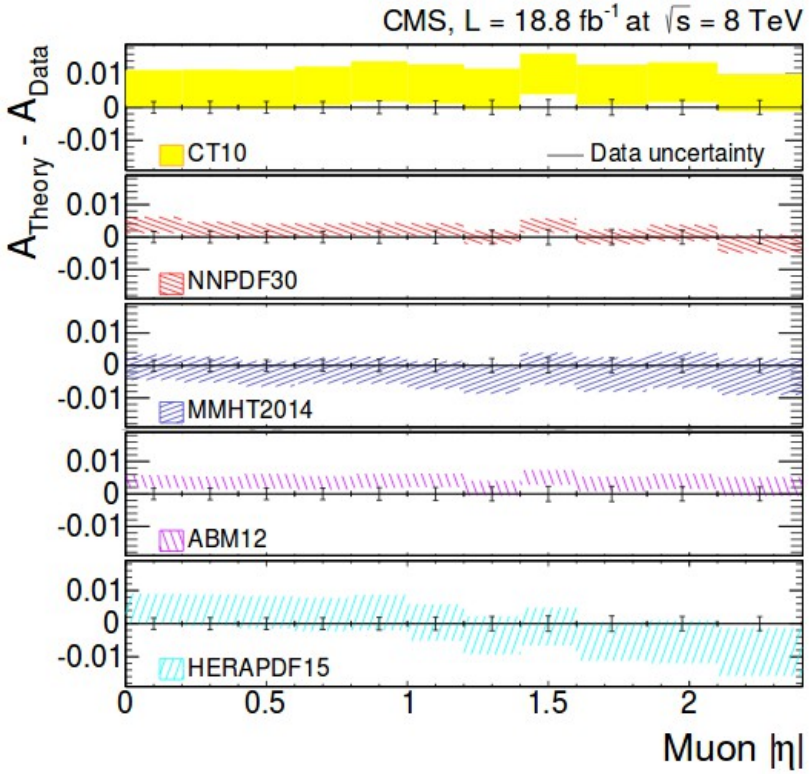
Data

- Data for 13 TeV from MIT W group:
  - Quick-and-dirty, we have to make our own cross sections
- Data for 8 TeV: 1603.01803, exist in xFitter





QCD analysis @ 8 TeV @ NNLO

- Let's look now at 8 TeV QCD analysis and possible additions
- Parameterisation & settings similar to HERAPDF2.0 (not the same)
  - Parameterisation found in parameterisation scan → we will have to do it, too

$$xg(x) = A_g x^{B_g} (1-x)^{C_g} (1 + D_g x), \quad (5)$$

$$xu_v(x) = A_{u_v} x^{B_{u_v}} (1-x)^{C_{u_v}} (1 + E_{u_v} x^2), \quad (6)$$

$$xd_v(x) = A_{d_v} x^{B_{d_v}} (1-x)^{C_{d_v}}, \quad (7)$$

$$x\overline{U}(x) = A_{\overline{U}} x^{B_{\overline{U}}} (1-x)^{C_{\overline{U}}} (1 + E_{\overline{U}} x^2), \quad (8)$$

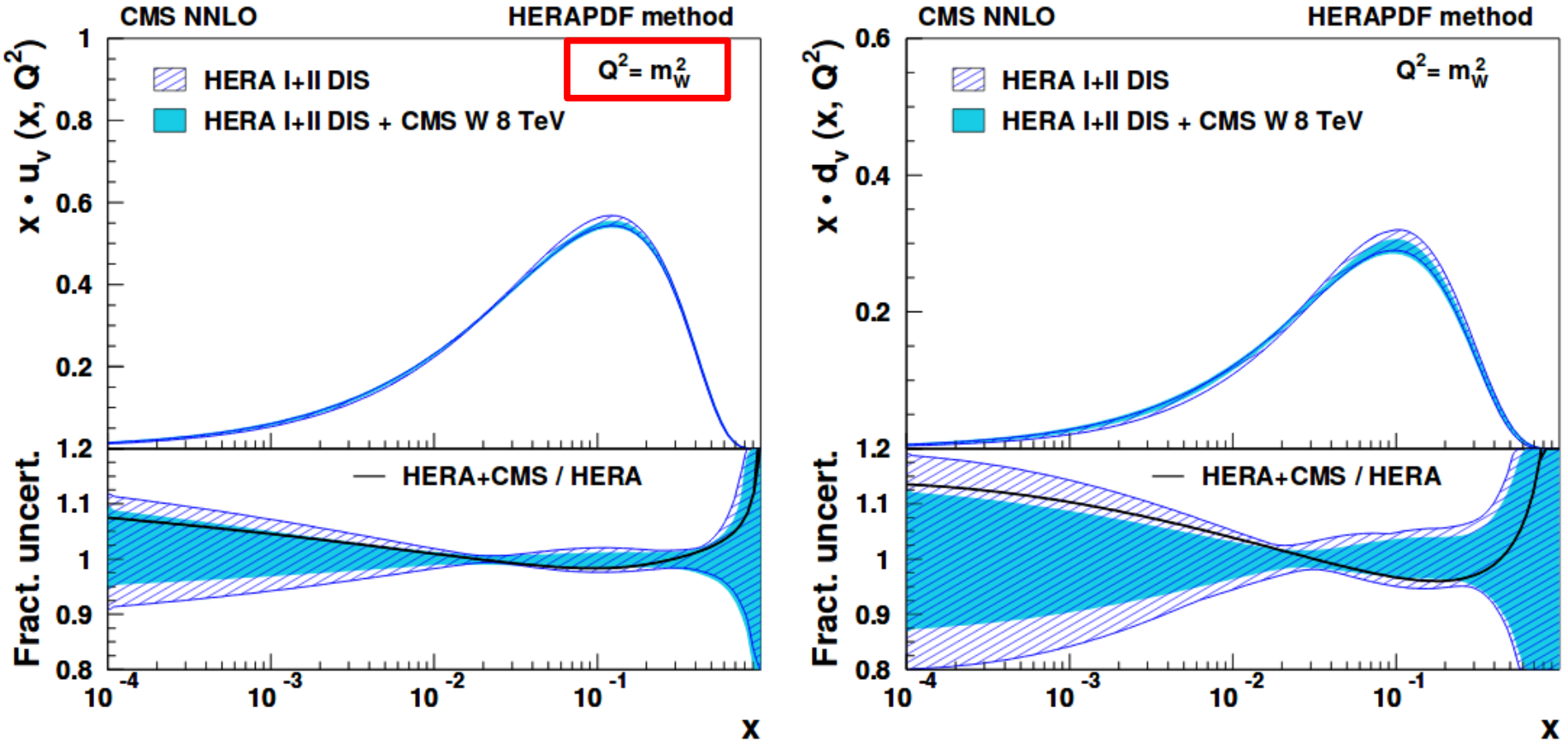
$$x\overline{D}(x) = A_{\overline{D}} x^{B_{\overline{D}}} (1-x)^{C_{\overline{D}}}, \quad (9)$$

with the relations $x\overline{U} = x\bar{u}$ and $x\overline{D} = x\bar{d} + x\bar{s}$ assumed.

The normalization parameters A_{u_v}, A_{d_v}, and A_g are determined by the QCD sum rules, the B parameter is responsible for small-x behavior of the PDFs, and the parameter C describes the shape of the distribution as $x \to 1$. Additional constraints $B_{\overline{U}} = B_{\overline{D}}$ and $A_{\overline{U}} = A_{\overline{D}}(1 - f_s)$ are imposed with f_s being the strangeness fraction, $f_s = \bar{s}/(\bar{d} + \bar{s})$, which is fixed to $f_s = 0.31 \pm 0.08$

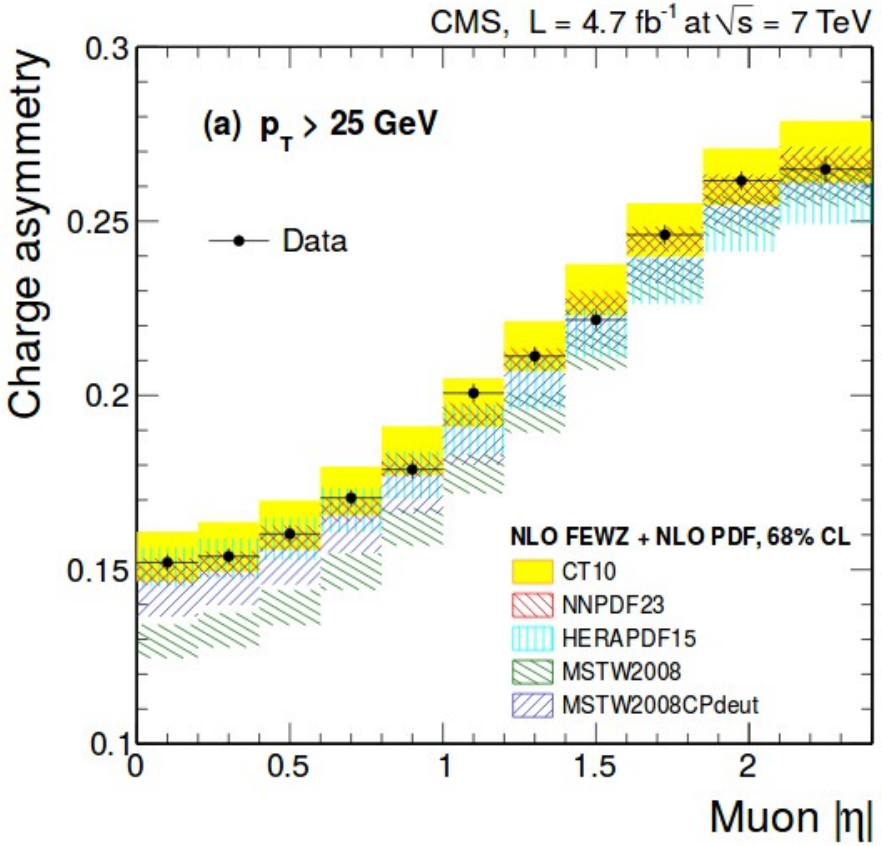
Data sets	Partial χ^2/n_{dp}
HERA1+2 neutral current, e^+p, $E_p = 920\,\text{GeV}$	440/377
HERA1+2 neutral current, e^+p, $E_p = 820\,\text{GeV}$	69/70
HERA1+2 neutral current, e^+p, $E_p = 575\,\text{GeV}$	214/254
HERA1+2 neutral current, e^+p, $E_p = 460\,\text{GeV}$	210/204
HERA1+2 neutral current, e^-p, $E_p = 920\,\text{GeV}$	218/159
HERA1+2 charged current, e^+p, $E_p = 920\,\text{GeV}$	46/39
HERA1+2 charged current, e^-p, $E_p = 920\,\text{GeV}$	50/42
Correlated χ^2 of HERA1+2 data	141
CMS $W^\pm$ muon charge asymmetry $\mathcal{A}(\eta_\mu)$, $\sqrt{s} = 8\,\text{TeV}$	3/11
Global χ^2/n_{dof}	1391/1143

Results



Additional data at 7 TeV

- There are also results at 7 TeV: 1312.6283
- So far used @ NLO only
  - Compatible with 8 TeV
  - Similar conclusions for PDFs



- NEW
  - NNLO k-factors available
  - Used within xFitter

Ref. [11]. Due to somewhat lower Bjorken x probed by the measurements at 8 TeV, as compared to 7 TeV, the two data sets are complementary and should both be used in the future global QCD analyses.

→ Can be now used together with 8 TeV @ NNLO

Fit results

Data sets	Partial χ^2/n_{dp}
HERA1+2 neutral current, e^+p, $E_p = 920\,GeV$	440/377
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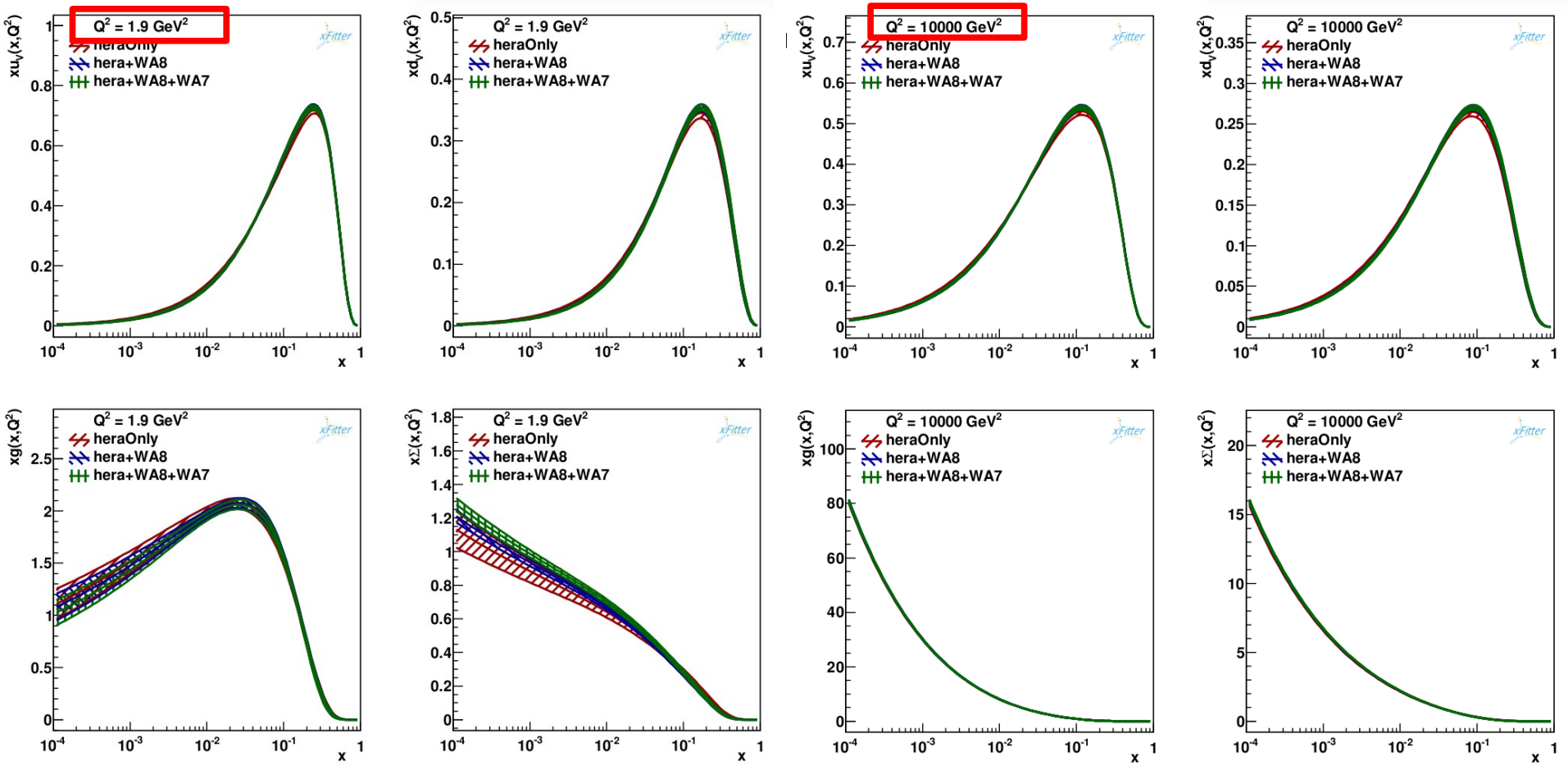
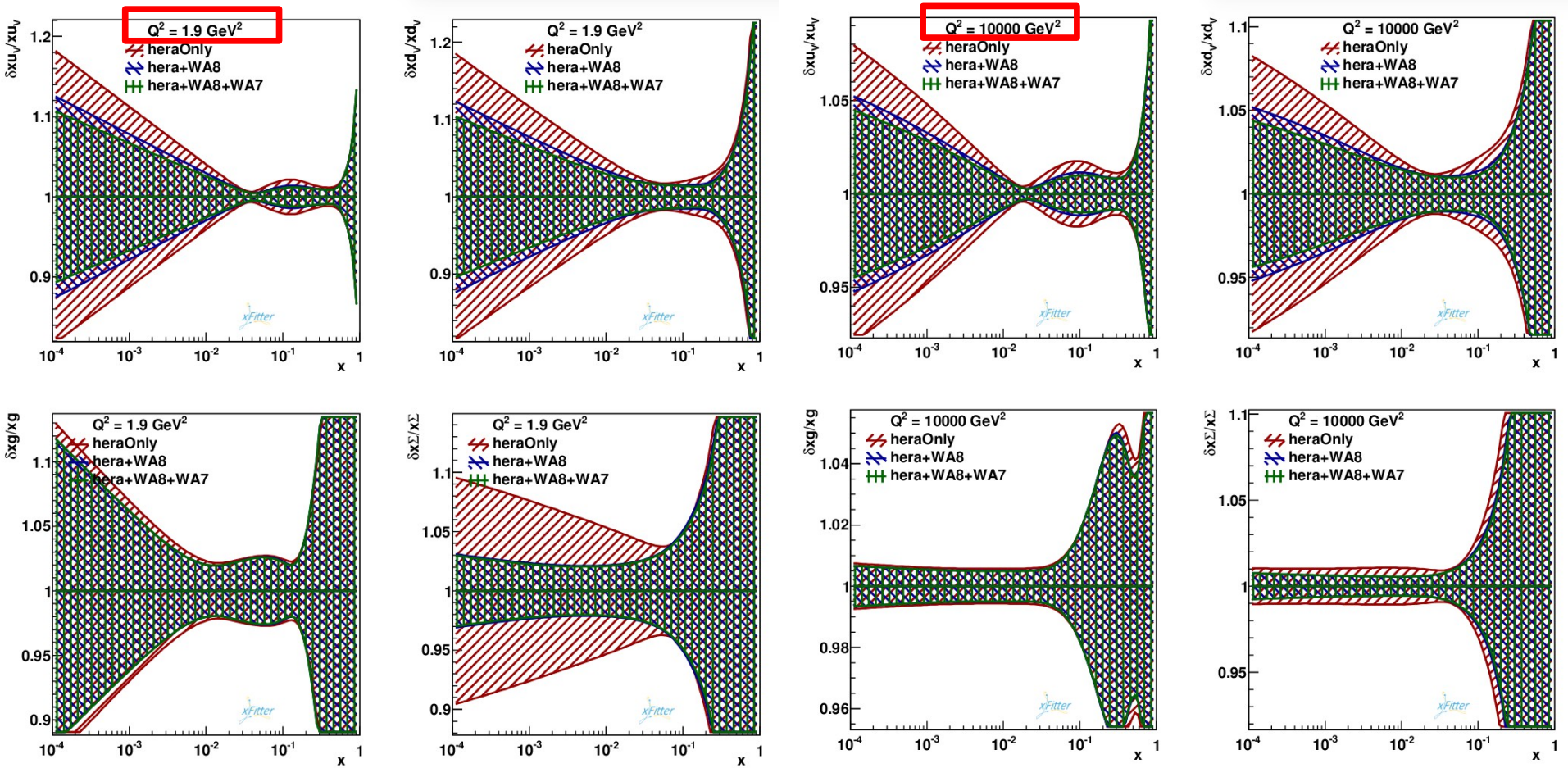
- Replication of 8 TeV analysis
  - Good consistency
- 7 TeV data added @ NNLO
  - Fits well

Dataset	heraOnly	hera+WA8	hera+WA8+WA7
HERA1+2 CCep	45 / 39	47 / 39	45 / 39
HERA1+2 CCem	61 / 42	61 / 42	63 / 42
HERA1+2 NCem	222 / 159	220 / 159	221 / 159
HERA1+2 NCep 820	70 / 70	71 / 70	71 / 70
HERA1+2 NCep 920	445 / 377	444 / 377	446 / 377
HERA1+2 NCep 460	217 / 204	216 / 204	217 / 204
HERA1+2 NCep 575	223 / 254	222 / 254	223 / 254
CMS W muon asymmetry 7 TeV	-	-	13 / 11
CMS W muon asymmetry 8 TeV	-	3.1 / 11	2.8 / 11
Correlated χ^2	94	95	95
Log penalty χ^2	+4.6	+8.3	+5.0
Total χ^2 / dof	1382 / 1132	1387 / 1143	1399 / 1154
χ^2 p-value	0.00	0.00	0.00

PDFs at starting scale & 10000 GeV²



Experimental uncertainties



Data description