uPDF Fits using H1 Jet Data

Magnus Hansson

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Outline

⇒ Why $k_\perp$-factorization?

⇒ Previous Fits: F_2 and F_2^c

⇒ Fit Procedure

⇒ New Fits to Jet Data

⇒ Summary & Conclusions

Why $k_\perp$-factorization?

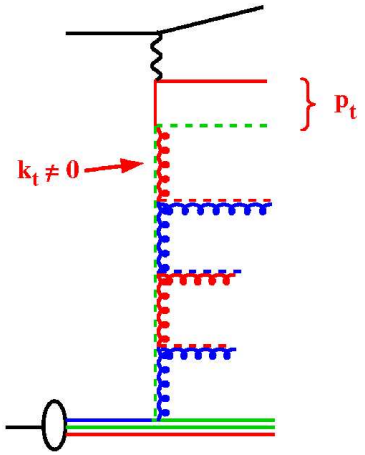
More correct treatment of kinematics

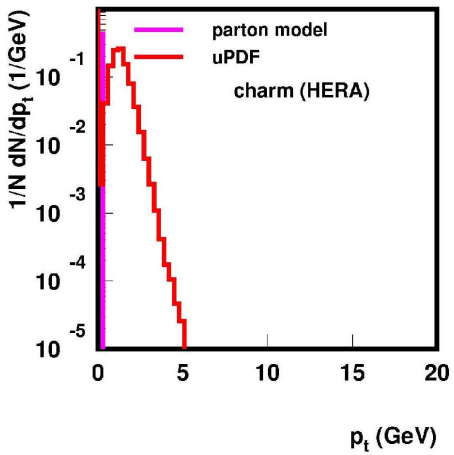
J.Collins, H.Jung hep-ph/0508280

$\Rightarrow$ More physical distributions already in LO

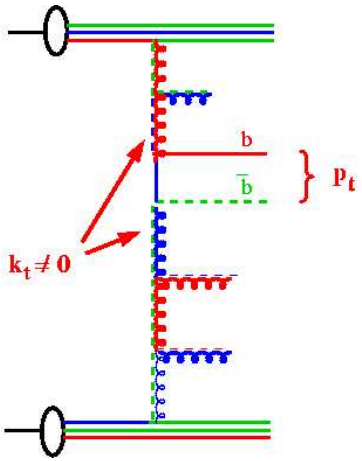
$\Rightarrow$ Smaller NLO corrections

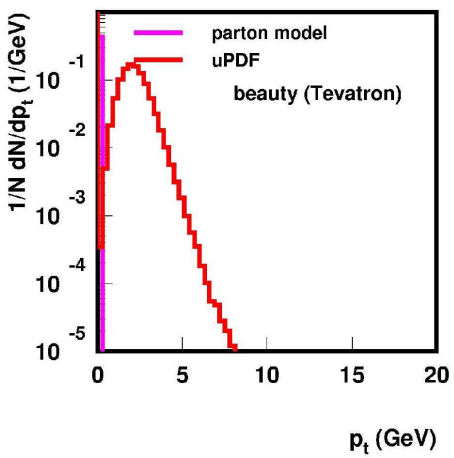
Heavy Quarks at HERA



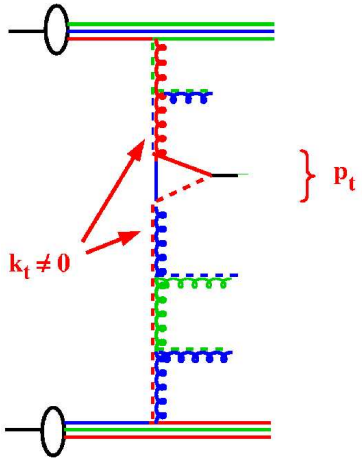


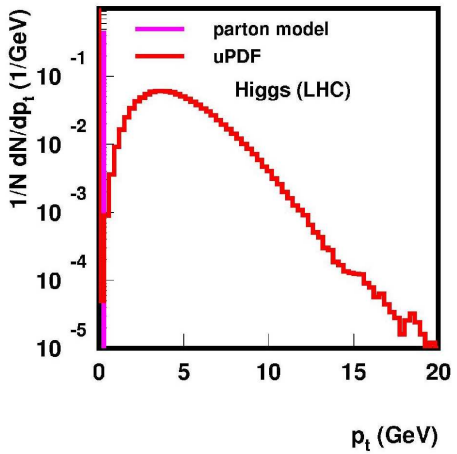
Heavy Quarks at pp





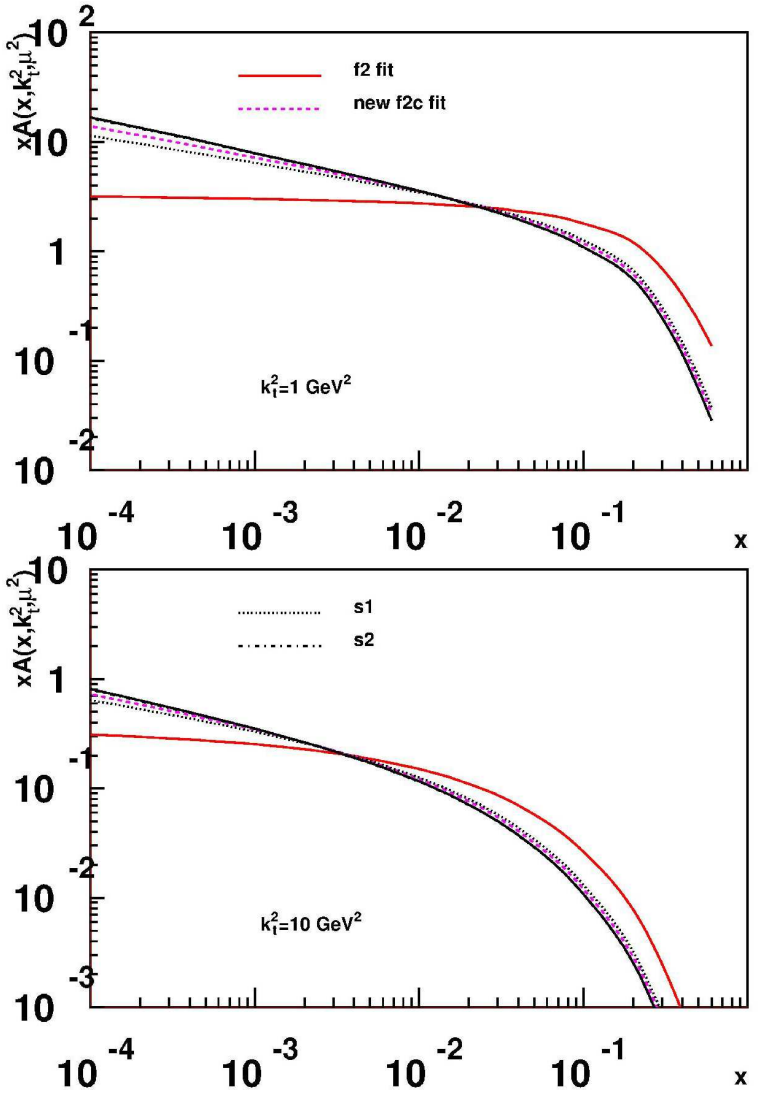
Higgs at pp





Previous Fits: F_2 and F_2^c

- H. Jung *et al.* hep-ph/0611093
- Fits to F_2 and F_2^c suggest different uPDFs
- Fit to $F_2 \Rightarrow$ flat uPDF for small x
- Fit to $F_2^c \Rightarrow$ steep rise of uPDF for small x



Previous Fits: F_2 and F_2^c

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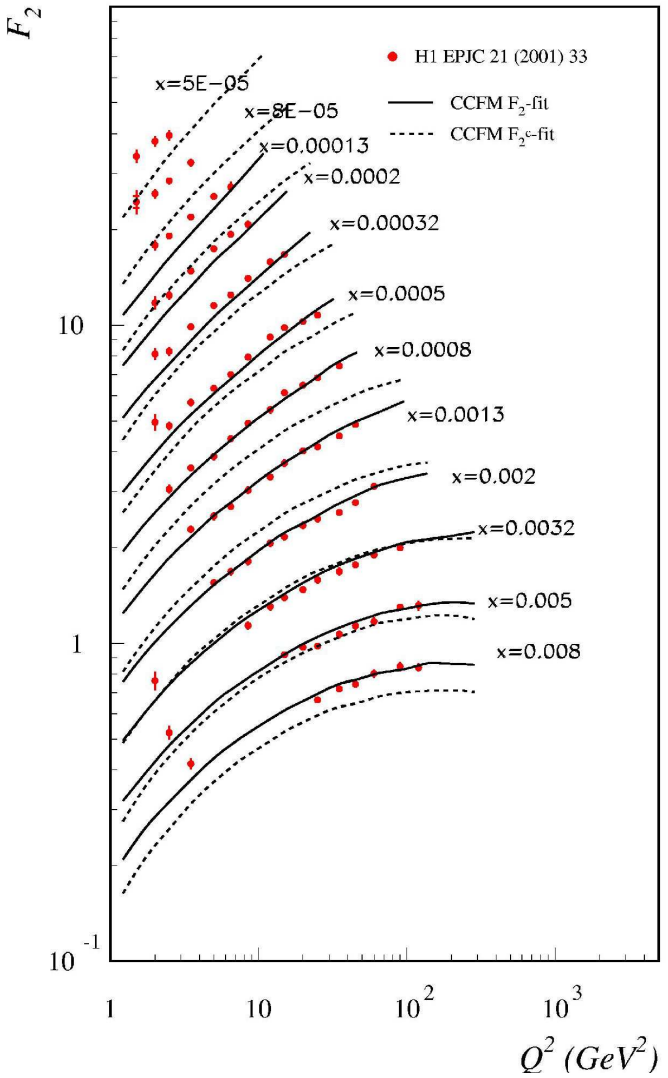
- Fits to F_2 and F_2^c suggest different uPDFs
- Fit to $F_2 \Rightarrow$ flat uPDF for small x
- Fit to $F_2^c \Rightarrow$ steep rise of uPDF for small x
- uPDF obtained from fit to F_2 can not describe F_2^c and vice versa
- Updated F_2 and F_2^c fits: See talk by A. Cholewa
- uPDF from jet data?



Fit Procedure I

Use Fit Program by H. Jung:

- Only use gluon densities
- Select starting distribution $x\mathcal{A}_0(x, k_\perp, \bar{q}_0)$
- Simulate events using CASCADE MC generator,
  uPDF is evolved using CCFM according to

$$x\mathcal{A}(x, k_\perp, \bar{q}) = \int dx' \mathcal{A}_0(x', k_\perp, \bar{q}_0) \cdot \frac{x}{x'} \tilde{\mathcal{A}}(\frac{x}{x'}, k_\perp, \bar{q})$$

- Minimize χ^2 by varying parameters in starting distribution $x\mathcal{A}_0(x, k_\perp, \bar{q}_0)$
  using HZTOOL and MINUIT

Fit Procedure II

- Starting distribution:

$$x\mathcal{A}_0(x, k_\perp, \bar{q}_0) = N \cdot x^{-B} \cdot (1-x)^4 \cdot exp(-k_\perp^2/k_0^2)$$

  where N and B are free parameters

- Using full splitting function, i.e. including non-singular terms
- One-loop α_s with $\lambda_{QCD}^{[4]} = 0.13$ GeV
- Starting scale of evolution: $\bar{q}_0 = 1.2$ GeV
- Width of Gaussian: $k_0 = 1.2$ GeV
- $k_\perp$ cut-off $= 1.2$ GeV
- $\chi^2 = \sum_i \left(\frac{(T_i - D_i)^2}{\sigma_{T,i}^2 + \sigma_{D,i}^2} \right)$

Fit to Dijet Data (H1 prelim)

DIS Selection

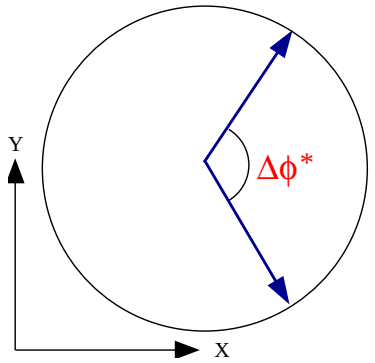
$$5\ \text{GeV}^2 < \quad Q^2 \quad < 100\ \text{GeV}^2$$

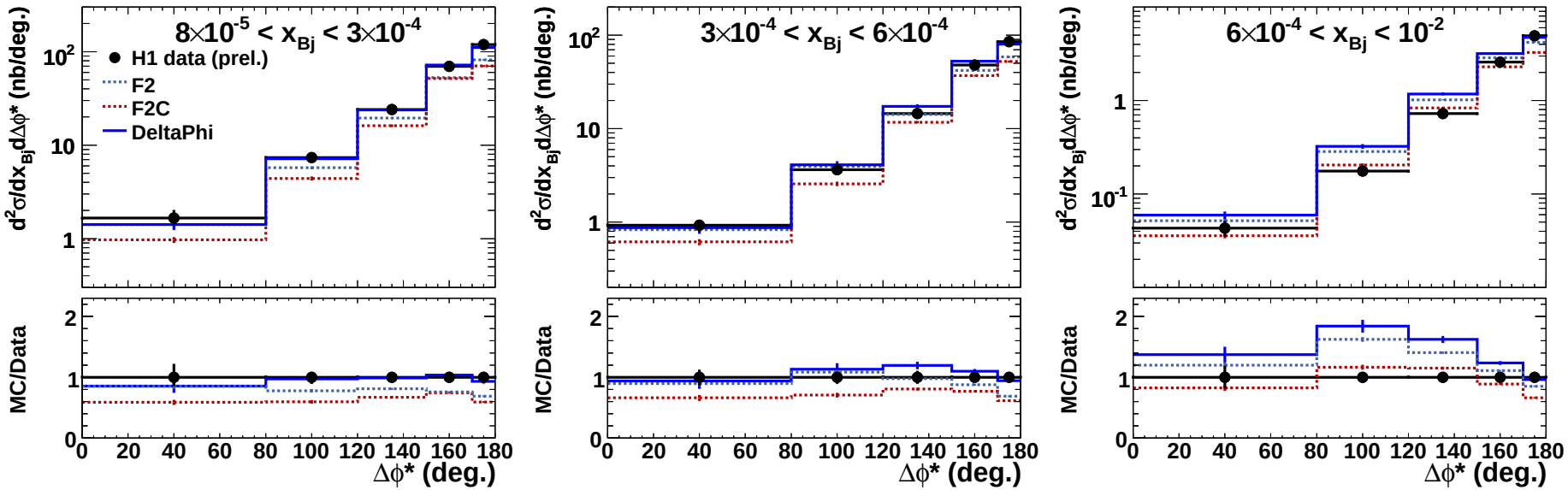
$$0.1 < \quad y \quad < 0.7$$

Dijet Selection

$$-1 < \quad \eta_j \quad < 2.5$$

$$5\ \text{GeV} < \quad E^*_{\perp j}$$



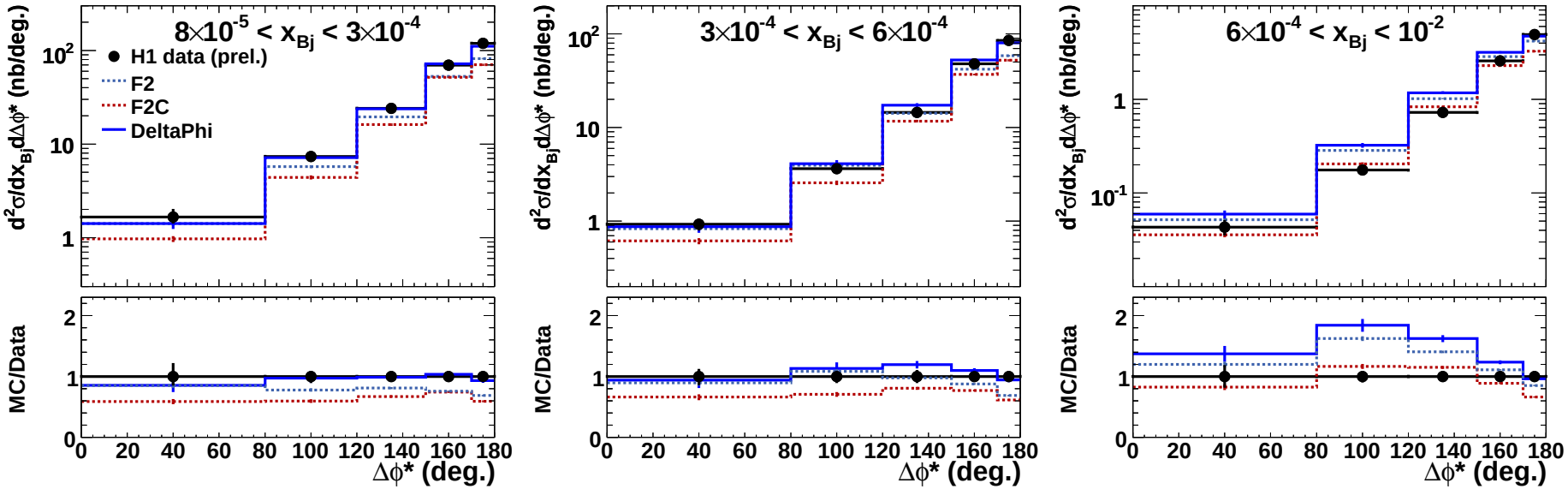


Only fit two lowest x_{Bj} bins

Fit to Dijet Data (H1 prelim)

χ^2/ndf for two lowest x_{Bj} bins:

	χ^2/ndf
F_2	14.9
F_2^c	22.6
$\Delta\phi^*$ Fit	1.04

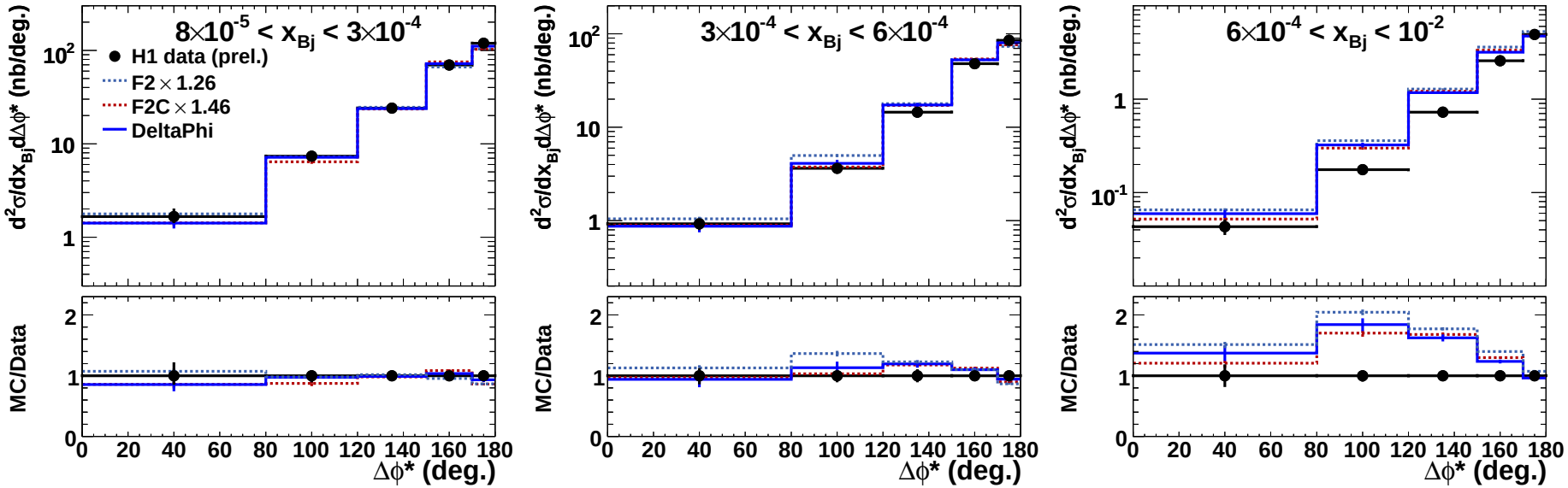


Only fit two lowest x_{Bj} bins

Fit to Dijet Data (H1 prelim)

χ^2/ndf for two lowest x_{Bj} bins:

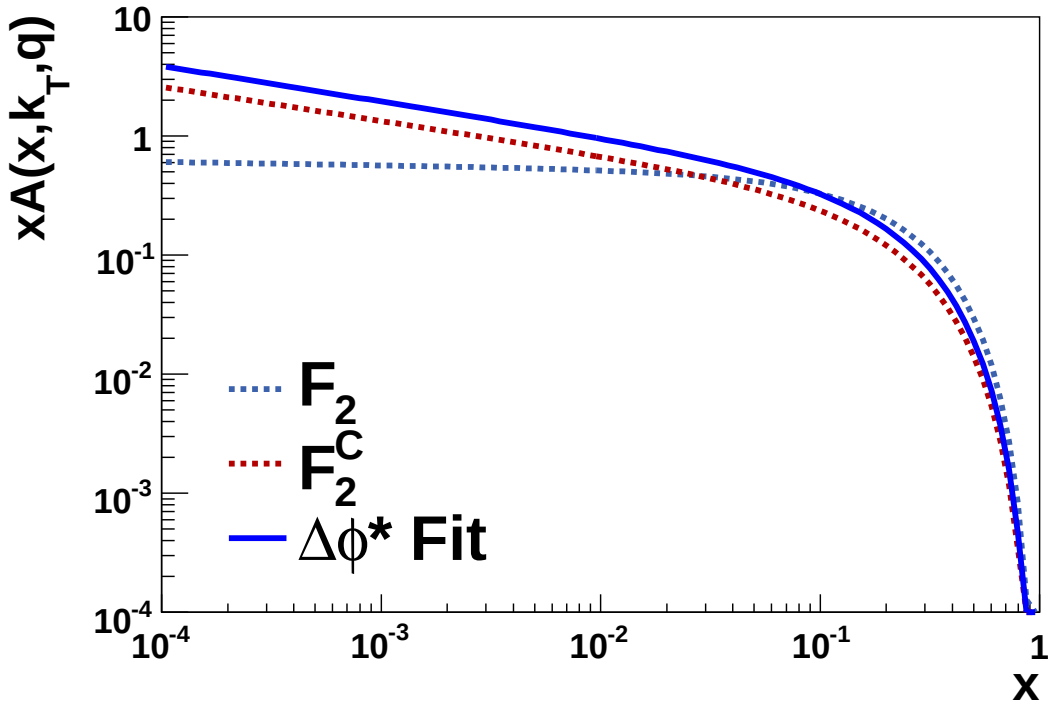
	χ^2/ndf	χ^2/ndf (fit norm)
F_2	14.9	4.3
F_2^c	22.6	2.9
$\Delta\phi^*$ Fit	1.04	



Only fit two lowest x_{Bj} bins

Fit to Dijet Data (H1 prelim)

	χ^2/ndf	χ^2/ndf (fit norm)	N	B
F_2	14.9	4.3	0.4695	0.0278
F_2^c	22.6	2.9	0.1860	0.2860
$\Delta\phi^*$ Fit	1.04		0.2502	0.2976



Fit to Forward Jet Data (H1)

DIS Selection

$$5\ \text{GeV}^2 < \quad Q^2 \quad < 85\ \text{GeV}^2$$

$$0.1 < \quad y \quad < 0.7$$

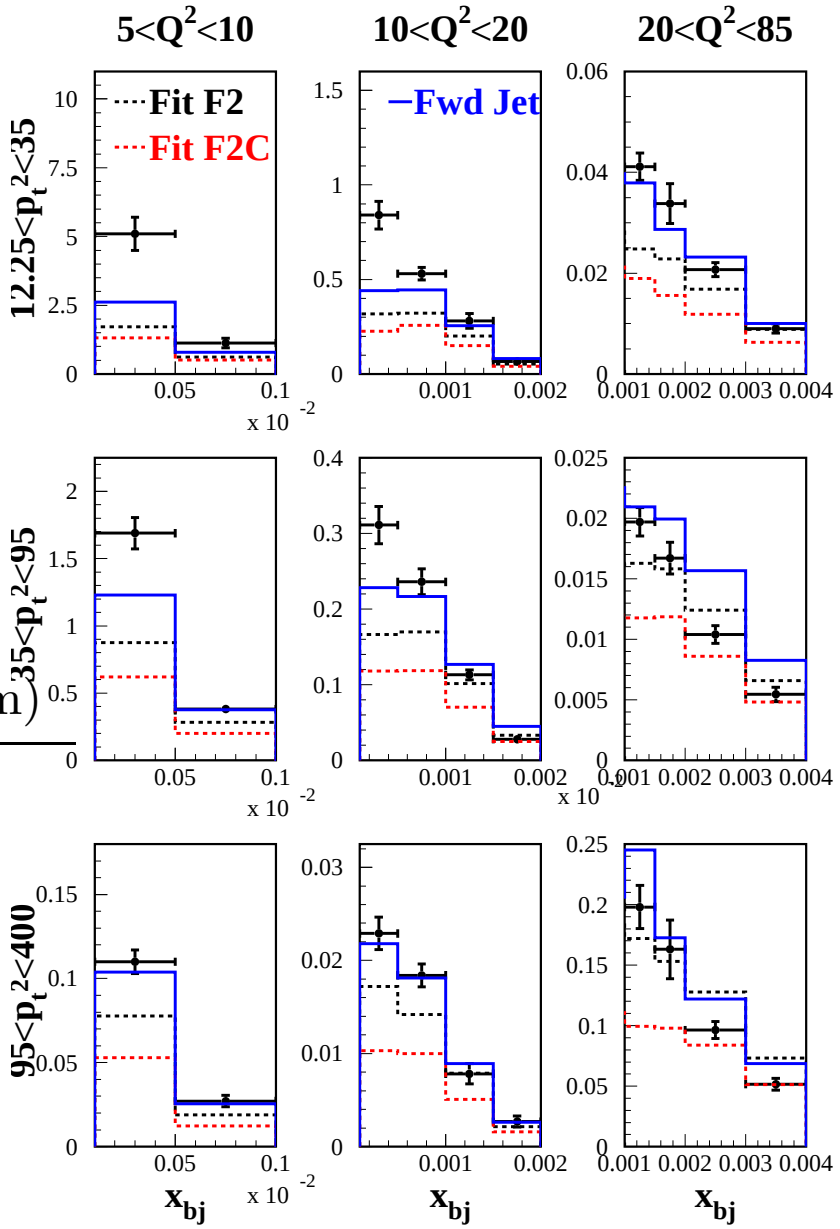
$$10^{-4} < \quad x_{Bj} \quad < 4 \cdot 10^{-3}$$

Forward Jet Selection

$$1.735 < \quad \eta_j \quad < 2.79$$

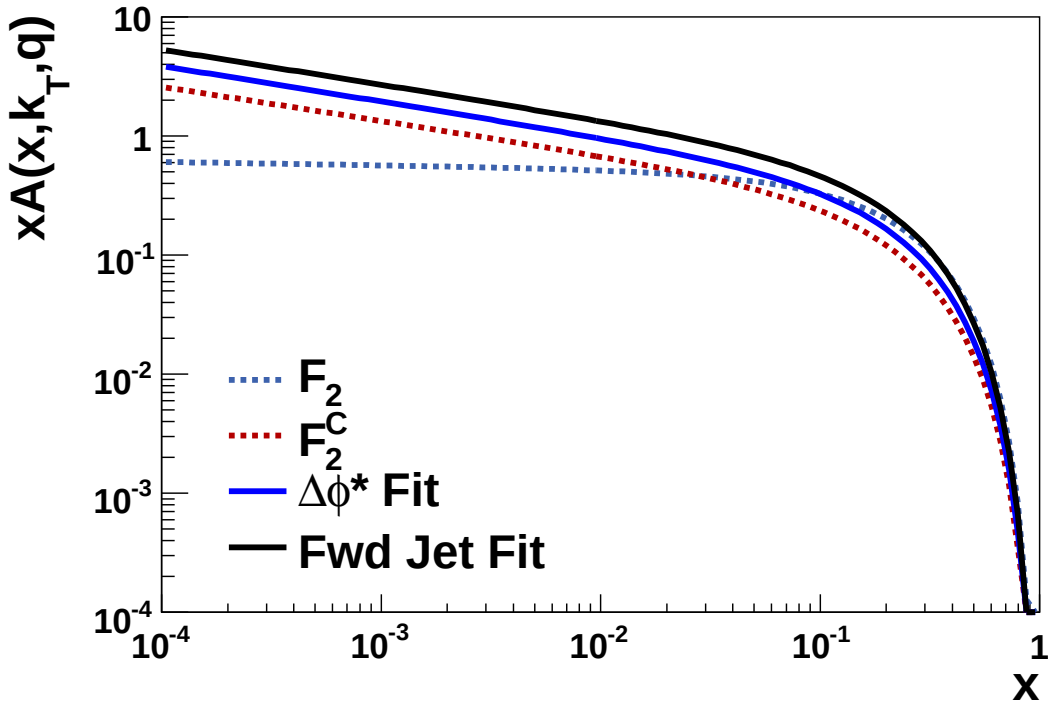
$$3.5\ \text{GeV} < \quad E_{\perp j}$$

	χ^2/ndf	χ^2/ndf (fit norm)
F_2	13.6	10.8
F_2^c	29.9	9.9
Fwd Jet Fit	5.3	



Fit to Forward Jet Data (H1)

	N	B
F_2	0.4695	0.0278
F_2^c	0.1860	0.2860
$\Delta\phi^*$ Fit	0.2502	0.2976
Fwd Jet Fit	0.3551	0.2940



Summary & Conclusions

- Unintegrated gluon density fitted to jet data using CASCADE, HZTOOL and MINUIT

- Fit to H1 preliminary jet data ($\Delta\phi^*$)
  $\Rightarrow$ Good description at low x
  $\Rightarrow$ Improvement compared to F_2 and F_2^c

- Fit to H1 forward jet data
  $\Rightarrow$ Improvement compared to F_2 and F_2^c
  $\Rightarrow$ ...but no good χ^2

- Fits to dijet and forward jet data suggest similar gluon as obtained from F_2^c