

# Validphys Report

## NNPDF revision 528M

The NNPDF Collaboration

February 4, 2013

### Contents

<b>1 Fit summary</b>	<b>1</b>	2.4 Replicas in the evolution basis . . . . .	12
		2.5 Replicas in the LH basis . . . . .	15
<b>2 Comparing PDFs</b>	<b>2</b>	<b>3 Fit properties</b>	<b>17</b>
2.1 Distances . . . . .	2	3.1 $\chi^2$ details - experimental covariance matrix	18
2.2 Comparing PDFs in evolution basis . . . . .	3		
2.3 Comparing PDFs in LHA basis . . . . .	8	<b>4 Configuration file of the training</b>	<b>19</b>

VALIDPHYS 528M	Current Fit	Reference	CTEQ	MSTW
<b>PDF set name</b>	NNPDF23 nlo as 0120 mc	NNPDF23 nlo as 0120	CT10nlo	MSTW2008nlo90cl

Table 1: Configuration file

## 1 Fit summary

- This is the description block, please update these lines before run.

Parameter	Current Fit	Reference Fit
$\chi_{\text{tot}}^2$ (exp)	1.15	1.09
$\langle E \rangle \pm \sigma_E$	2.21±0.06	2.21±0.06
$\langle E_{\text{tr}} \rangle \pm \sigma_{E_{\text{tr}}}$	2.17±0.09	2.17±0.09
$\langle E_{\text{val}} \rangle \pm \sigma_{E_{\text{val}}}$	2.25±0.08	2.25±0.08
$\langle \text{TL} \rangle \pm \sigma_{\text{TL}}$	18539±6918	18539±6918
$\langle \chi^{2(k)} \rangle \pm \sigma_{\chi^{2(k)}}$	1.17±0.07	1.16±0.08
$\langle \sigma^{(\text{exp})} \rangle_{\text{dat}}$	14.89%	14.89%
$\langle \sigma^{(\text{net})} \rangle_{\text{dat}}$	2.89%	3.09%
$\langle \rho^{(\text{exp})} \rangle_{\text{dat}}$	3.81e-01	3.81e-01
$\langle \rho^{(\text{net})} \rangle_{\text{dat}}$	6.10e-01	5.87e-01
$\langle \text{cov}^{(\text{exp})} \rangle_{\text{dat}}$	1.87e+08	1.87e+08
$\langle \text{cov}^{(\text{net})} \rangle_{\text{dat}}$	1.09e+06	8.89e+05
$x\Sigma + xg$	1.00600e+00±3.17845e-03	9.99715e-01±7.70332e-04
$u_v$	2.00133e+00±1.30948e-02	2.00192e+00±1.45620e-02
$d_v$	1.00130e+00±1.32110e-02	1.00240e+00±1.47082e-02
$s_v$	-1.10087e-03±3.49152e-03	4.66451e-06±1.07592e-05
$xs_v$	2.34501e-03±1.64846e-03	3.58400e-03±2.08038e-03
$K_s$	3.34251e-01±6.90586e-02	2.84304e-01±7.70546e-02
$\Delta_s$	1.39619e-01±3.50720e-02	1.39031e-01±3.53393e-02

Table 2: Summary.

## 2 Comparing PDFs

### 2.1 Distances

NNPDF Fit vs Reference Distances

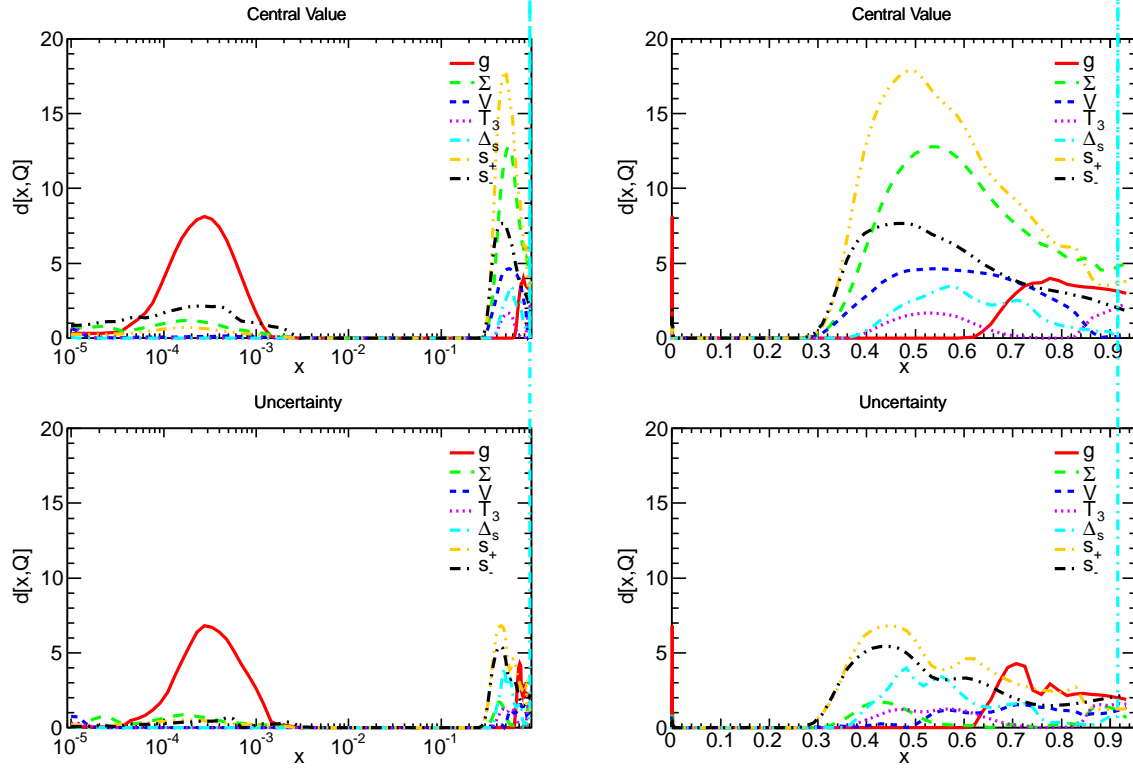


Figure 1: Distances in the fitting basis.

NNPDF Fit vs Reference Distances

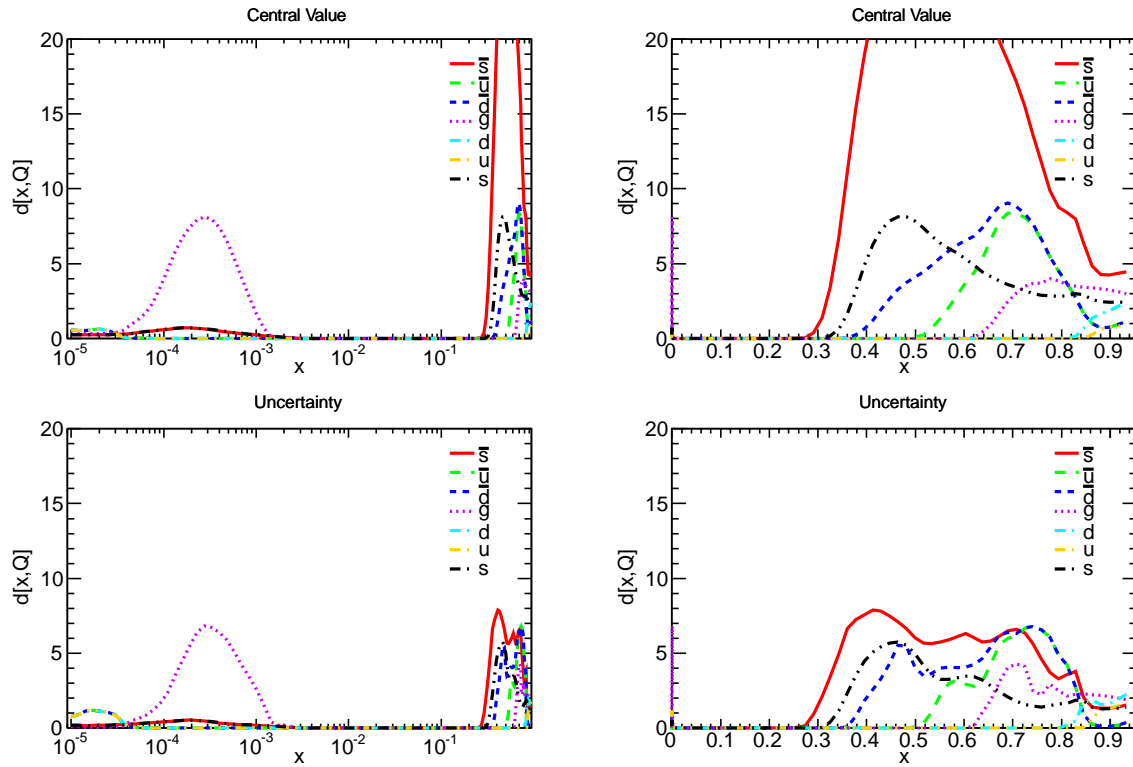


Figure 2: Distances in the flavour basis.

## 2.2 Comparing PDFs in evolution basis

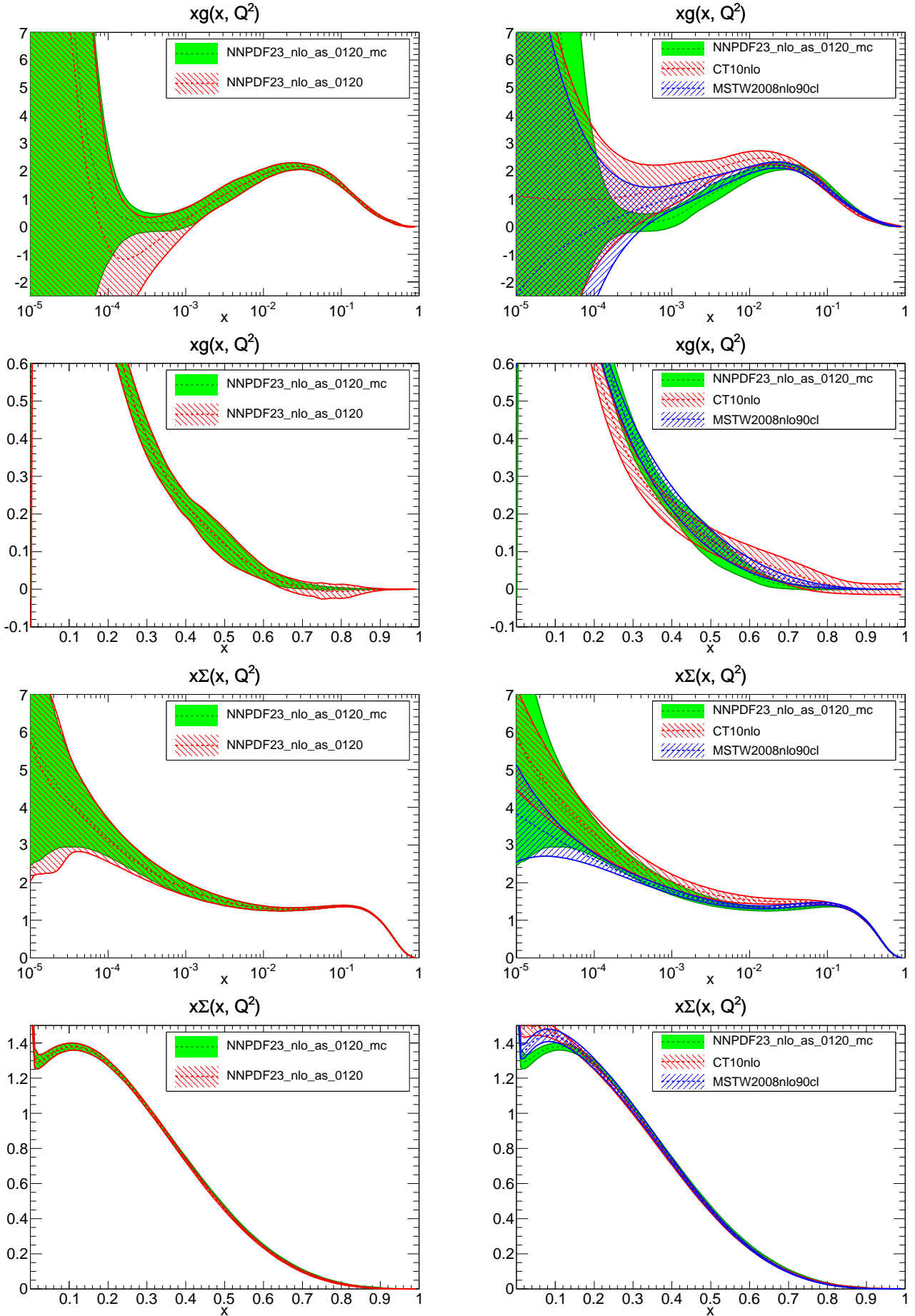


Figure 3: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

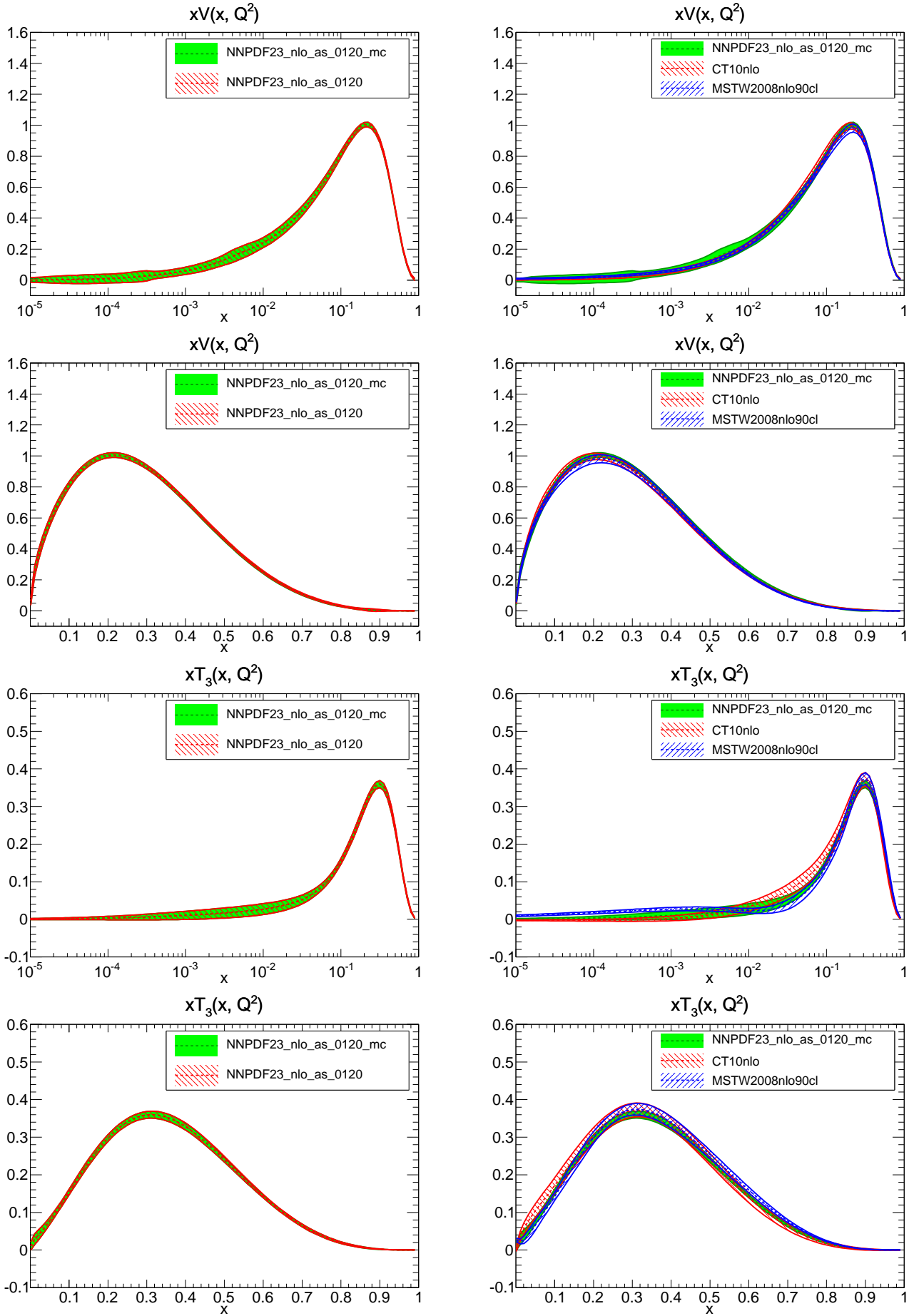


Figure 4: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

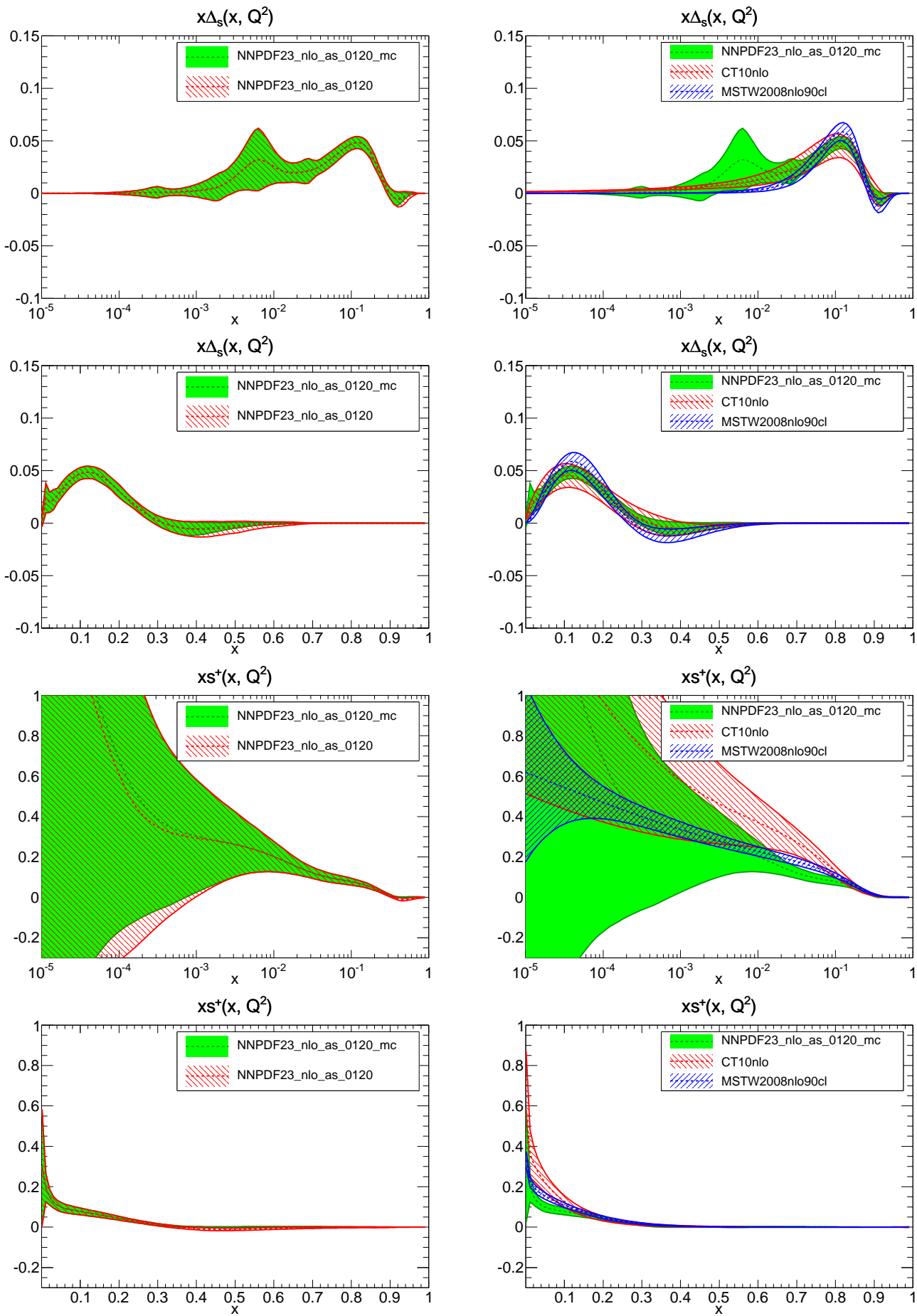


Figure 5: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

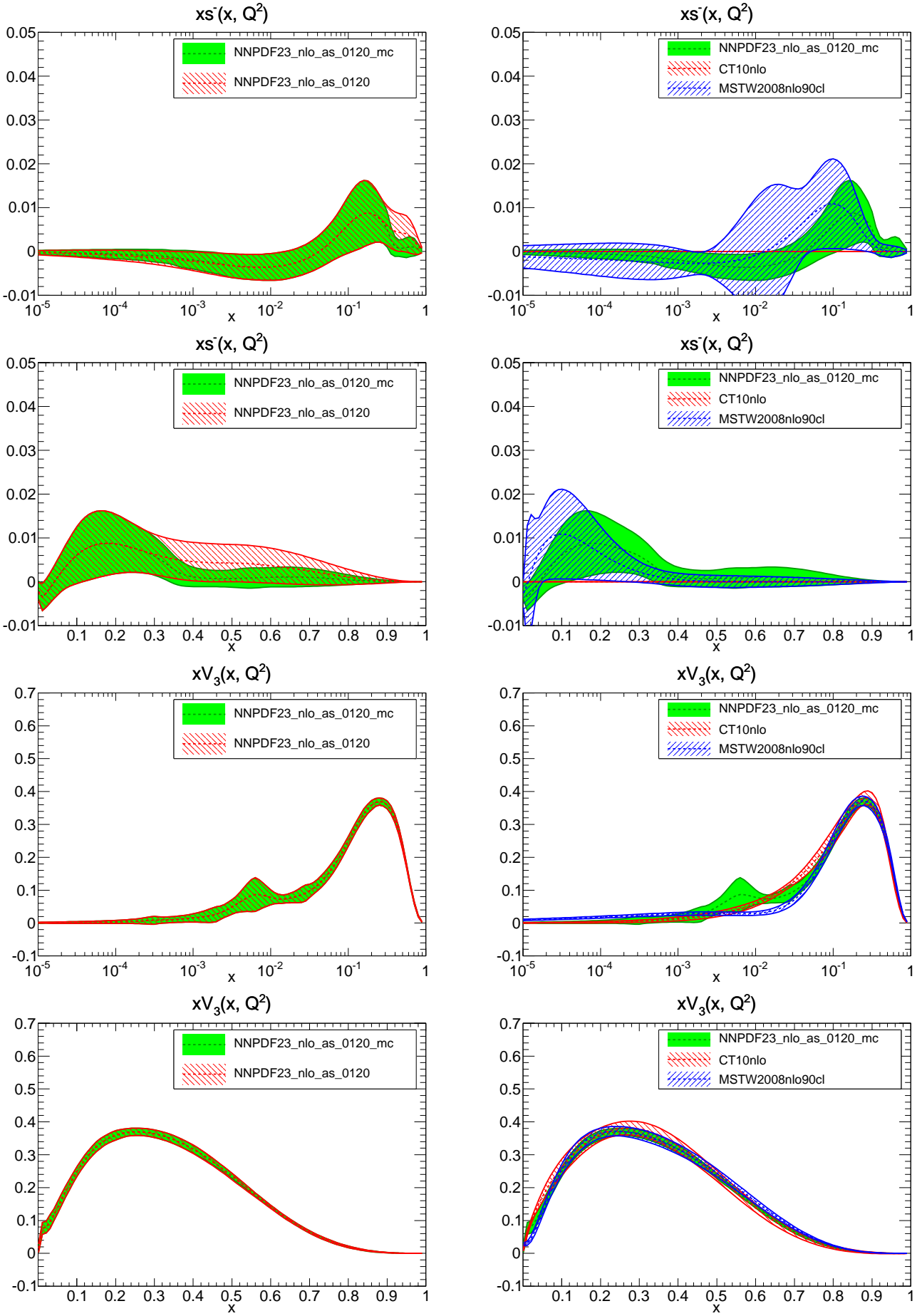


Figure 6: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

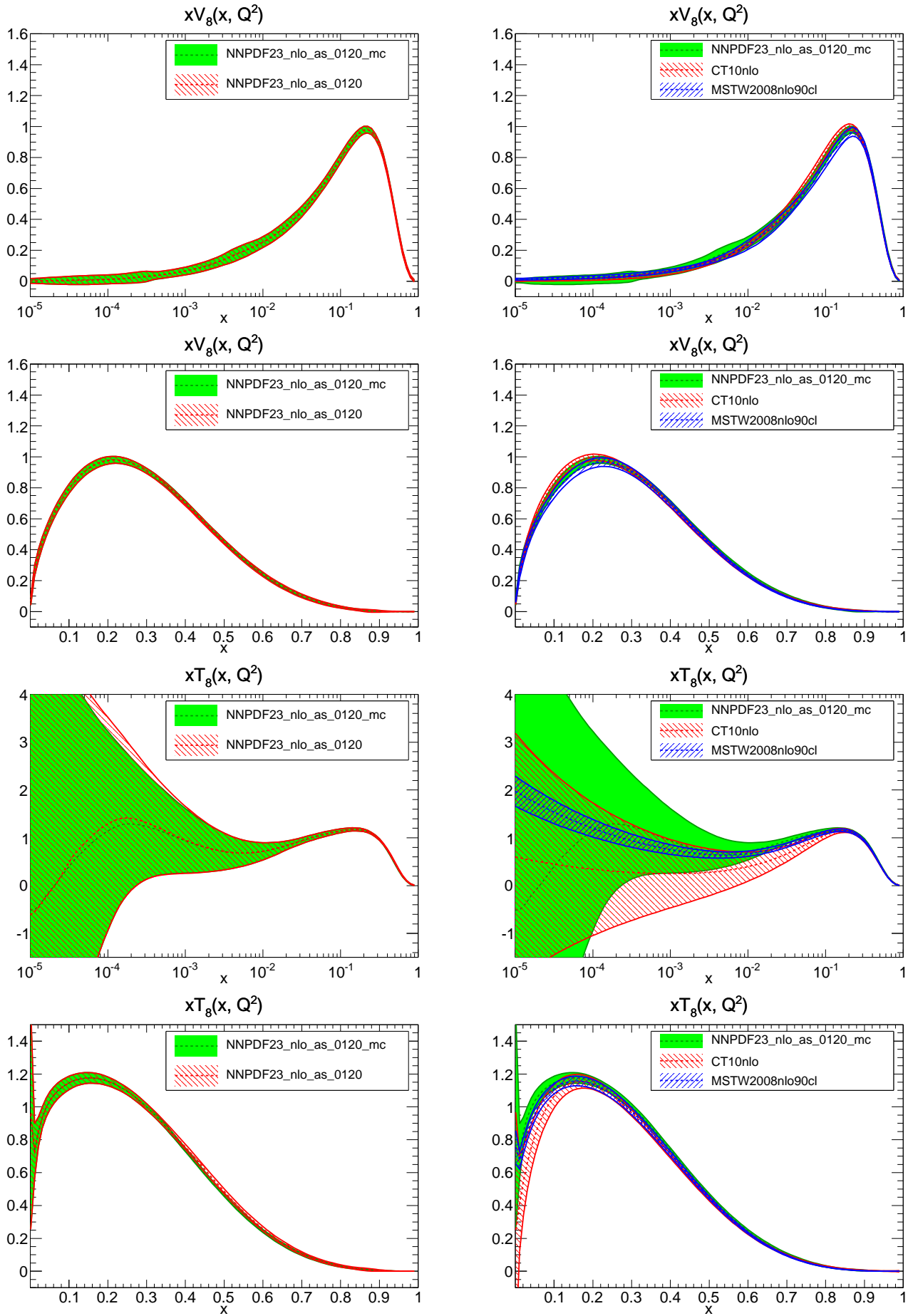


Figure 7: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

### 2.3 Comparing PDFs in LHA basis

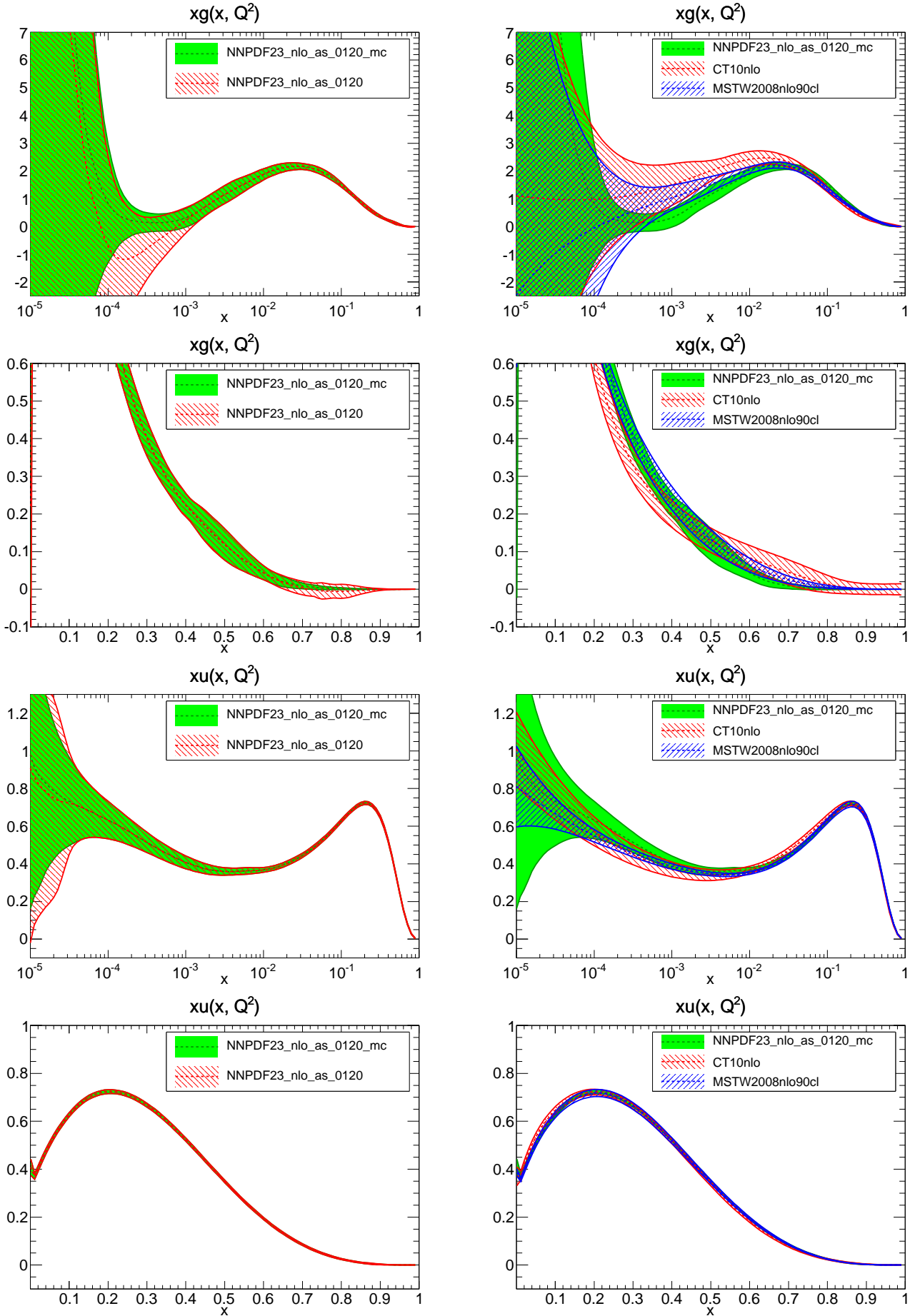


Figure 8: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .



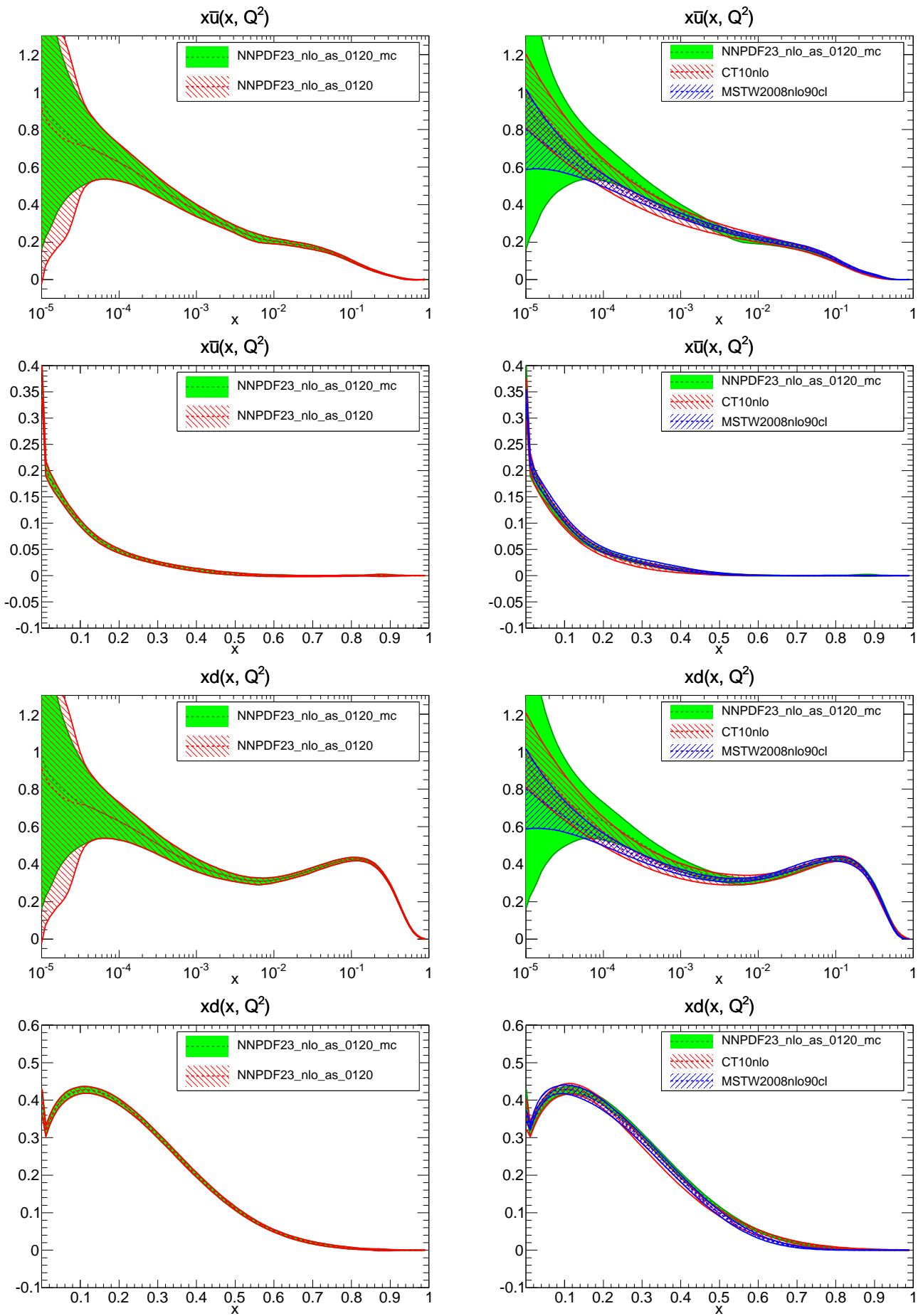


Figure 9: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

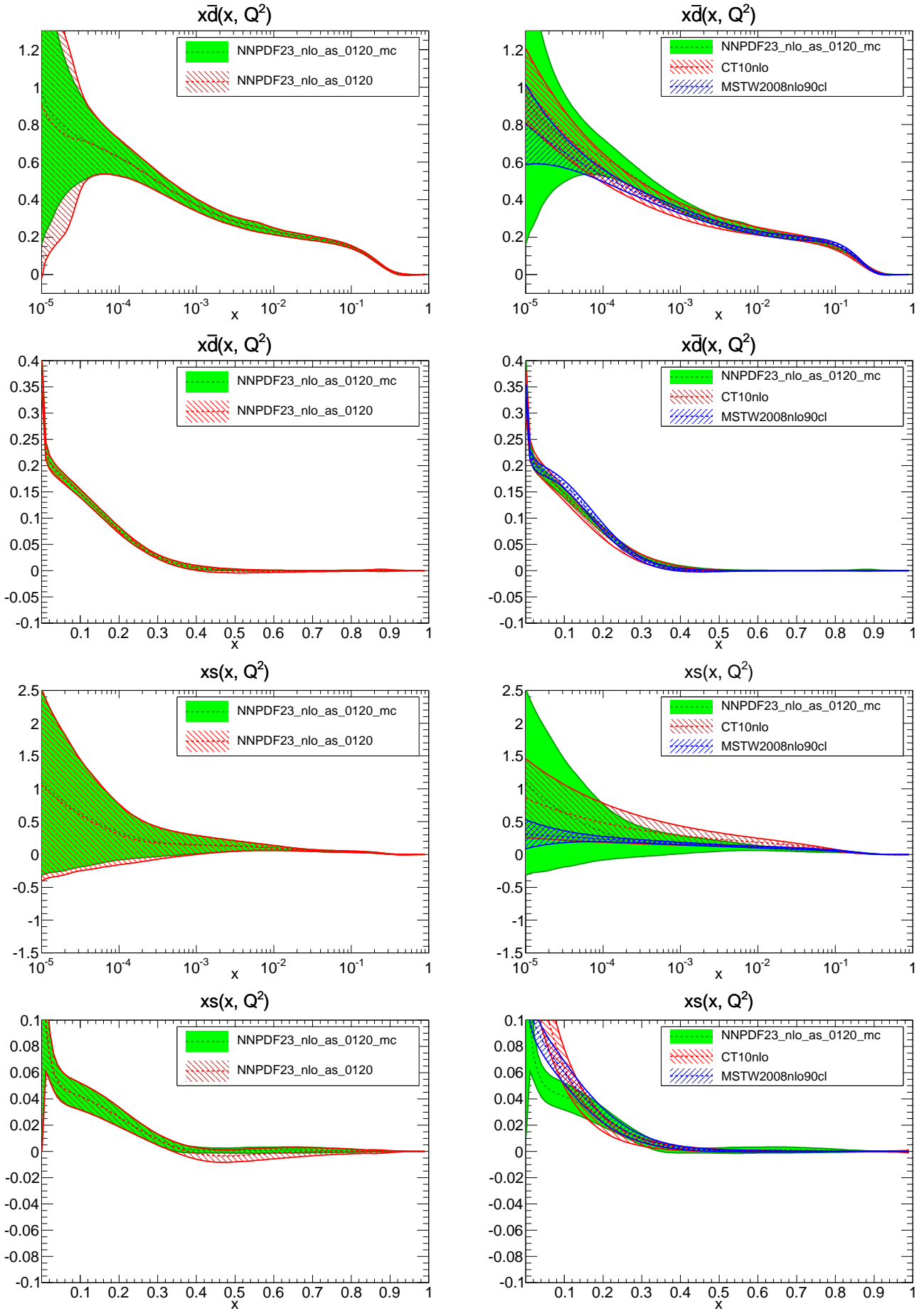


Figure 10: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

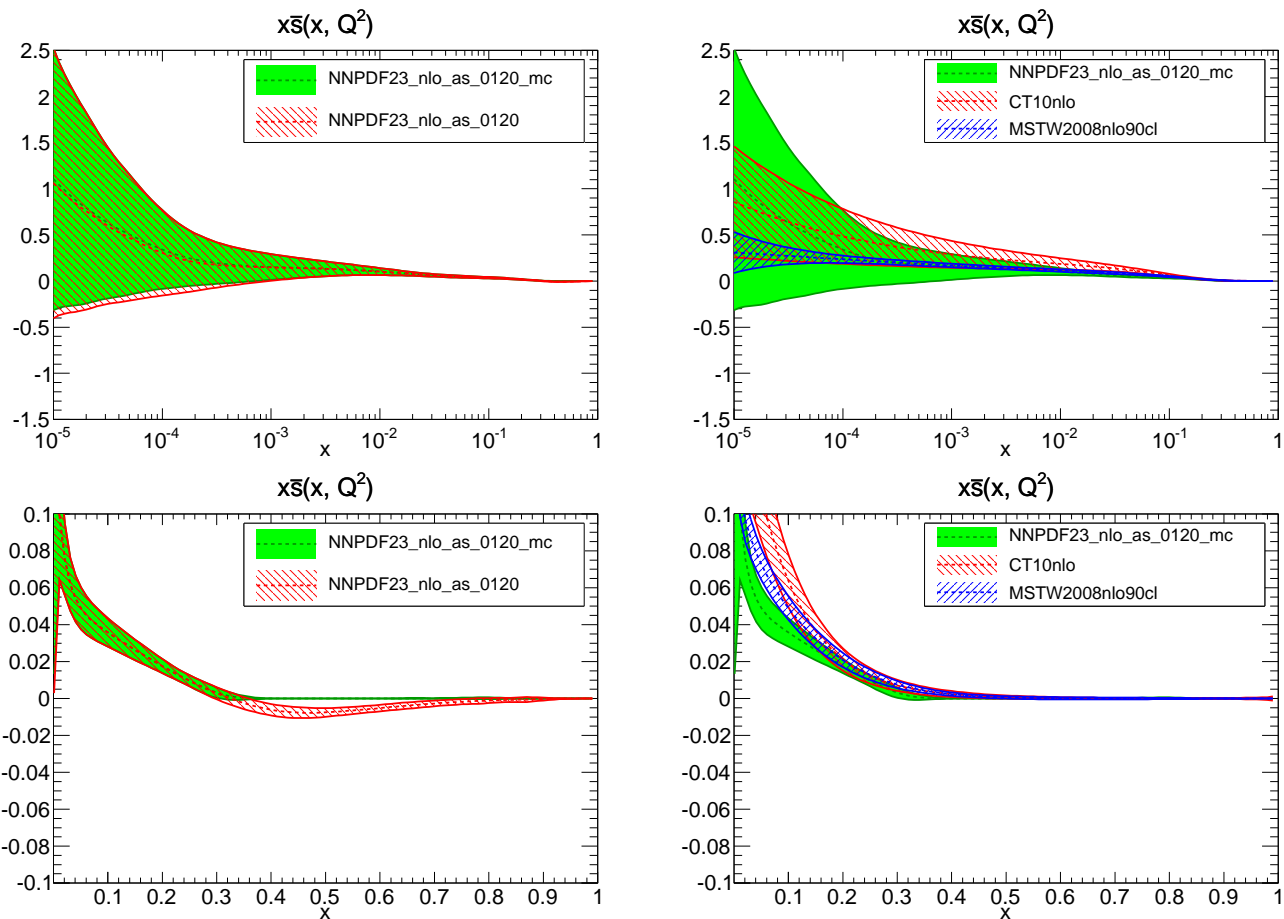


Figure 11: Comparison between PDFs at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

## 2.4 Replicas in the evolution basis

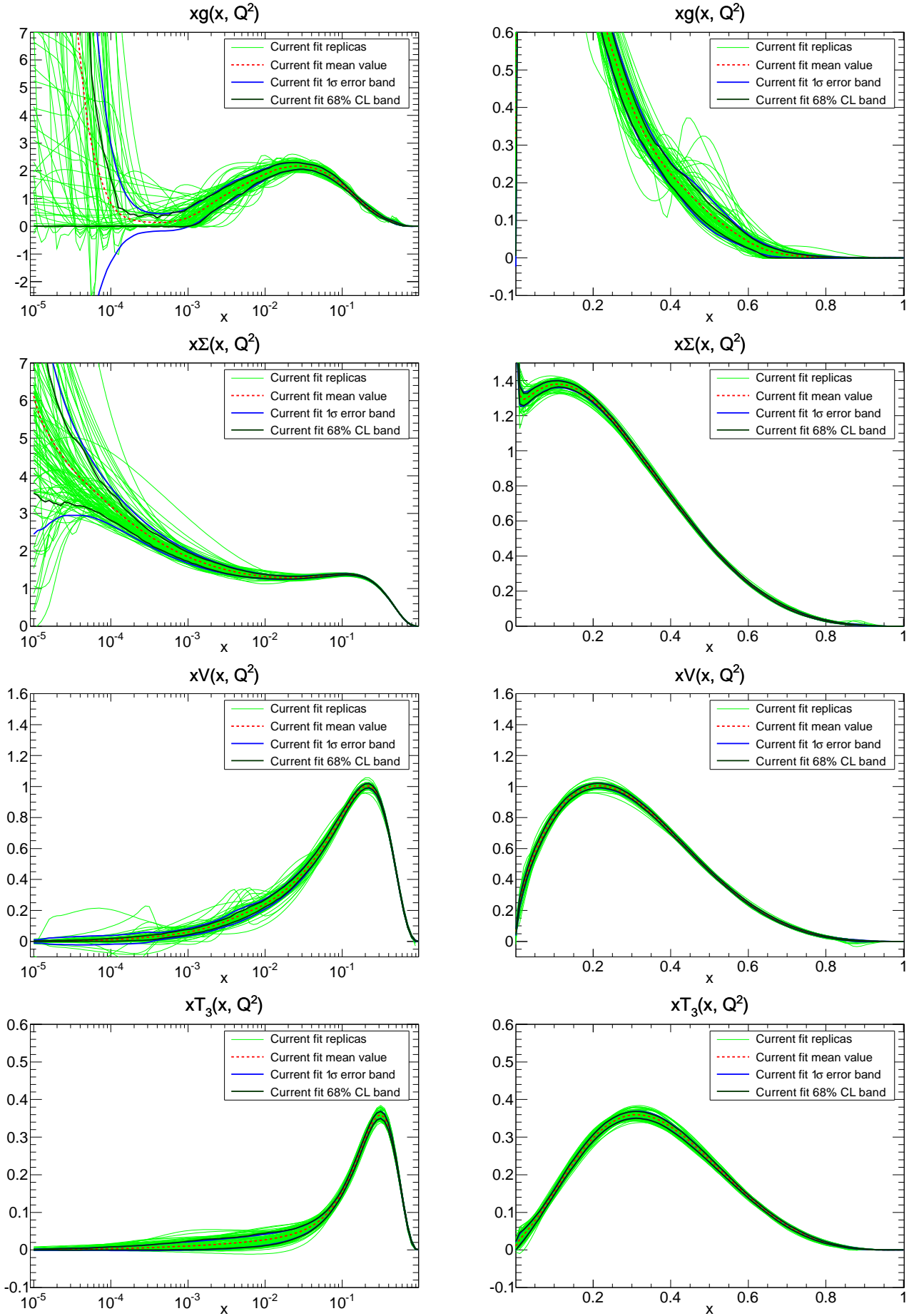


Figure 12: Current fit PDFs in the evolution basis at  $Q^2 = 2.0e + 00 \text{ GeV}^2$ .

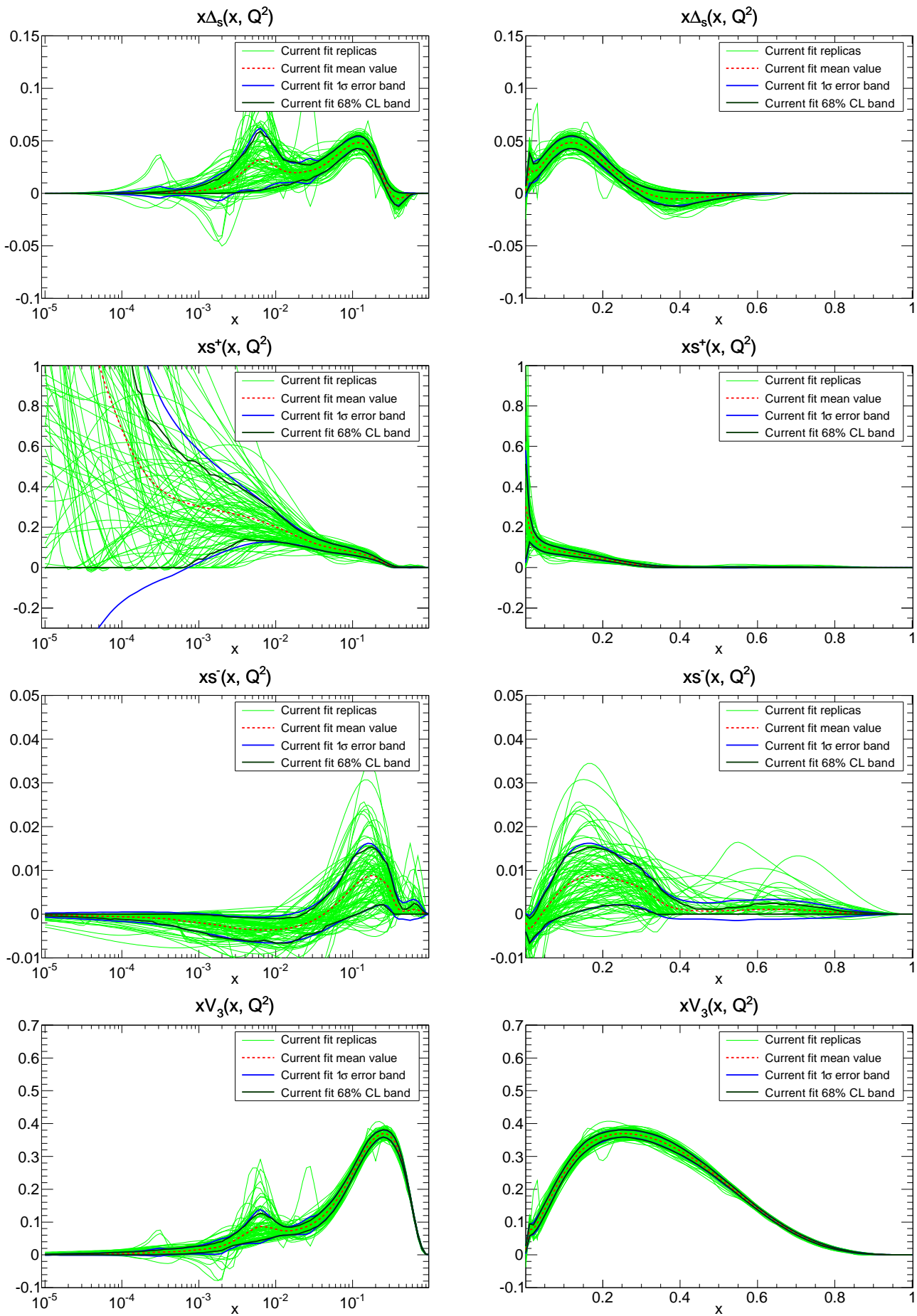


Figure 13: Current fit PDFs in the evolution basis at  $Q^2 = 2.0e+00 \text{ GeV}^2$ .

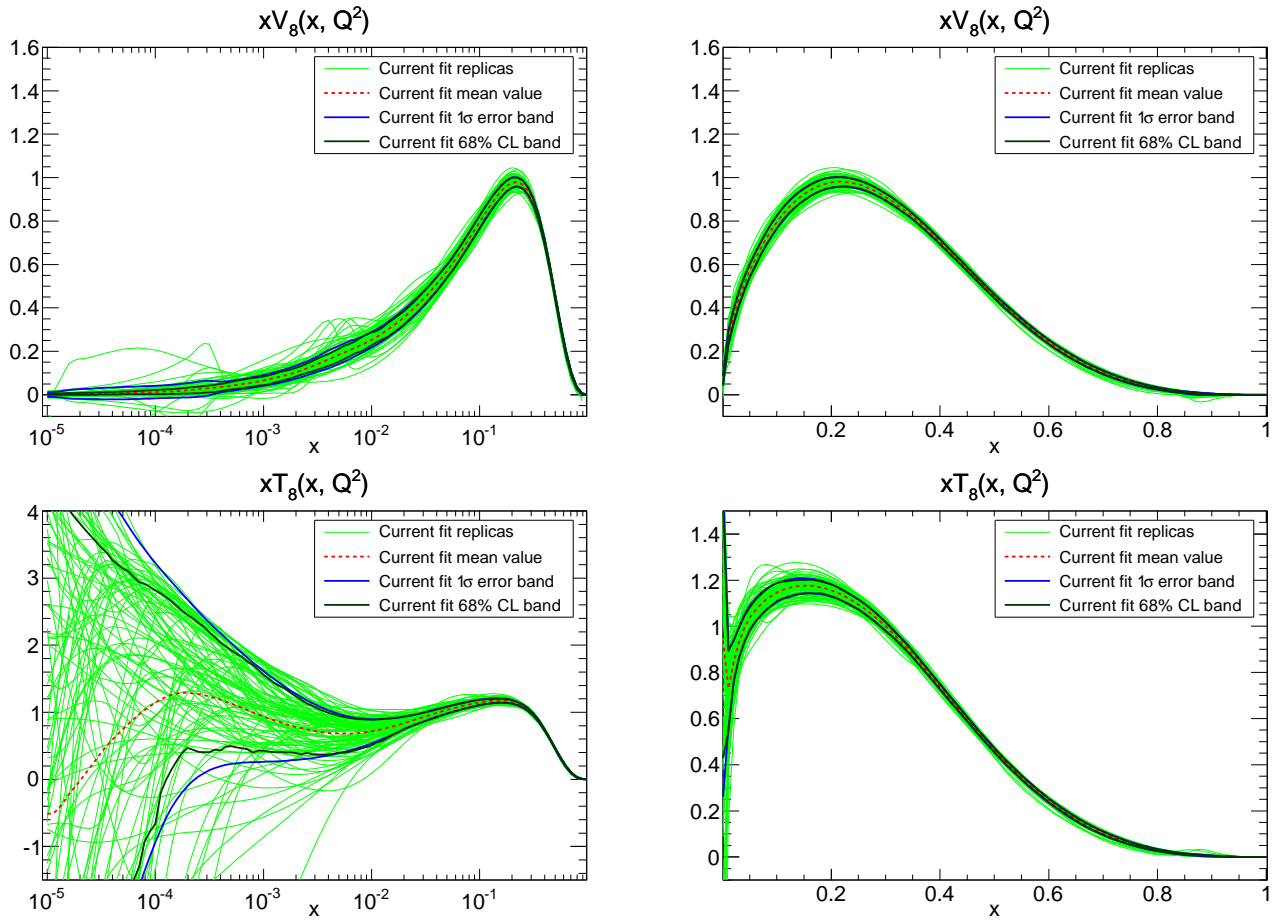


Figure 14: Current fit PDFs in the evolution basis at  $Q^2 = 2.0e+00 \text{ GeV}^2$ .

## 2.5 Replicas in the LH basis

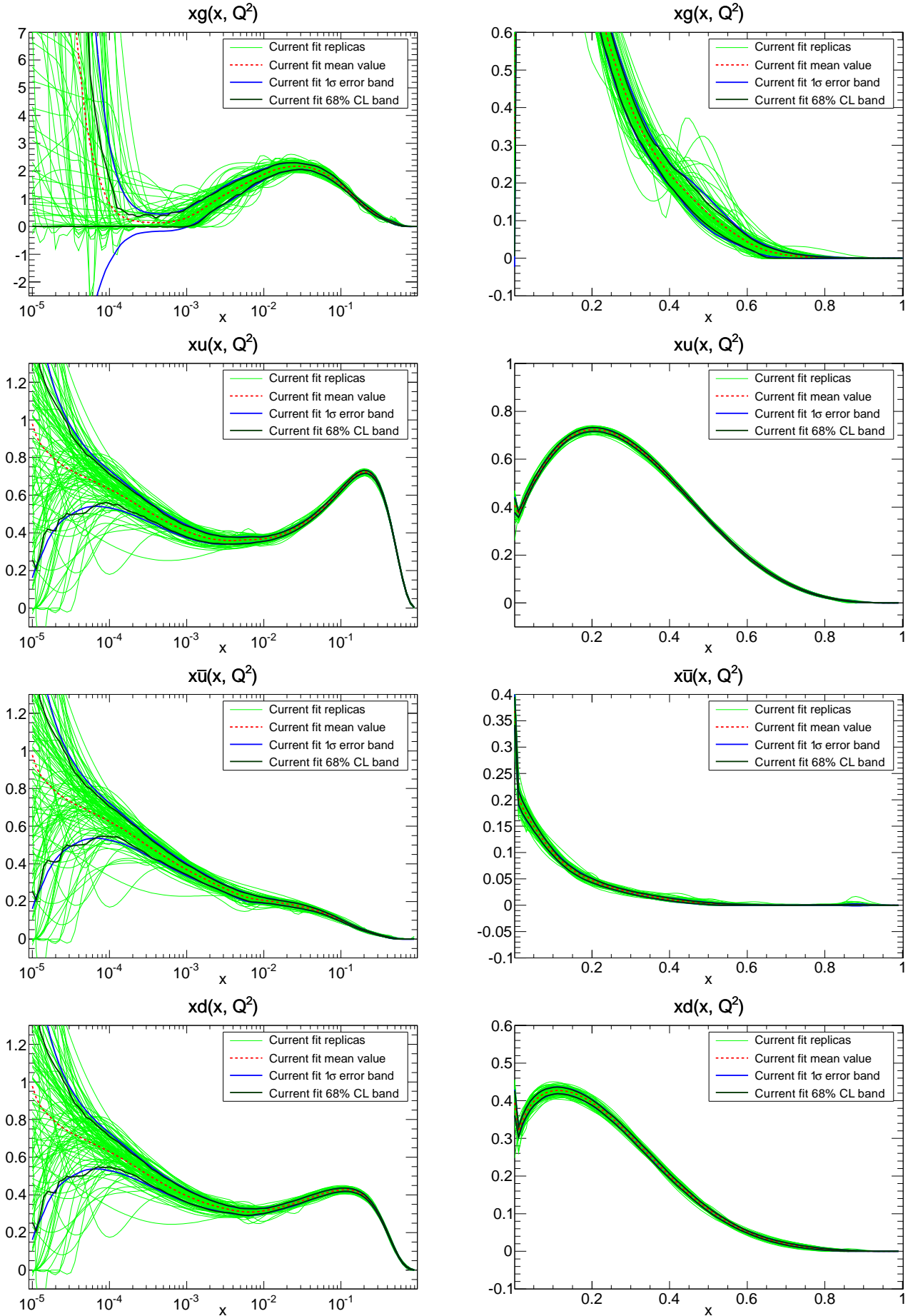


Figure 15: Current fit PDFs in the LH basis at  $Q^2 = 2.0e+00 \text{ GeV}^2$ .

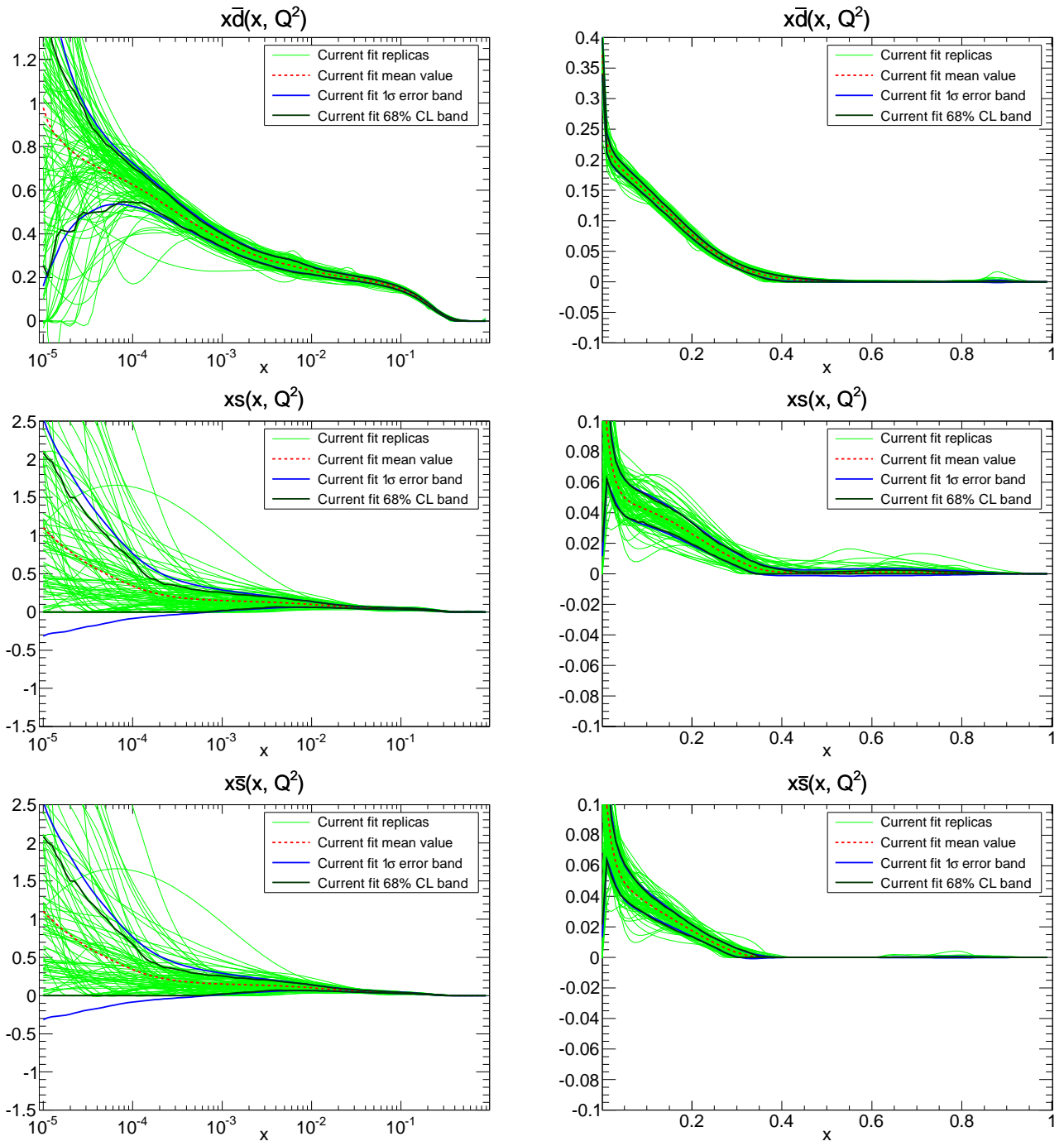


Figure 16: Current fit PDFs in the LH basis at  $Q^2 = 2.0e+00 \text{ GeV}^2$ .



### 3 Fit properties

Distribution of  $\chi^2$  for experiments

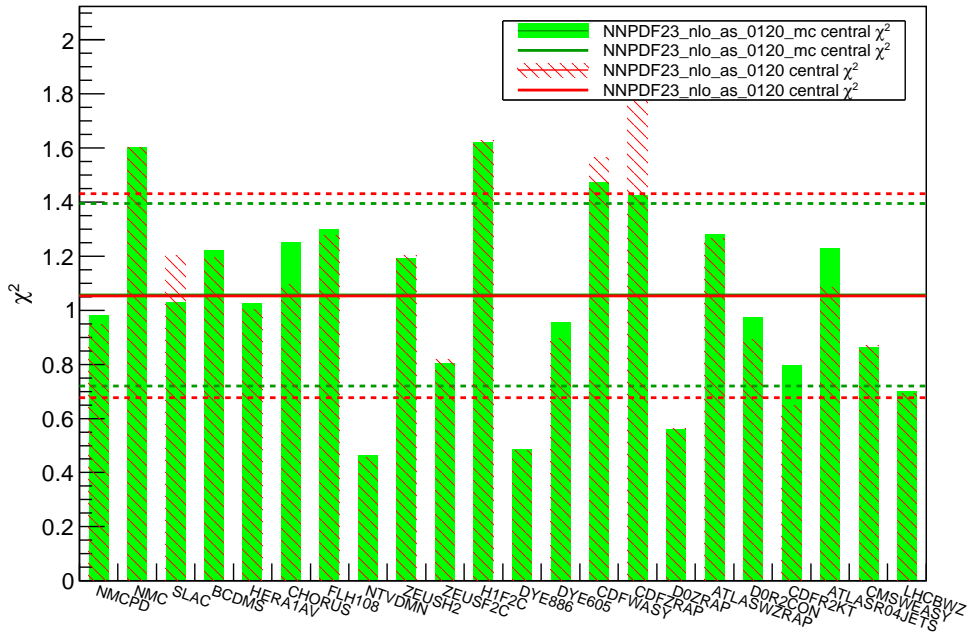


Figure 17: Total  $\chi^2$  for each experiment.

### 3.1 $\chi^2$ details - experimental covariance matrix

Experiment	Dataset	DOF	Current $\chi^2$	Reference $\chi^2$	CTEQ $\chi^2$	MSTW $\chi^2$
NMCPD	NMCPD	132	0.98179	0.94794	0.97558	0.97705
NMC	NMC	224	1.60215	1.60227	1.69484	1.43420
SLAC	SLACP	74	1.02897	1.20123	1.76784	1.43447
	SLACD	37	1.13112	1.26249	1.74580	1.35034
	SLACD	37	0.88815	1.09222	1.57004	1.36595
BCDMS	BCDMS	581	1.22392	1.19510	1.78538	1.55223
	BCDMSP	333	1.21570	1.21116	1.98186	1.53741
	BCDMSD	248	1.18341	1.14239	1.51868	1.44713
HERA1AV	HERA1AV	592	1.02529	1.00262	1.55123	1.23561
	HERA1NCEP	379	1.18472	1.15146	1.92013	1.49490
	HERA1NCEM	145	0.77982	0.77269	0.84975	0.80762
	HERA1CCEP	34	0.86488	0.88301	1.11770	0.94891
	HERA1CCEM	34	0.56522	0.57173	0.59330	0.56560
CHORUS	CHORUS	862	1.25398	1.09382	1.34272	1.23278
	CHORUSNU	431	1.16901	1.13062	1.30847	1.16117
	CHORUSNB	431	1.20884	0.99009	1.28055	1.21985
FLH108	FLH108	8	1.29771	1.27778	1.47340	1.36120
NTVDMN	NTVDMN	79	0.46423	0.45539	4.11773	1.02519
	NTVNUDMN	41	0.29806	0.29124	2.64295	0.63867
	NTVNBDMN	38	0.63672	0.62865	6.33561	1.67843
ZEUSH2	ZEUSH2	127	1.19289	1.20394	1.53947	1.19210
	ZO6NC	90	1.14517	1.14956	1.56788	1.13676
	ZO6CC	37	1.18215	1.20909	1.33275	1.18208
ZEUSF2C	ZEUSF2C	50	0.80278	0.81847	0.70113	0.70633
	ZEUSF2C99	14	0.76084	0.77409	0.58874	0.63459
	ZEUSF2C03	21	1.33252	1.36159	1.11898	1.16675
	ZEUSF2C08	7	0.19116	0.19070	0.37462	0.21906
	ZEUSF2C09	8	0.12139	0.12095	0.23483	0.13932
H1F2C	H1F2C	38	1.62354	1.62943	1.48635	1.46443
	H1F2C01	6	0.97426	0.98750	0.49406	0.82622
	H1F2C09	6	2.99262	2.96351	2.94472	2.68817
	H1F2C10	26	1.36898	1.38162	1.30056	1.25629
DYE886	DYE886R	15	0.48645	0.47953	0.50136	0.76020
DYE605	DYE605	119	0.95552	0.89363	0.72467	0.93410
CDFWASY	CDFWASYM	13	1.47349	1.56456	3.46828	9.25681
CDFZRAP	CDFZRAP	29	1.42380	1.79634	2.00430	2.52211
DOZRAP	DOZRAP	28	0.56214	0.56326	0.56482	0.60921
ATLASWZRAP	ATLASWZRAP36PB	30	1.28265	1.26747	1.21188	1.98839
DOR2CON	DOR2CON	110	0.97493	0.89218	0.91490	0.90350
CDFR2KT	CDFR2KT	76	0.79660	0.64898	0.92848	0.66190
ATLASR04JETS	ATLASR04JETS36PB	90	1.23184	1.08535	1.19851	1.03684
CMSWEASY	CMSWEASY840PB	11	0.86454	0.86941	1.38111	4.52985
LHCBWZ	LHCBWZ36PB	10	0.70298	0.69223	1.17855	0.92755
<b>Total (sets)</b>		<b>3298</b>	<b>1.13</b>	<b>1.08</b>	<b>1.48</b>	<b>1.00</b>
<b>Total (exps)</b>		<b>3298</b>	<b>1.15</b>	<b>1.09</b>	<b>1.50</b>	<b>1.30</b>

Table 3: Fit quality for datasets.

## 4 Configuration file of the training

```
#
# Configuration file for NNPDF++,
# comments start with # or ; or [
#

[Description]
This is the description block, please update these lines before run.
[/Description]

#####
[Experiments & Datasets]
EXPERIMENT: NMCPD
    DATASET = NMCPD 0.5
EXPERIMENT: NMC
    DATASET = NMC 0.5
EXPERIMENT: SLAC
    DATASET = SLACP 0.5
    DATASET = SLACD 0.5
EXPERIMENT: BCDMS
    DATASET = BCDMSP 0.5
    DATASET = BCDMSD 0.5
EXPERIMENT: HERA1AV
    DATASET = HERA1NCEP 0.5
    DATASET = HERA1NCEM 0.5
    DATASET = HERA1CCEP 0.5
    DATASET = HERA1CCEM 0.5
EXPERIMENT: CHORUS
    DATASET = CHORUSNU 0.5
    DATASET = CHORUSNB 0.5
EXPERIMENT: FLH108
    DATASET = FLH108 1
EXPERIMENT: NTVDMN
    DATASET = NTVNUDMN 0.5
    DATASET = NTVNBDMN 0.5
EXPERIMENT: ZEUSH2
    DATASET = Z06NC 0.5
    DATASET = Z06CC 0.5
EXPERIMENT: ZEUSF2C
    DATASET = ZEUSF2C99 0.5
    DATASET = ZEUSF2C03 0.5
    DATASET = ZEUSF2C08 0.5
    DATASET = ZEUSF2C09 0.5
EXPERIMENT: H1F2C
    DATASET = H1F2C01 0.5
    DATASET = H1F2C09 0.5
    DATASET = H1F2C10 0.5
EXPERIMENT: DYE886
    DATASET = DYE886R 1
EXPERIMENT: DYE605
    DATASET = DYE605 0.5
EXPERIMENT: CDFWASY
    DATASET = CDFWASYM 1
EXPERIMENT: CDFZRAP
    DATASET = CDFZRAP 1
EXPERIMENT: DOZRAP
    DATASET = DOZRAP 1
EXPERIMENT: ATLASWZRAP
    DATASET = ATLASWZRAP36PB 1
EXPERIMENT: DOR2CON
    DATASET = DOR2CON 0.5
EXPERIMENT: CDFR2KT
    DATASET = CDFR2KT 0.5
EXPERIMENT: ATLASR04JETS
    DATASET = ATLASR04JETS36PB 0.5
EXPERIMENT: CMSWEASY
    DATASET = CMSWEASY840PB 1
EXPERIMENT: LHCBWZ
    DATASET = LHCBWZ36PB 1
[/Experiments & Datasets]

#####
[Theory]
NFL = 7
PTORD = 1
ALPHAS = 120
Q20 = 2
VFNS = GMVN
VFNSTYPE = 1
[/Theory]

#####
[Experimental Data]
TOPDFSET = NNPDF-t0-set-nlo
IQ2CUT = 0
NPARSAT = 2
PARSAT = 1.5 0.333333
IREG = 1
Q2MINCUT = 3
Q2MIN = 3
W2MIN = 12.5
[/Experimental Data]

#####
[Replica Properties]
SEED = 0
GENREP = 1
RNGALGORITHM = 0
[/Replica Properties]

#####
[Fit Properties]
NGEN = 50000
DYNSTOP = 0
POSITIVITY = 0
MINCHI2 = 6
NSMEAR = 200
DELTASM = 200
RV = 1.0003
RT = 0.9999
[/Fit Properties]

#####
[Positivity]
PGSDATASET = FCPGS
PGSDATASET = FLPGS
PGSDATASET = DMPGS
[/Positivity]

#####
[NN Properties]
NMUTANTS = 80
```

```
NLAYERS = 4
NNODES = 2 5 3 1
SMALLXSNG = 1.05 1.35
LARGXSNG = 2.55 3.45
SMALLXGLU = 1.05 1.35
LARGXGLU = 3.55 4.45
SMALLXT3 = 0 0.5
LARGXT3 = 2.55 3.45
SMALLXV = 0 0.5
LARGXV = 2.55 3.45
SMALLXDS = -0.95 -0.65
LARGXDS = 12 14
SMALLXSP = 1.05 1.35
LARGXSP = 2.55 3.45
SMALLXSM = 0 0.5
LARGXSM = 2.55 3.45
[/NN Properties]
```

```
#####
[Output Folder]
RESULTSDIR = results
[/Output Folder]
```