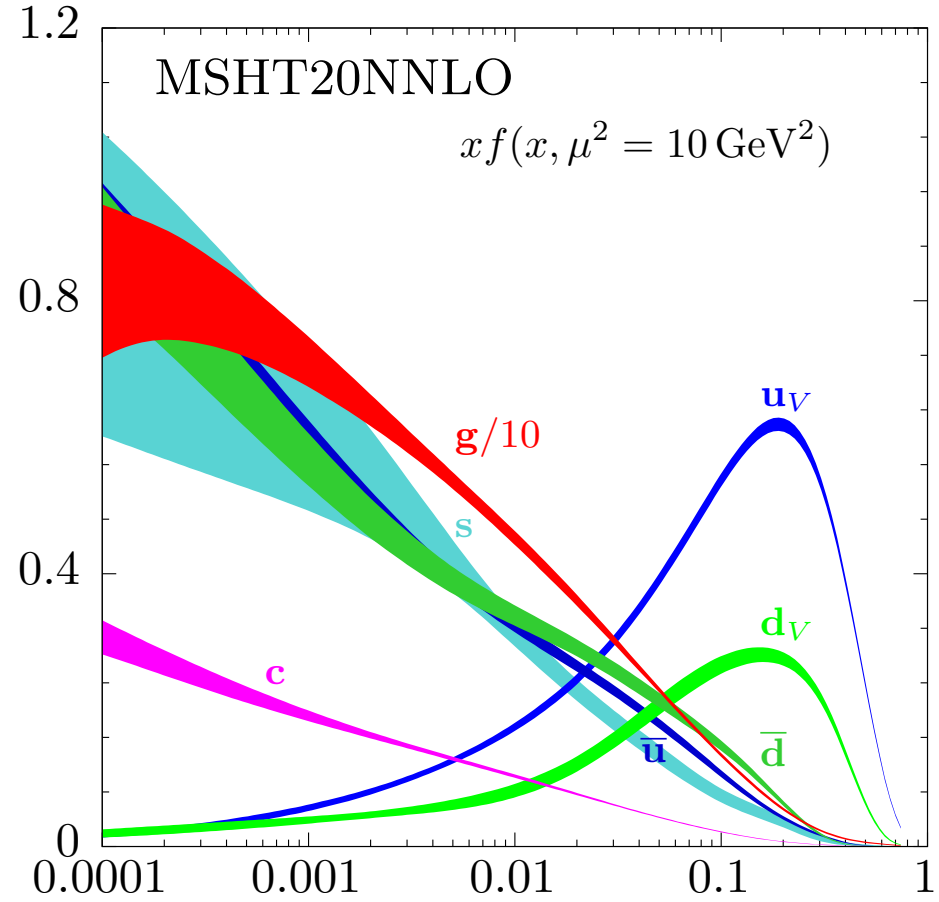
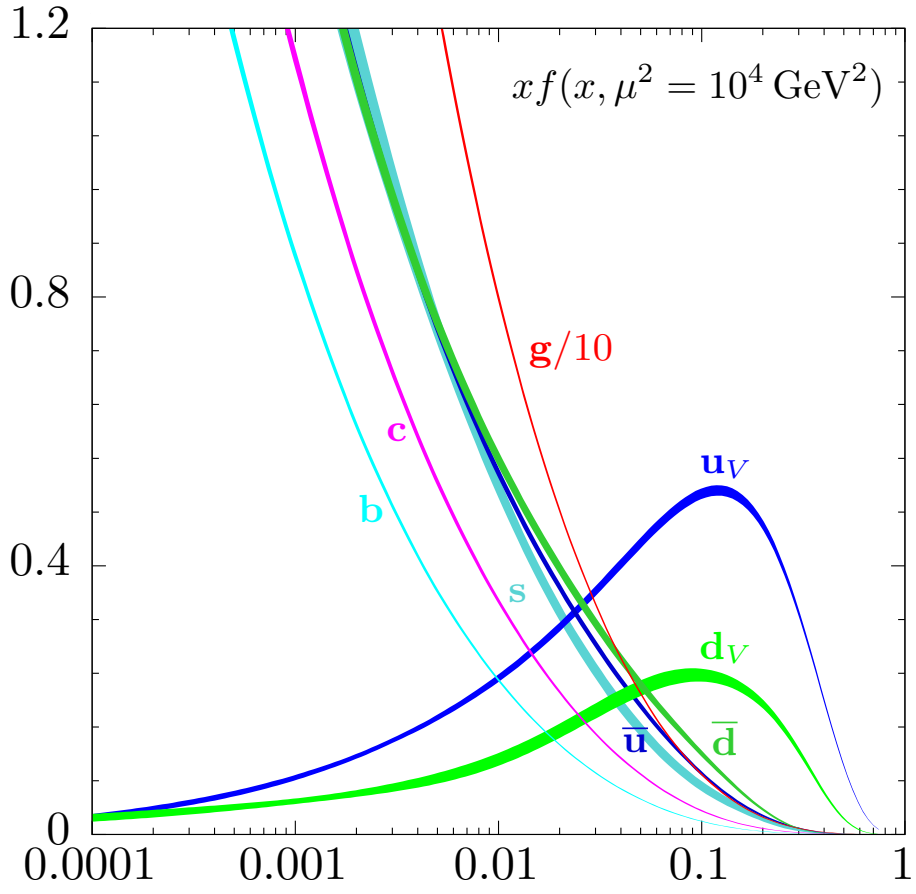
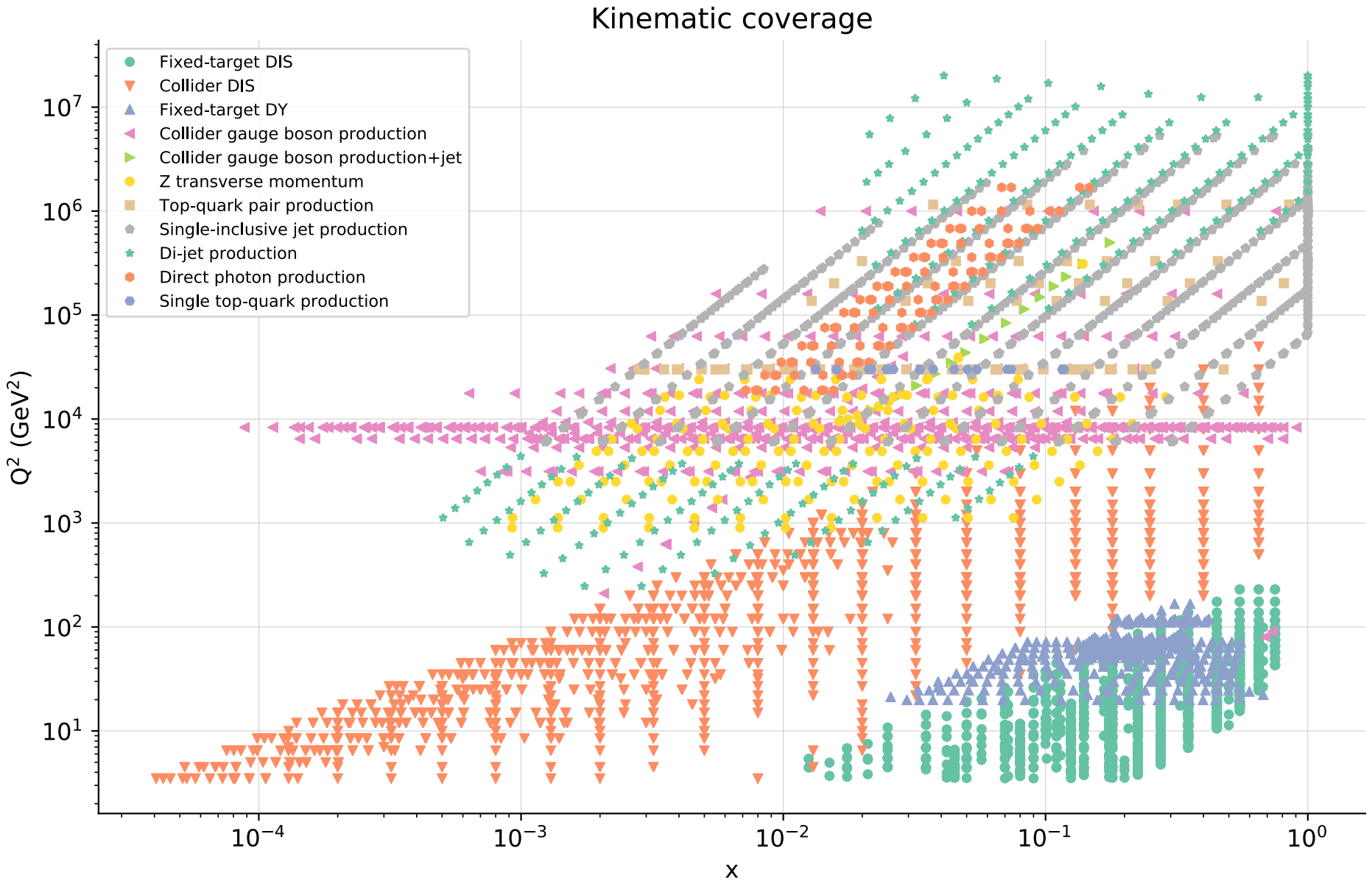
Why are we still talking about PDFs?

Francesco Giuli and Juan M. Cruz Martinez

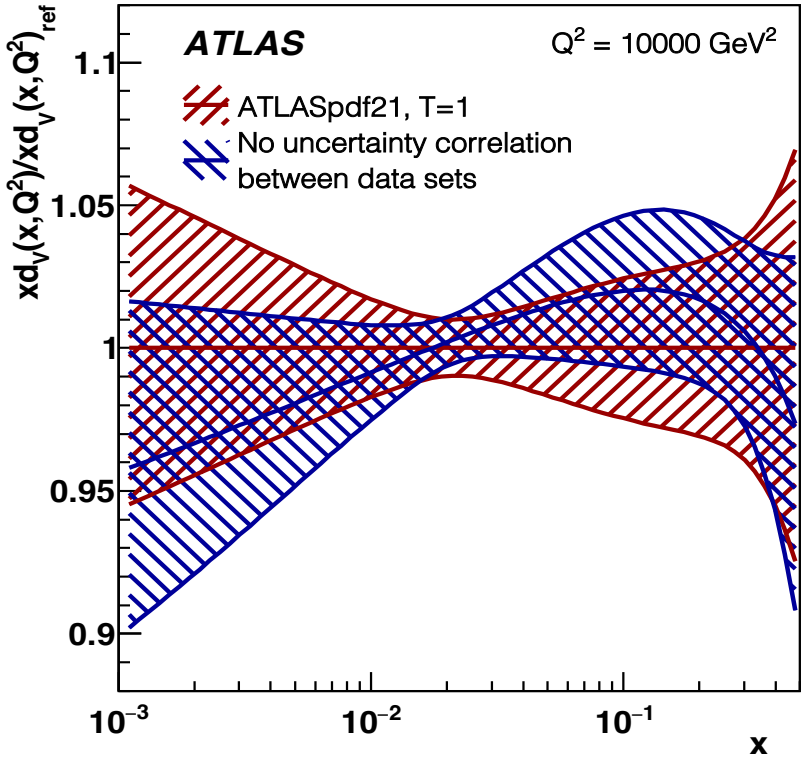
Collider Cross Talk
14/12/2023

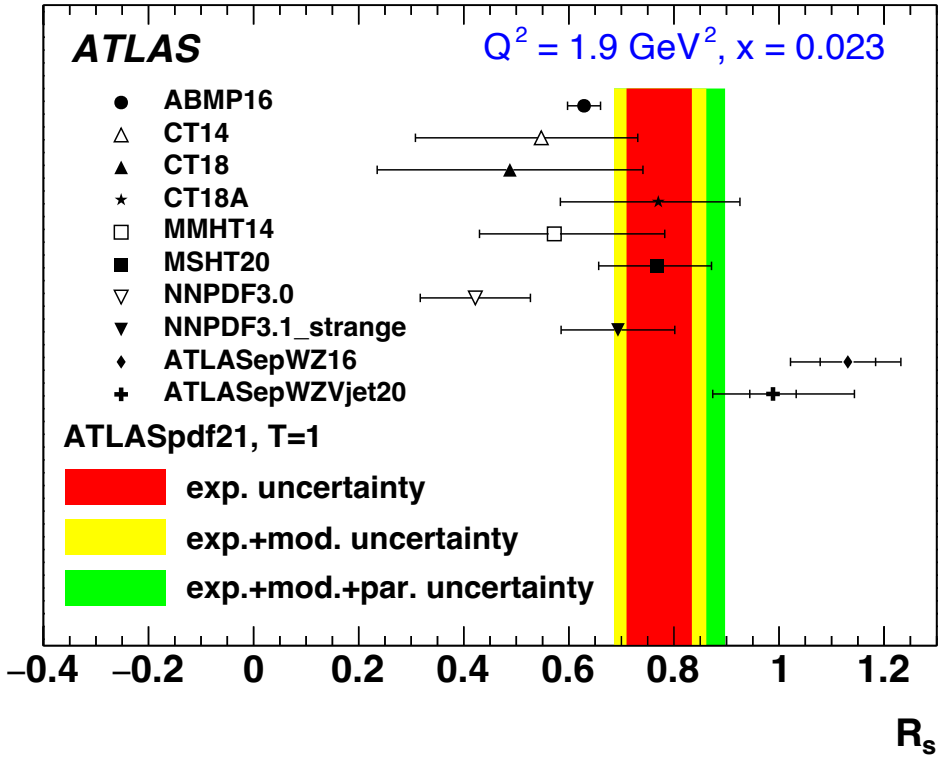

MSHT20NNLO
$xf(x, \mu^2 = 10\,\mathrm{GeV}^2)$
1.2
0.8
0.4
0
0.0001
0.001
0.01
0.1
1
g/10
s
c
u_V
d_V
$\bar{u}$
$\bar{d}$

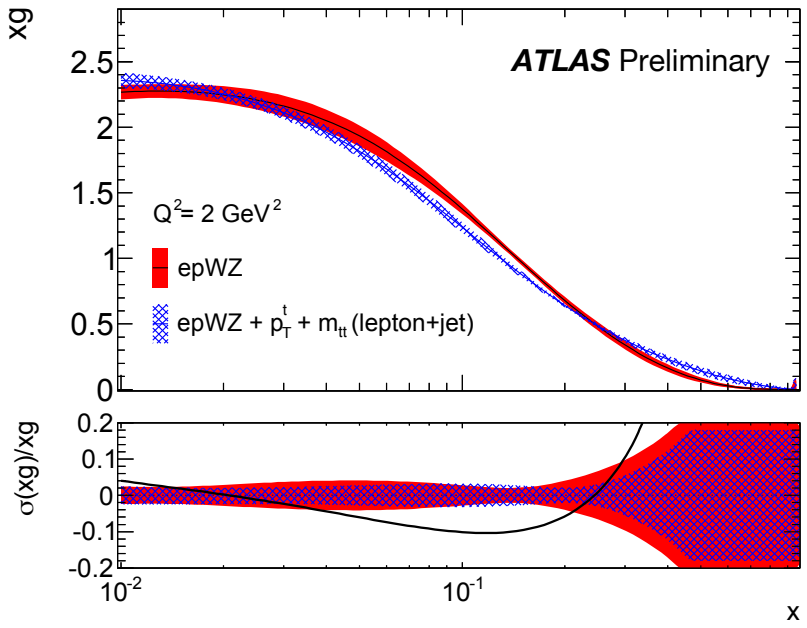

$xf(x, \mu^2 = 10^4\,\mathrm{GeV}^2)$
1.2
0.8
0.4
0
0.0001
0.001
0.01
0.1
1
g/10
c
b
s
u_V
d_V
$\bar{u}$
$\bar{d}$

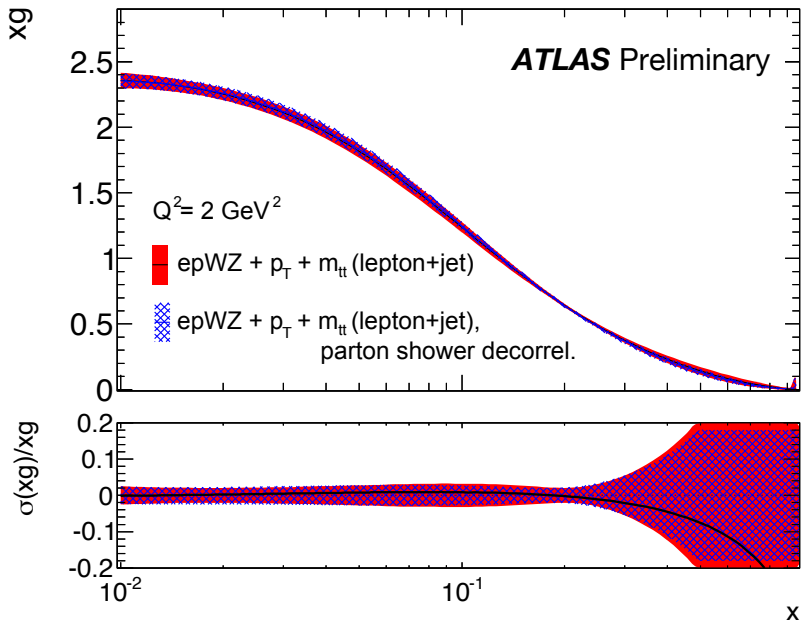

Kinematic coverage
Fixed-target DIS
Collider DIS
Fixed-target DY
Collider gauge boson production
Collider gauge boson production+jet
Z transverse momentum
Top-quark pair production
Single-inclusive jet production
Di-jet production
Direct photon production
Single top-quark production
Q^2 (GeV^2)
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^0
x

Systematic uncertainty	8 TeV W + jets	8 TeV Z + jets	8 TeV $t\bar{t}$ lepton + jets	13 TeV $t\bar{t}$ lepton + jets	8 TeV inclusive jets
Jet flavour response	JetScaleFlav2	Flavor Response	flavres-jes	JET29NP JET Flavour Response	syst JES Flavour Response*
Jet flavour composition	JetScaleFlav1Known	Flavor Comp	flavcomp-jes	JET29NP JET Flavour Composition	syst JES Flavour Comp
Jet punchthrough	JetScalepunchT	Punch Through	punch-jes	-	syst JES PunchThrough MC15
Jet scale	JetScalePileup2	PU OffsetMu	pileoffmu-jes	-	syst JES Pileup MuOffset
	-	PU Rho	pileoffrho-jes	JET29NP JET Pileup RhoTopology	syst JES Pileup Rho topology*
	JetScalePileup1	PU OffsetNPV	pileoffnpv-jes	JET29NP JET Pileup OffsetNPV	syst JES Pileup NPVOffset
	-	PU PtTerm	pileoffpt-jes	JET29NP JET Pileup PtTerm	syst JES Pileup Pt term
Jet JVF selection	JetJVFcut	JVF	jetvxfrac	-	syst JES Zjets JVF
B-tagged jet scale	-	btag-jes	JET29NP JET BJES Response	-	-
Jet resolution	-	jeten-res	JET JER SINGLE NP	-	-
Muon scale	-	-	mup-scale	MUON SCALE	-
Muon resolution	-	-	muonms-res	MUON MS	-
Muon identification	-	-	muid-res	MUON ID	-
Diboson cross section	-	-	dibos-xsec	Diboson xsec	-
Z + jets cross section	-	-	zjet-xsec	Zjets xsec	-
Single-t cross section	-	-	singletop-xsec	st xsec	-









		lepton+jets spectrum			
		m_{tt}	p_T^t	y_{tt}	y_t
Total χ^2/NDF		1238.4 / 1062	1239.4 / 1063	1257.5 / 1060	1246.5 / 1060
Partial χ^2/NDP	HERA	1153 / 1016	1151 / 1016	1149 / 1016	1146 / 1016
Partial χ^2/NDP	ATLAS $W, Z/\gamma^*$	82.0 / 55	82.1 / 55	86.4 / 55	85.0 / 55
Partial χ^2/NDP	ATLAS $t\bar{t}$	3.4 / 7	7.9 / 8	19.7 / 5	18.3 / 5

		lepton+jets spectra			
		p_T^t and y_t with statistical correlations	p_T^t and y_t without statistical correlations	p_T^t and m_{tt} with statistical correlations	p_T^t and m_{tt} without statistical correlations
Total χ^2/NDF		1264 / 1068	1260 / 1068	1290 / 1070	1287 / 1070
Partial χ^2/NDP	HERA	1148 / 1016	1147 / 1016	1162 / 1016	1162 / 1016
Partial χ^2/NDP	ATLAS $W, Z/\gamma^*$	82.7 / 55	83.5 / 55	83.2 / 55	83.1 / 55
Partial χ^2/NDP	ATLAS $t\bar{t}$	33 / 13	30 / 13	45 / 15	42 / 15