

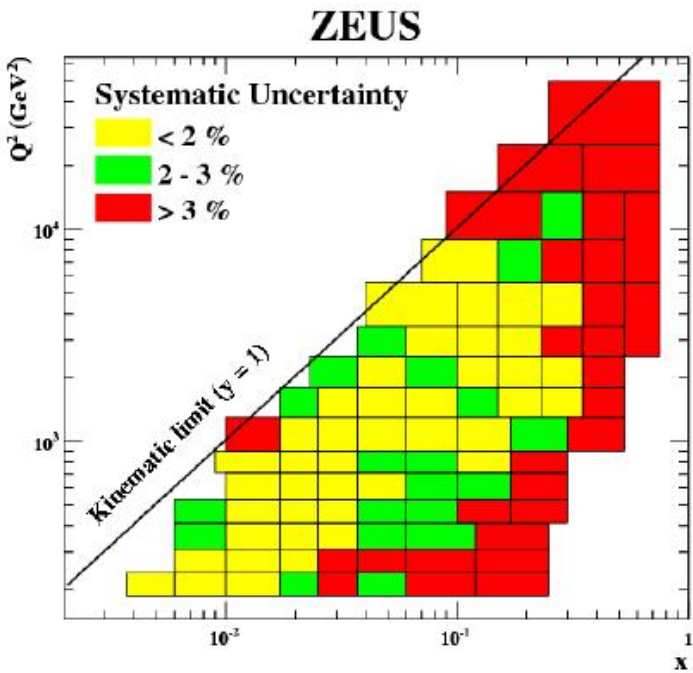


# Recent and upcoming Structure Function Results from HERA

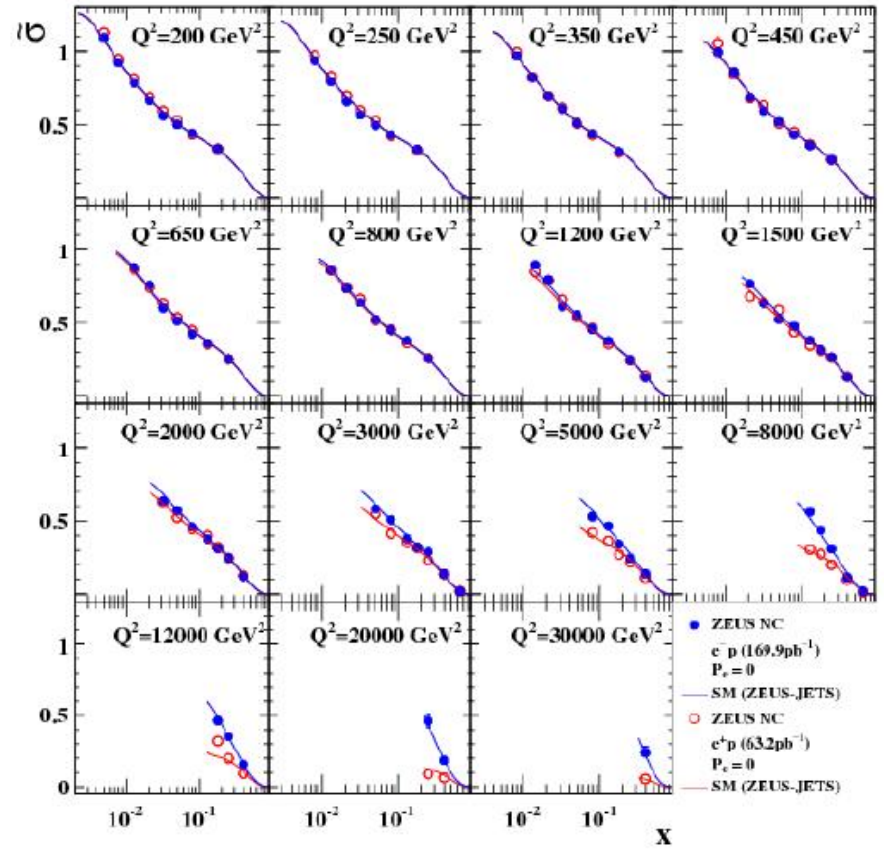
- High- $Q^2$  NC and CC from HERA II
- Charm and Beauty
- FL
- Combined F2

# xF<sub>3</sub> and in NC

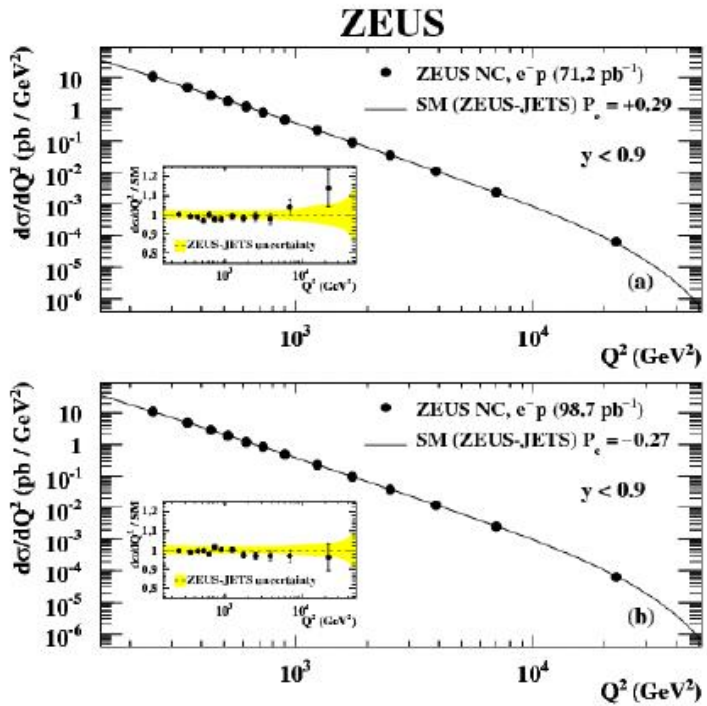
Latest paper on 2005 e-p data



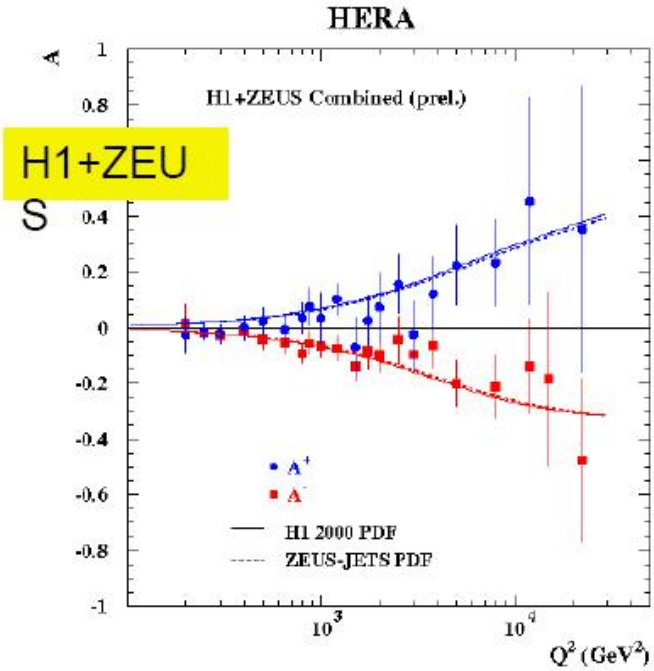
## ZEUS



# Polarized NC at high $Q^2$



$$A^{\pm} \simeq \mp \kappa_Z a_e \frac{F_2^{\gamma Z}}{F_2}$$

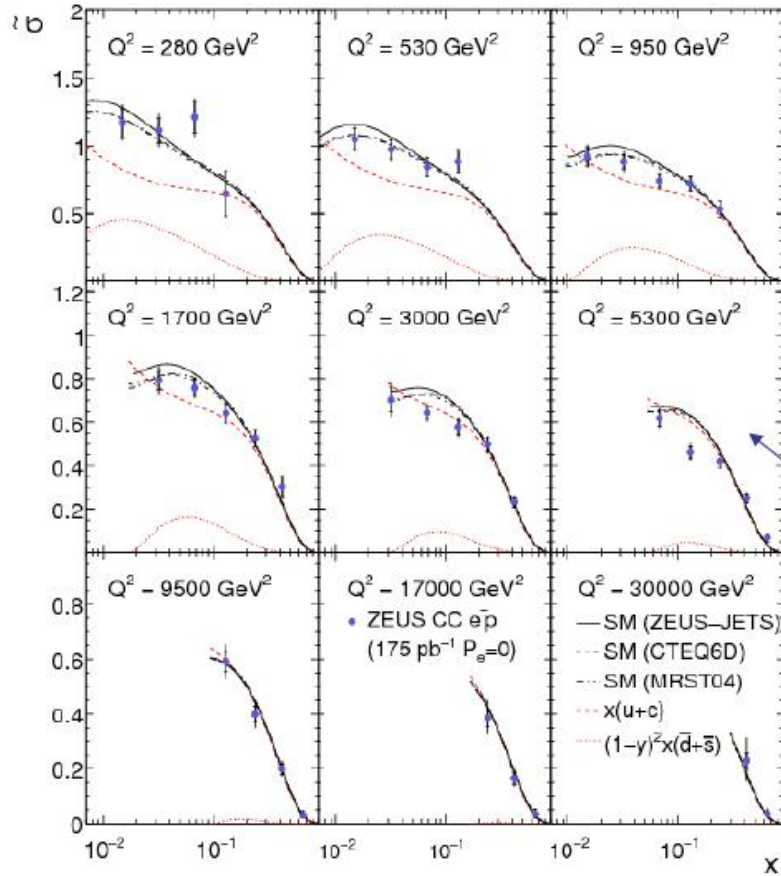


In NC the effect of  $P$  is small, but one can measure the asymmetry: parity-violating effect observed in NC at high  $Q^2$  for the first time

About to be published

# Differential CC cross-sections

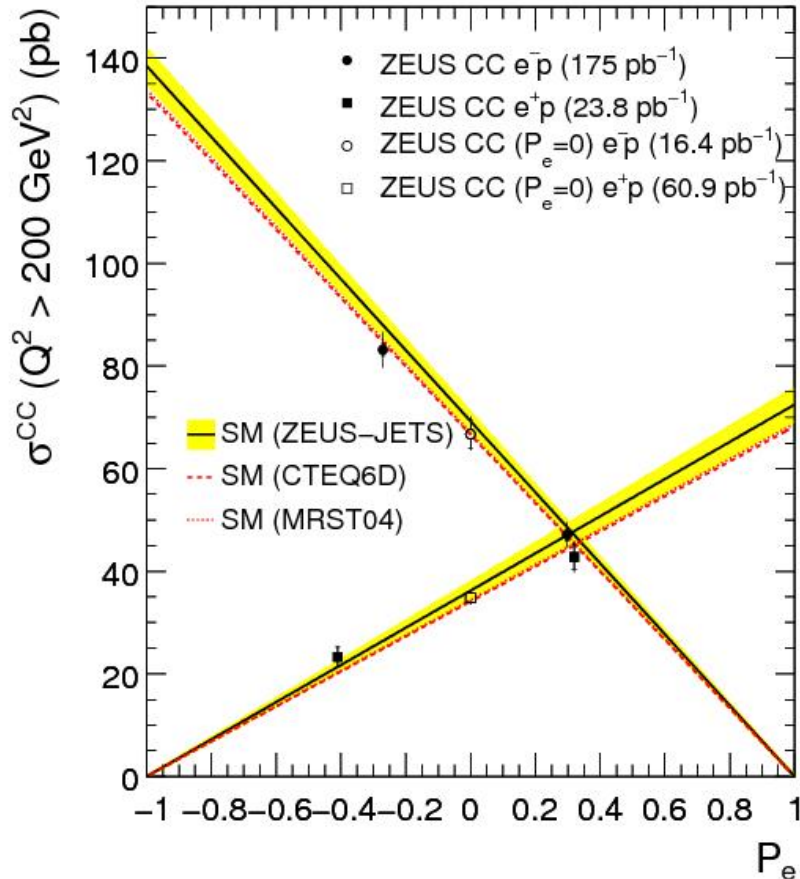
ZEUS



Differential CC cross sections can give information on the parton densities

$e\bar{p}$  u dominated

# ZEUS

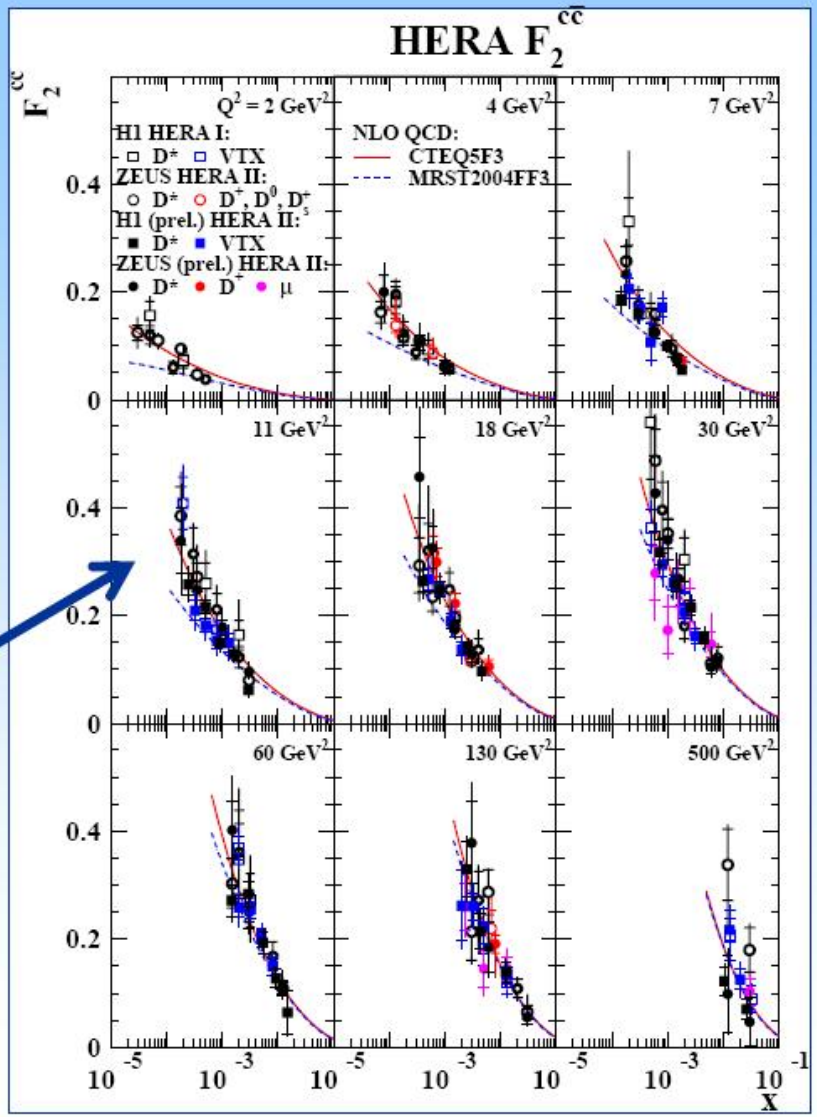
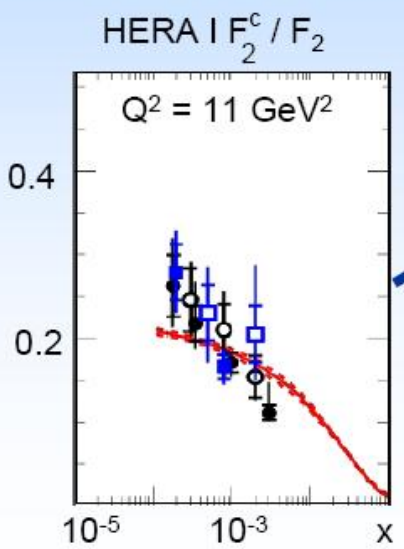


$$\sigma_{\text{polCC}}^{e\pm p}(Q^2, X) = \frac{1 \pm P_e}{2} \cdot \sigma_{\text{LHCC}}^{e\pm p}(Q^2, X)$$

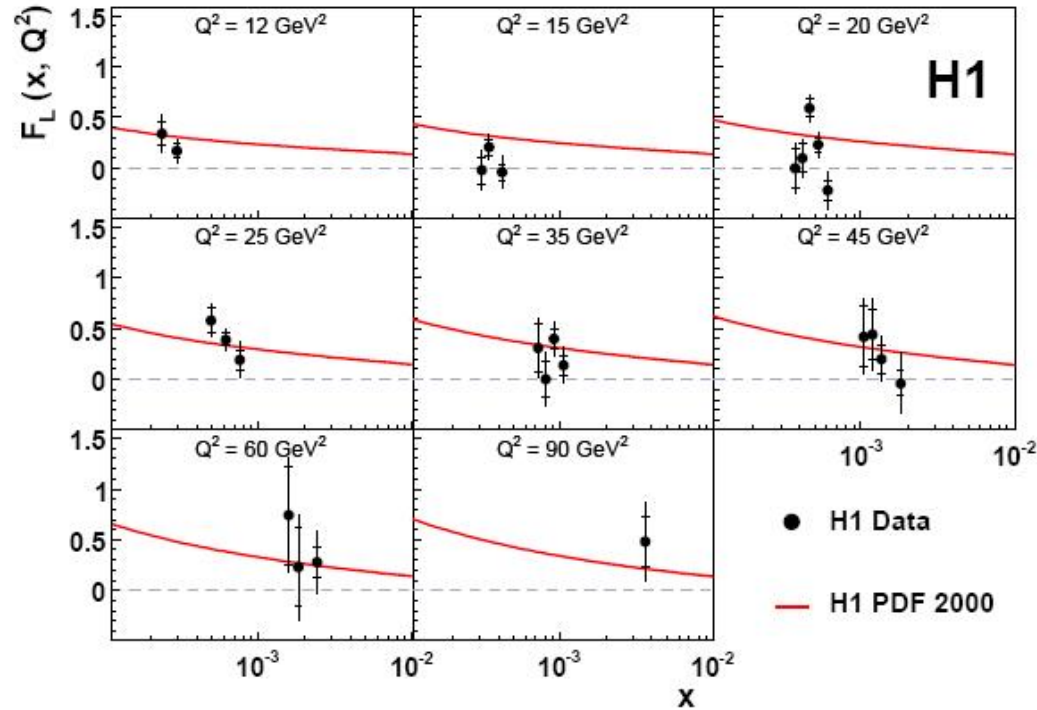
Another textbook plot,  
absence of right-handed  
charged current

DESY-08-177

Outlook:  
 Precision will improve  
 Results will be combined



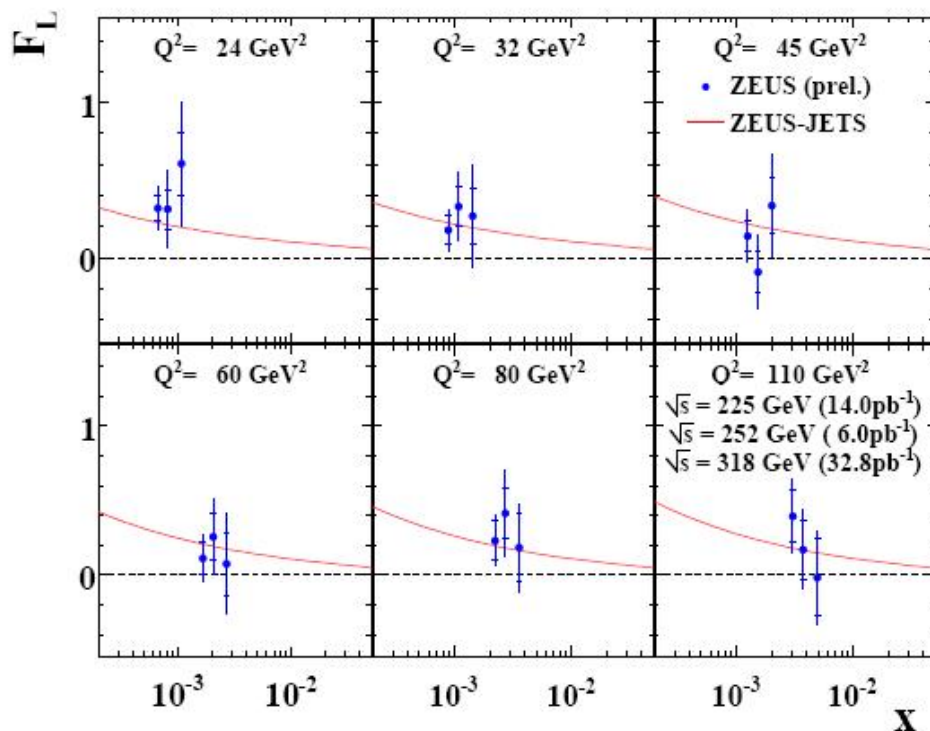
# The First Measurement of $F_L$ at HERA



- Agree well with QCD prediction.
- Released for Moriond QCD, March 2008. DESY-08-053.

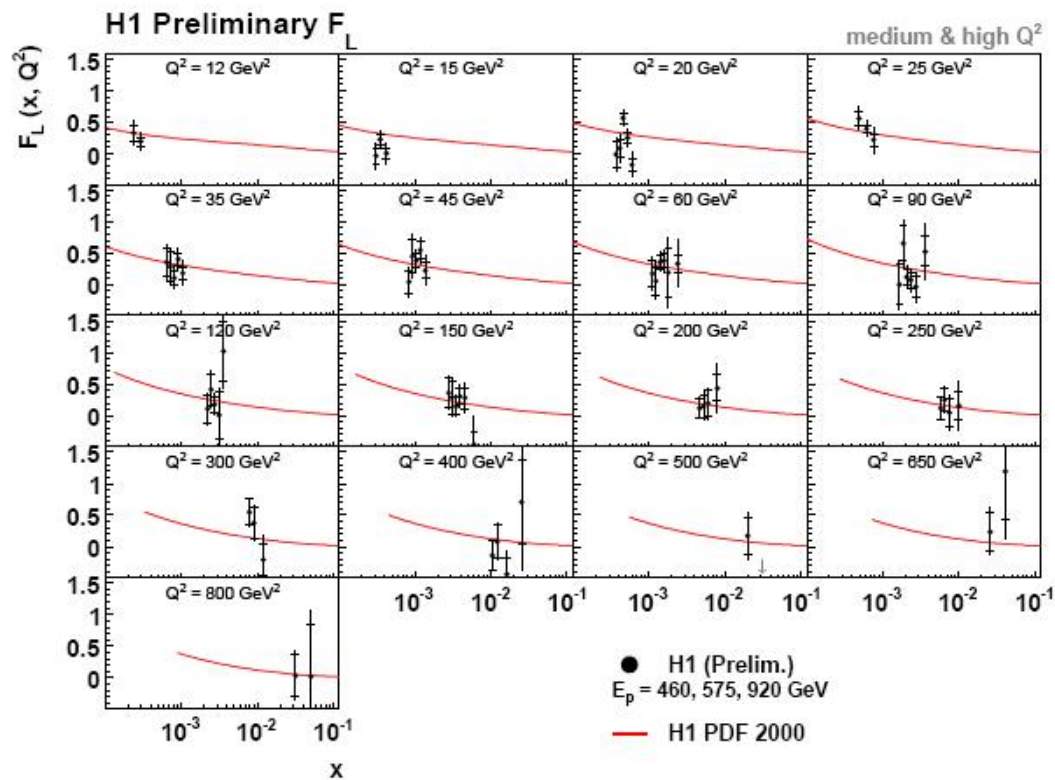
# Measurement of $F_L$ by ZEUS

## ZEUS



- Updated for ICHEP to include  $E_p = 575 \text{ GeV}$  data.
- Consistent with NLO prediction and H1.

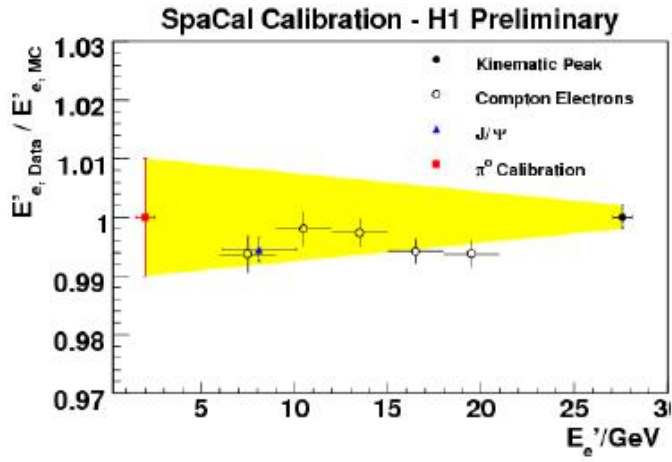
# The Combined Measurement of $F_L$ by H1



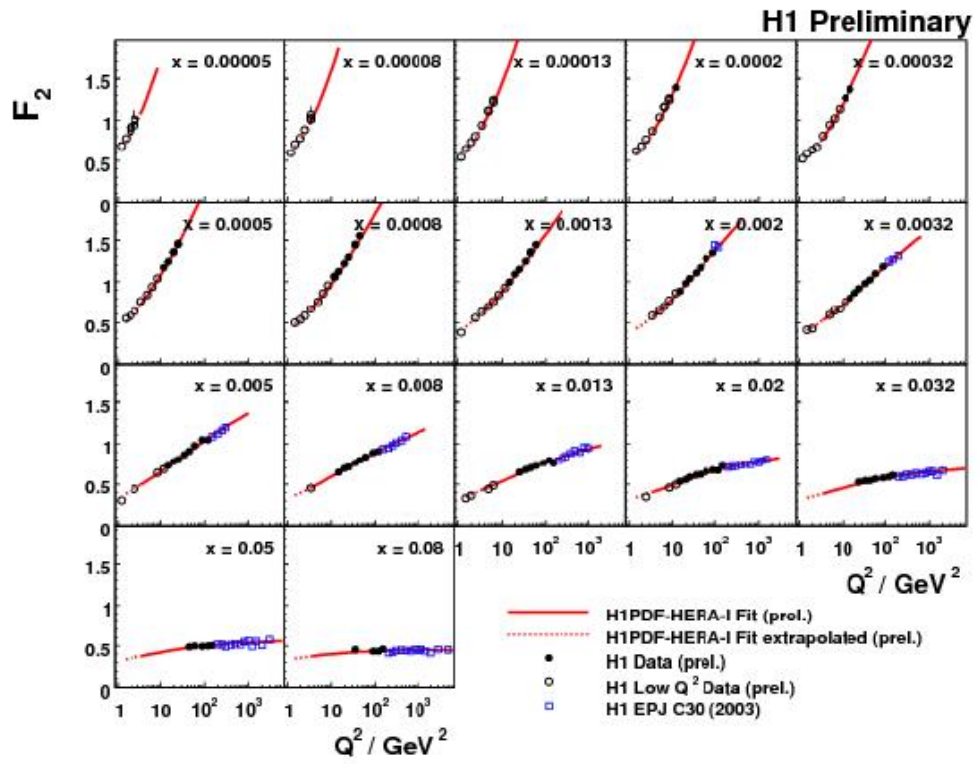
Bins 35 – 90  $\text{GeV}^2$  improved, new bins at  $Q^2 \geq 120 \text{ GeV}^2$ .

# Latest H1 measurement

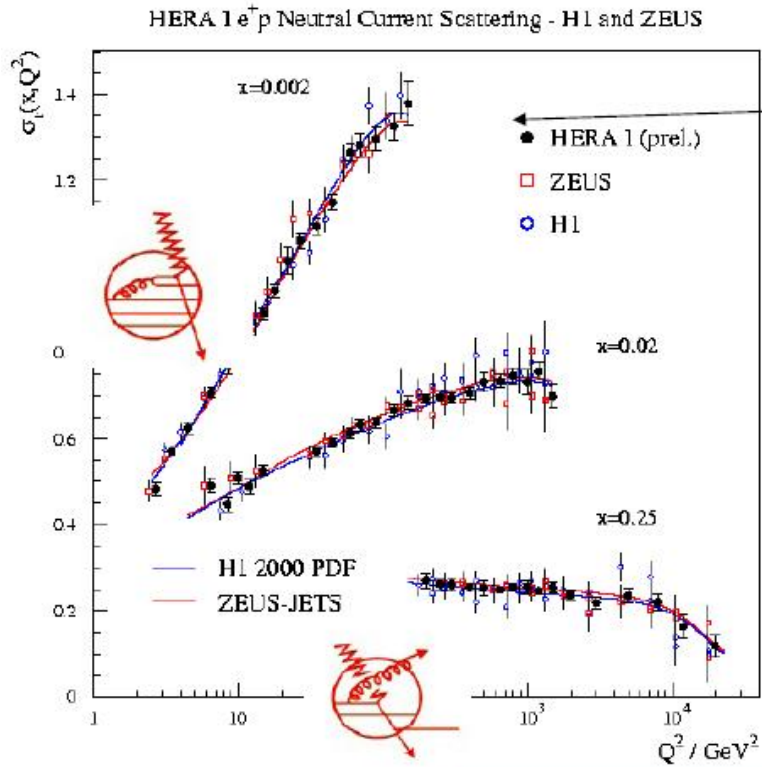
New 2000 data



2000 data added, most accurate measurement in the kinematic region  $12 < Q^2 < 150 \text{ GeV}^2$ ,  $0.0002 < x < 0.1$ , 1.5-2% syst. error



# Combined H1-ZEUS $F_2$

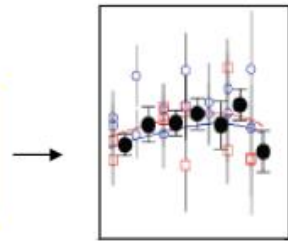


Precision ZEUS or H1  
2-3%, <2% combined

DGLAP works, can  
extract PDFs from fit

10% precision due to  
statistics

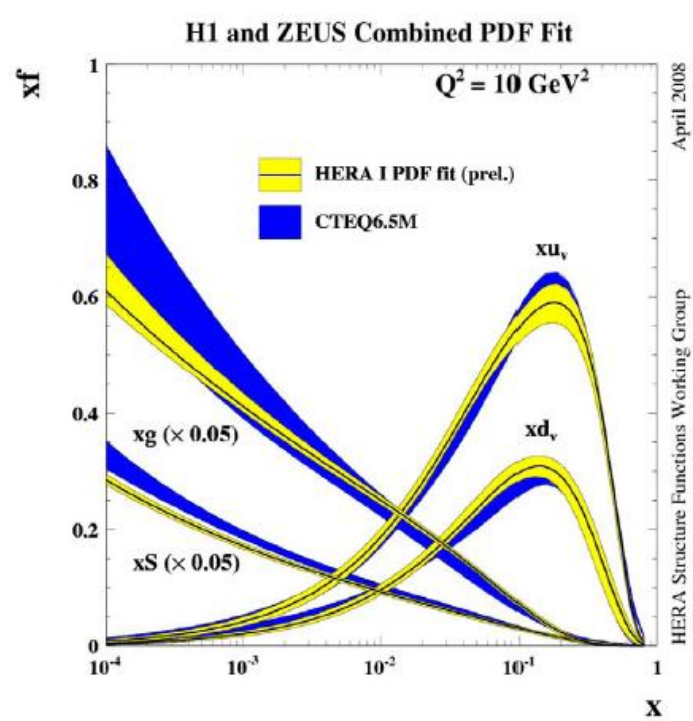
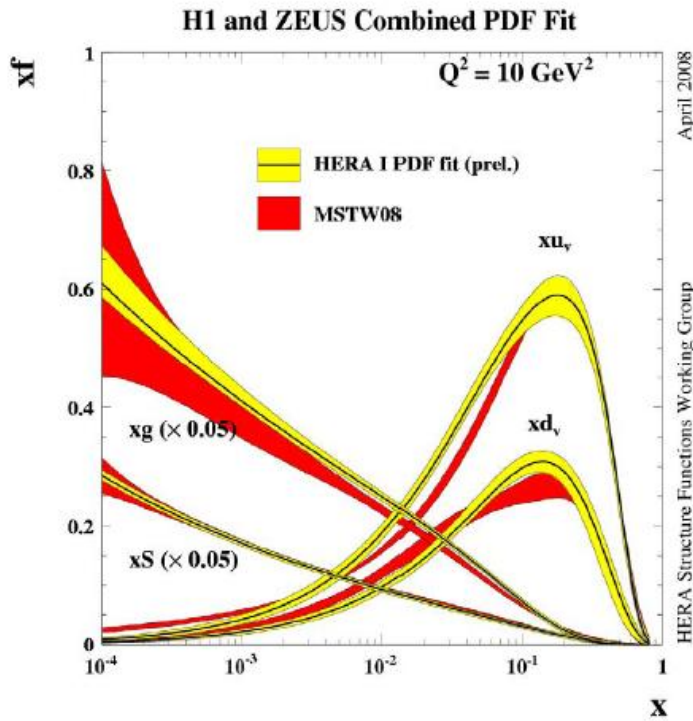
Errors reduced in combination, each  
experiment 'calibrates' the other



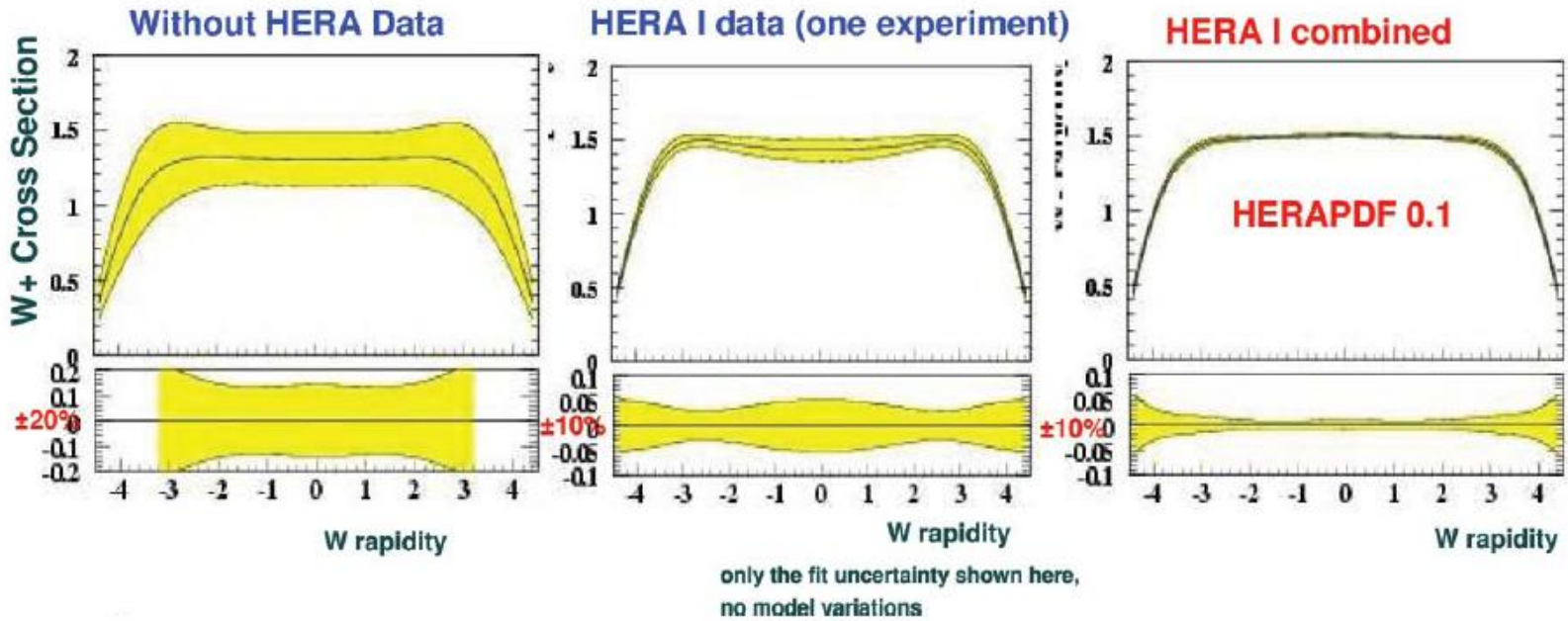
# Parton densities from combined HERA data

HERA I PDF Fit using HERA data only

- no heavy target corrections
- control of systematic errors



# Parton densities from combined data



A test on a standard candle process at LHC

HERA PDFs 0.1 available in LHAPDF

# Summary and outlook

- Final CC and NC e-p being published from ZEUS.
- Final CC and NC e+p from ZEUS—perhaps first half of next year. (~x2 more precise than now.)
- Charm and Beauty—many new results. Ultimately ~5% for F2c and ~20% F2b
- H1 first FL published. ZEUS will publish soon. Wider kinematic range and better precision expected from H1 in the future.
- New precision F2 from HERA 1 data from H1 being published.
- Combined H1+ZEUS F2 will use new H1 data and we expect to have it out first half of next year.