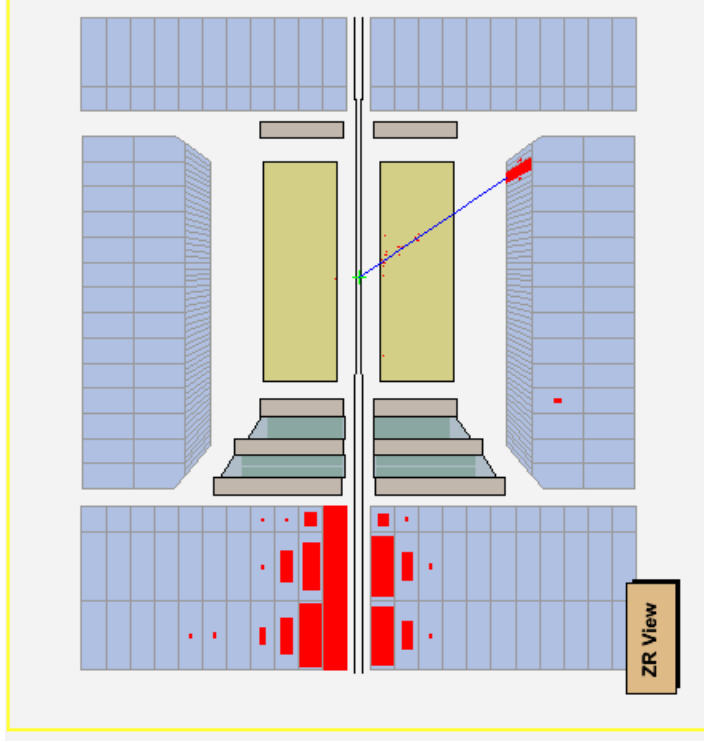


NC cross section at high x at ZEUS

Yujin Ning, Columbia University

On behalf of ZEUS Collaboration

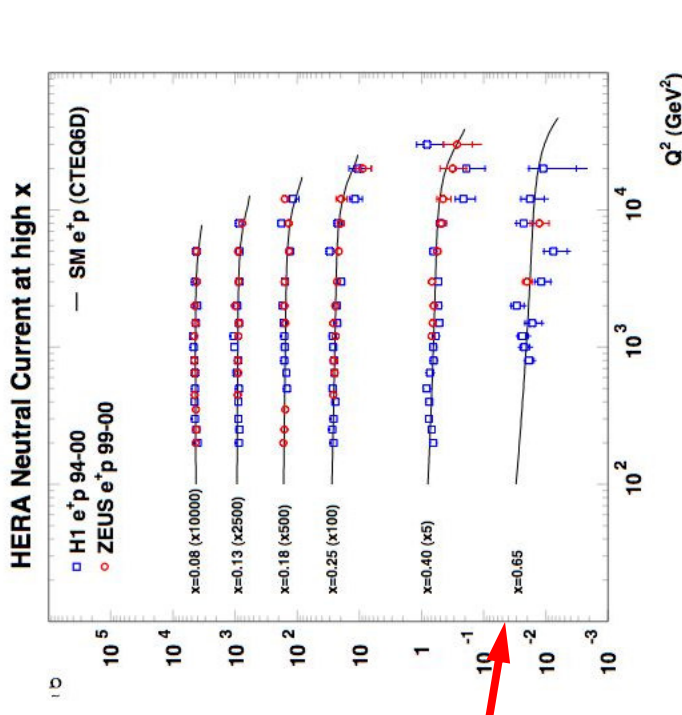
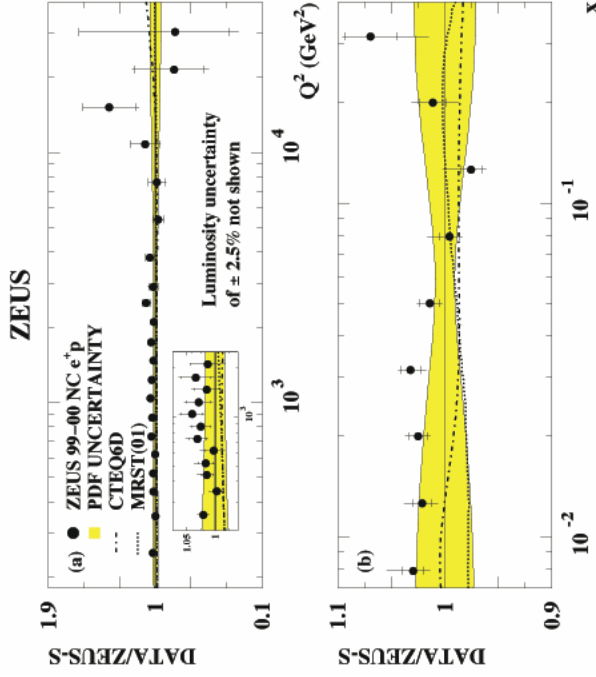
- Motivation & method
- Data selection
- Control plots
- Comparison with published ZEUS result
- Measured cross section
- Conclusion



Motivation

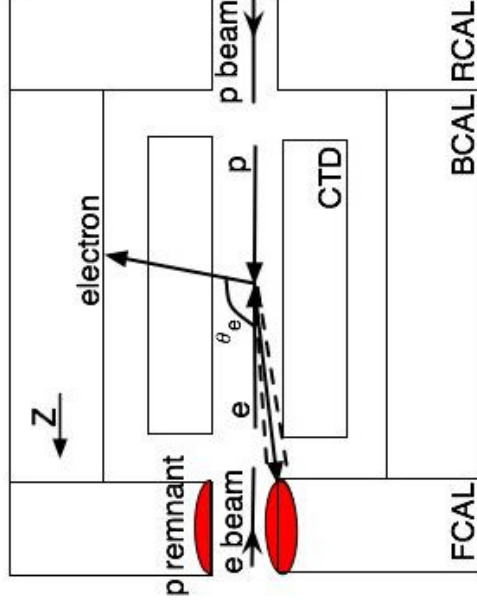
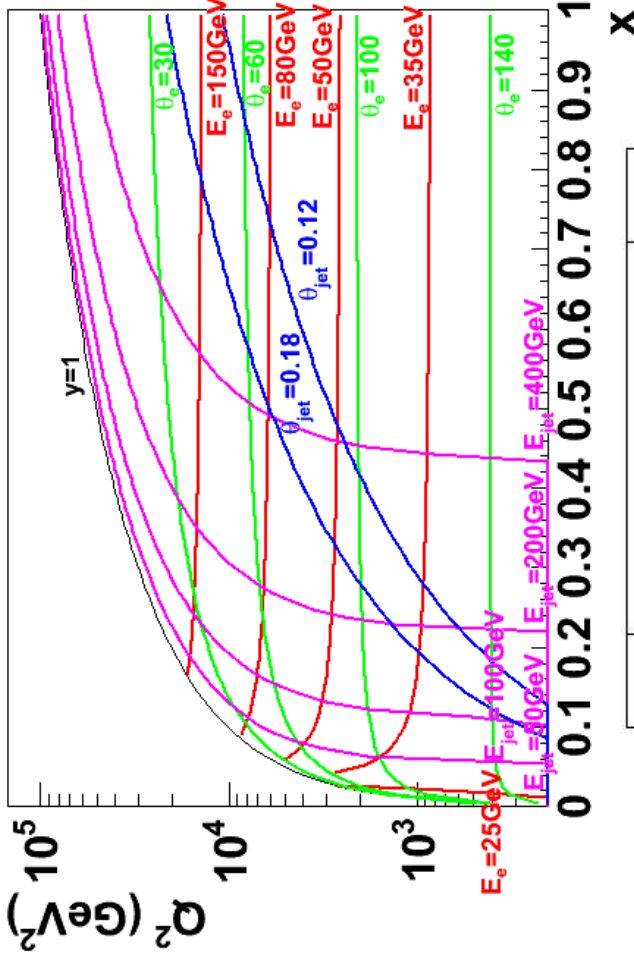
- PDFs decrease very quickly at high x , hard to measure because of low statistics and large migration
- Highest measured point $x=0.75$, BCDMS, data is available at higher x but at low W , need huge correction.

- ZEUS published $x=0.65$



- The uncertainties on PDF grow with x , might be infinite at $x=1$
- New reconstruction methods are needed to reach the highest x

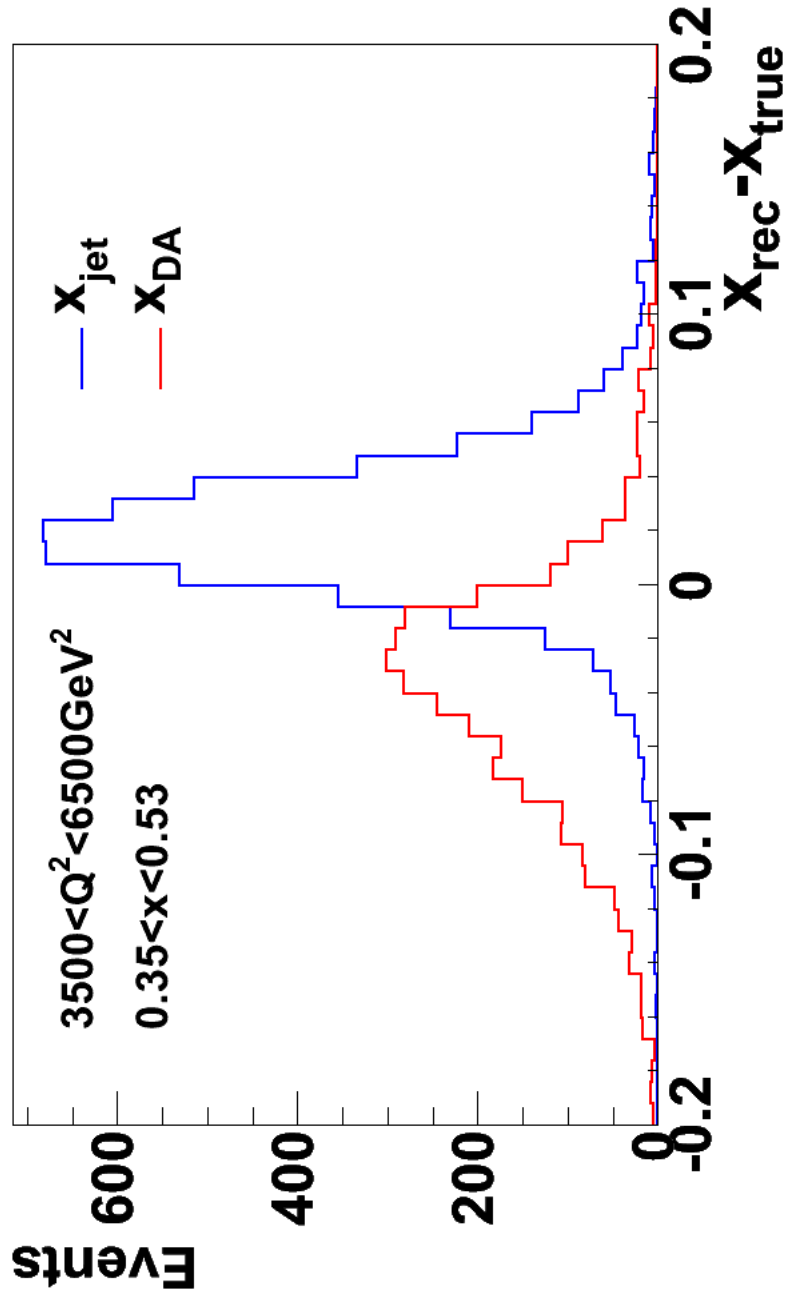
Method



- Electron + Jet
- Electron is well reconstructed for $Q^2 > 450 \text{ GeV}^2$, very high acceptance in whole x range
- Define Q^2 bins from E_e and θ_e :
 $Q^2 = 2 \times E_e \times E'_e \times (1 + \cos\theta_e)$
- In each Q^2 bin, define x bins:
 - If leading jet is NOT near the beam hole
 → low x , jet is well reconstructed, x from E_{jet} and θ_{jet} , good resolution
 - If jet IS near beam hole
 → high x , jet is not well reconstructed → no jet, count events without jet
 → $x_{\text{Edge}} < x < 1$ → integral of cross section

X_{jet} vs. X_{DA} at high x

ZEUS

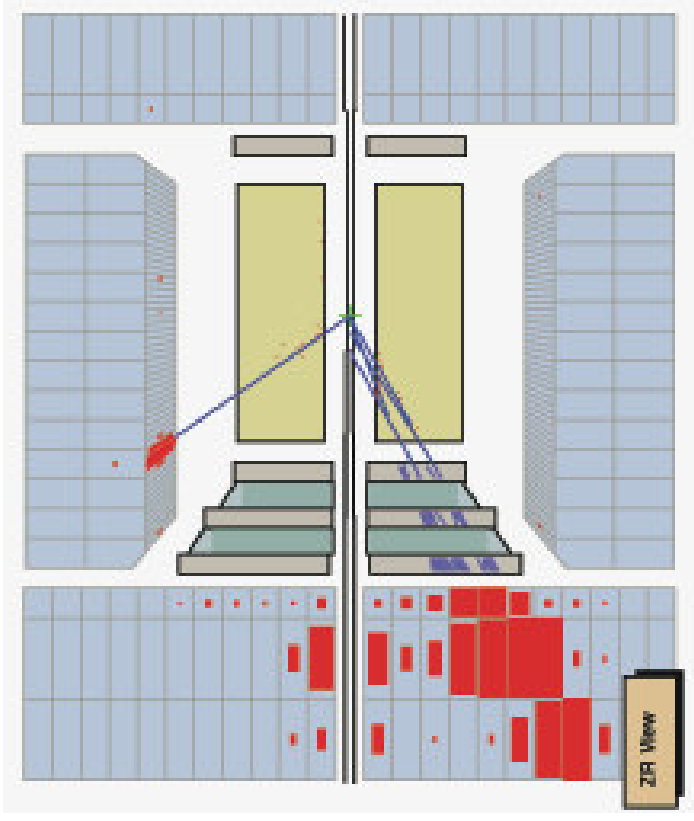


X_{jet} has better resolution at high x

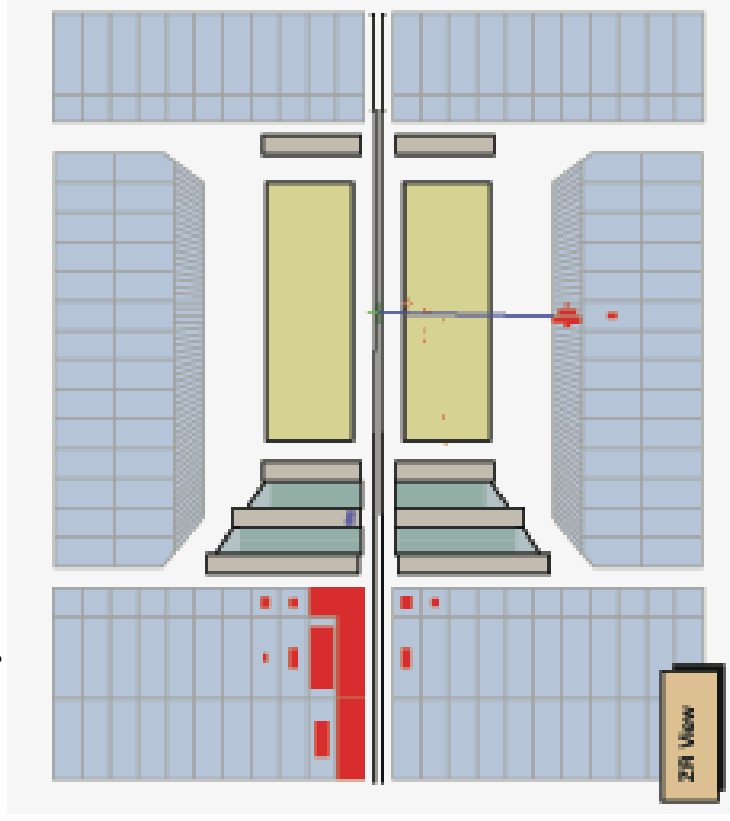
ZEUS previous reconstruction: Double Angle method (DA)
New method x reconstruction: E_{jet} and θ_{jet}

Data selection

- 99-00 e⁺p
- High energy electron with strict fiducial cuts
- Zero or one jet with high E_{Tjet} and $\theta_{jet} > 0.12$

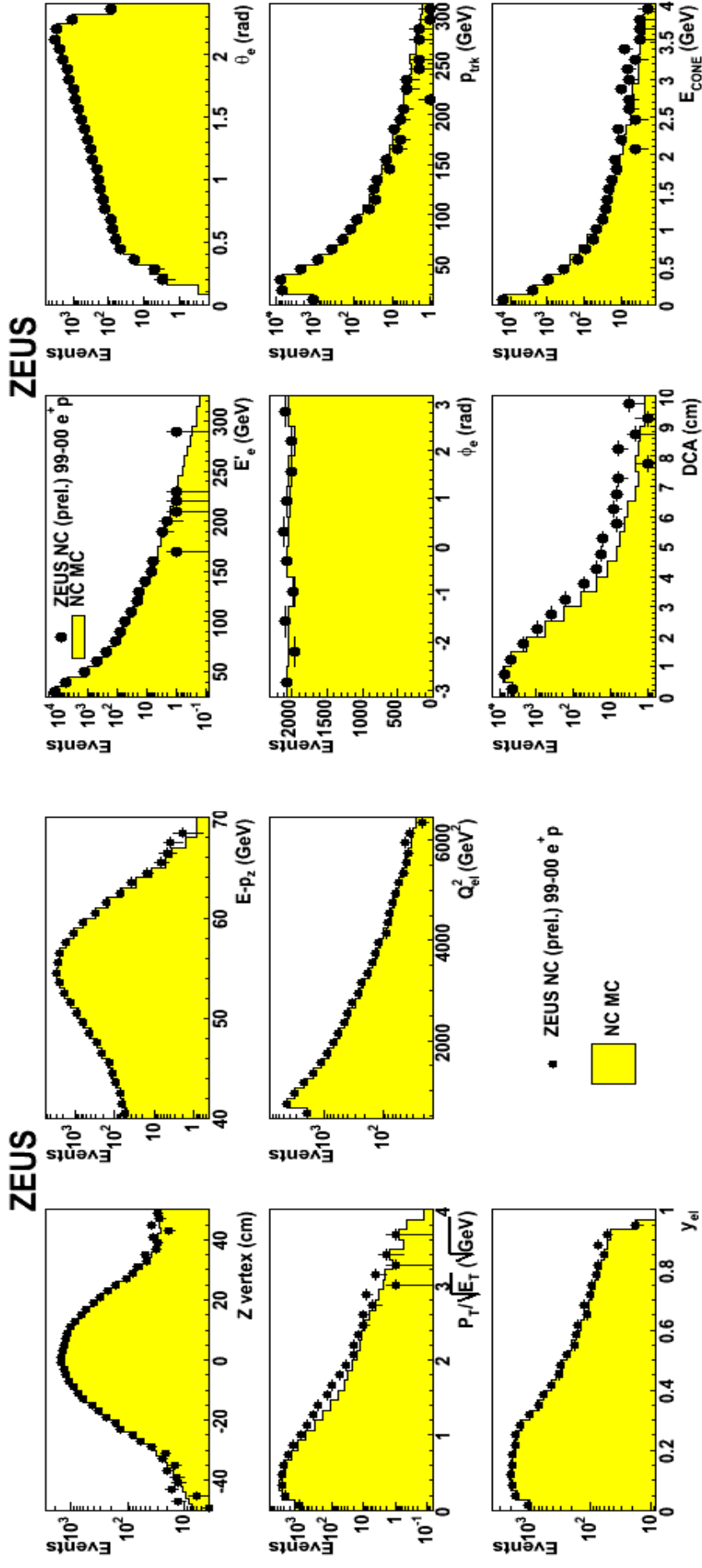


one jet



zero jet

Control plots

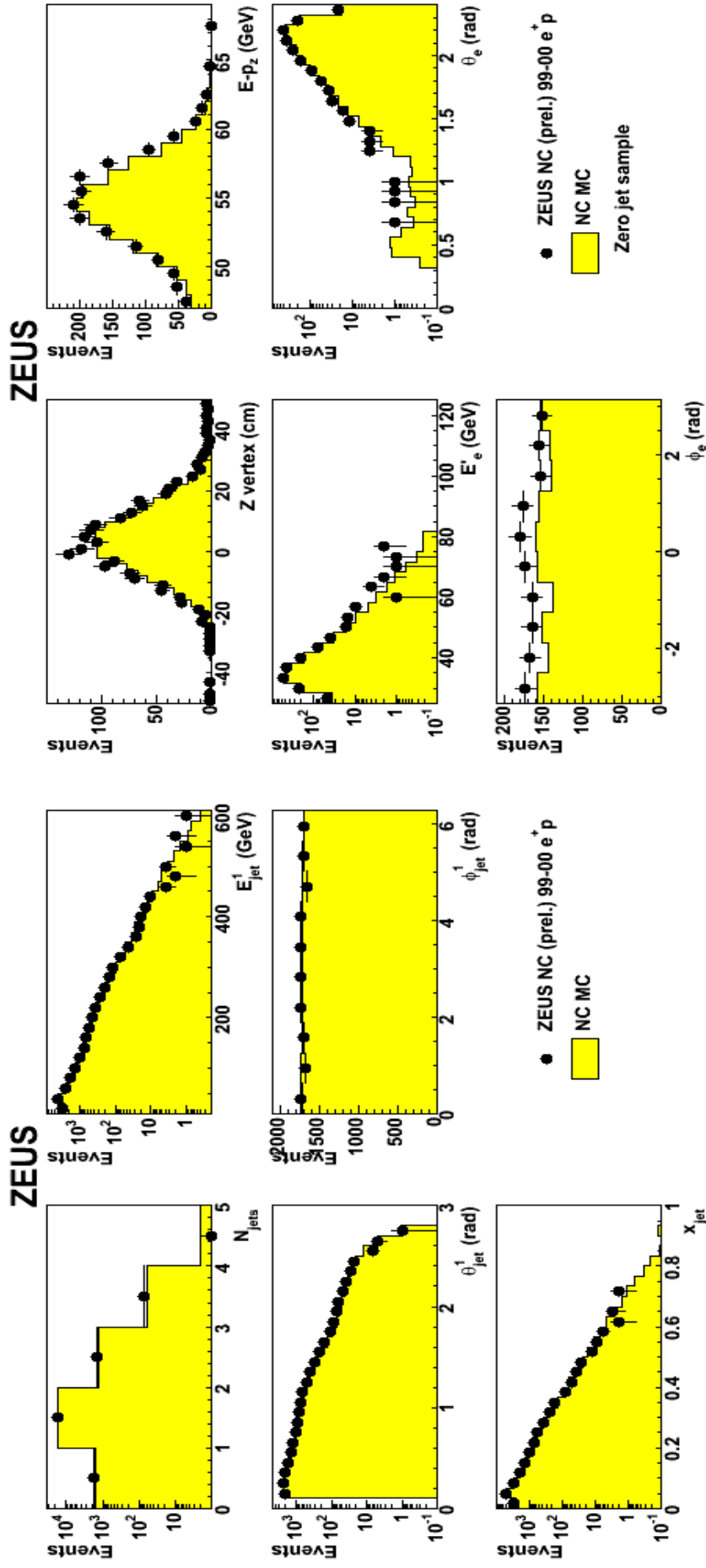


Kinematics

Electron

MC agrees quite well with Data

Control plots (cont.)



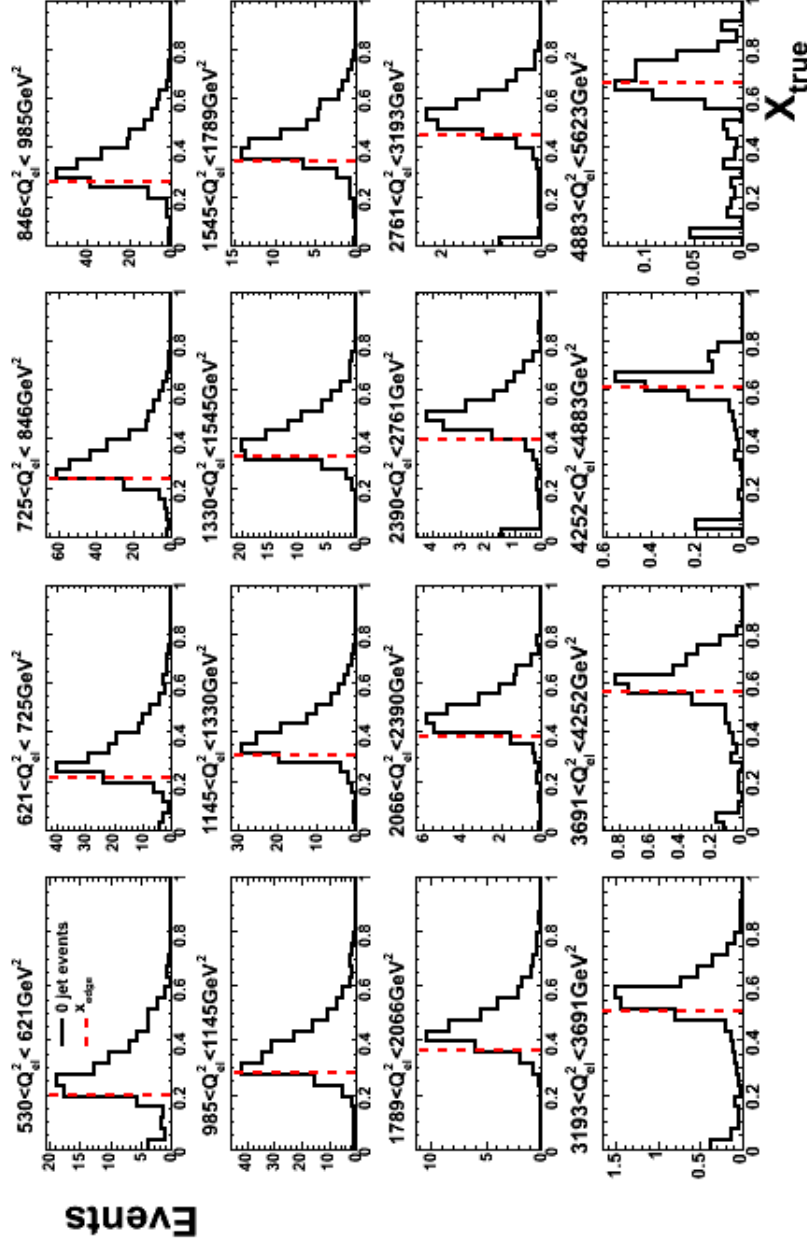
one jet

zero jet

MC agrees quite well with Data

Checks: x migration

ZEUS

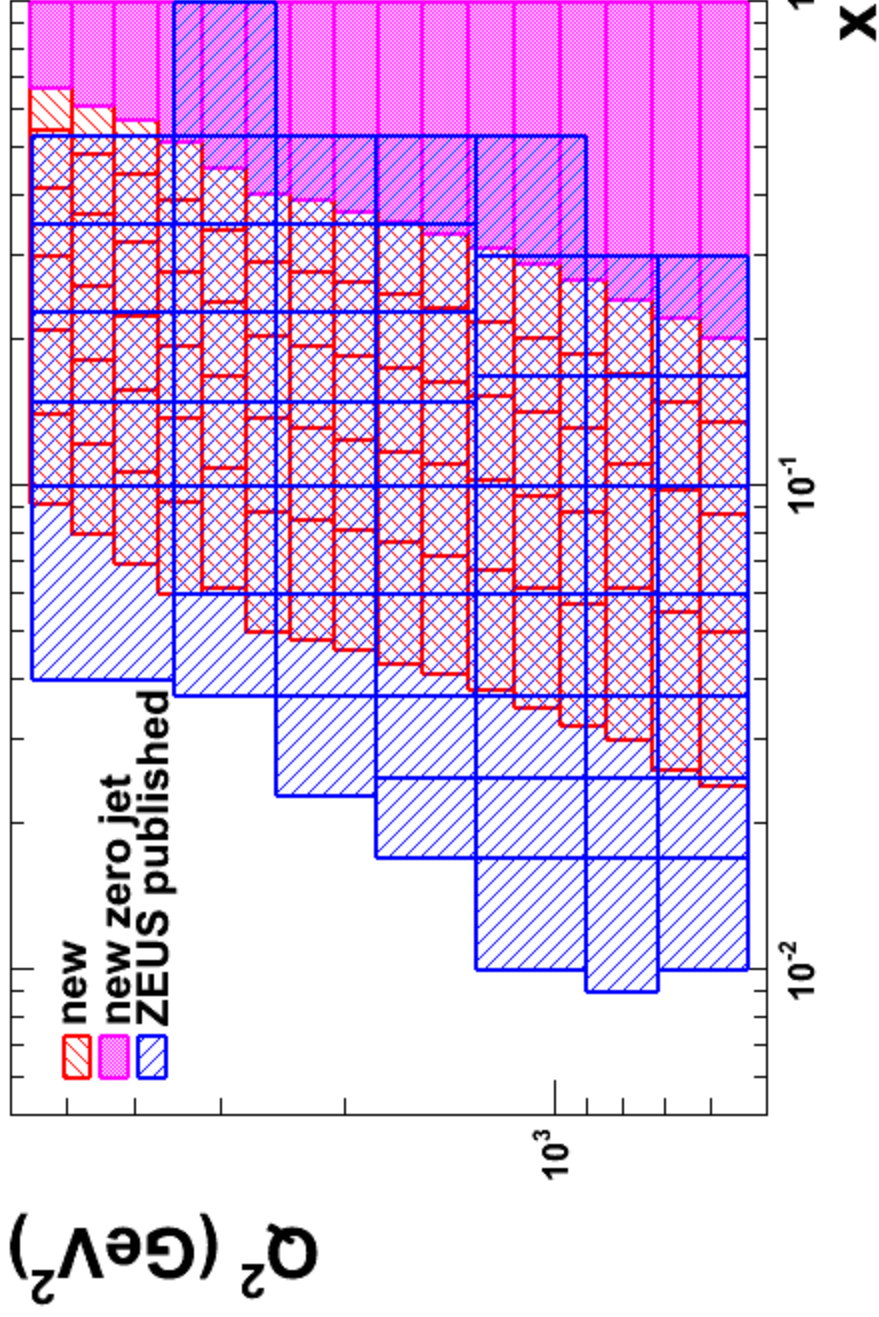


x_{true} distribution of the highest x bin

Migration from small x is tiny.

Zero jet events are really high x events.

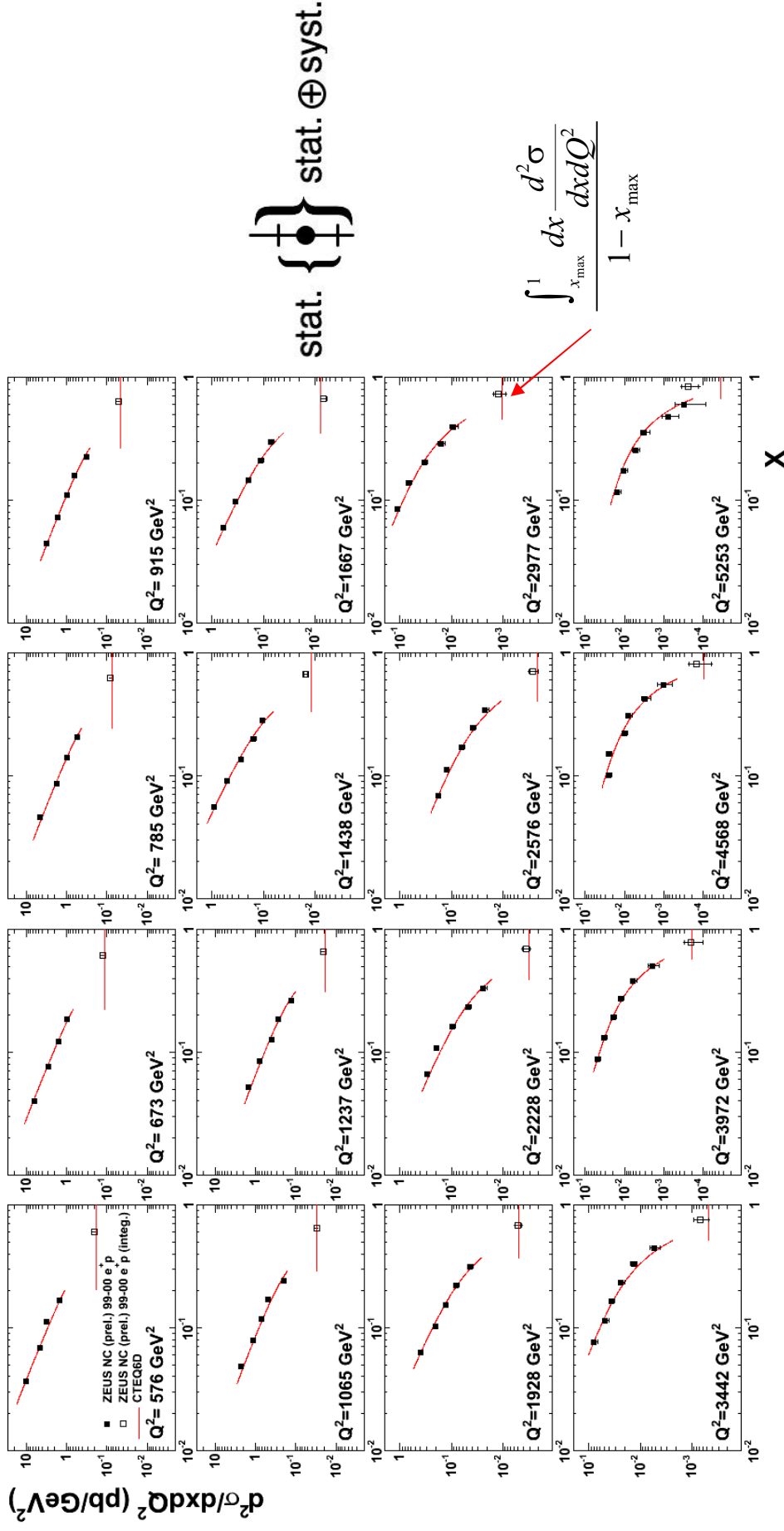
Compare the kinematic region with ZEUS published



More information at high x region

Cross section

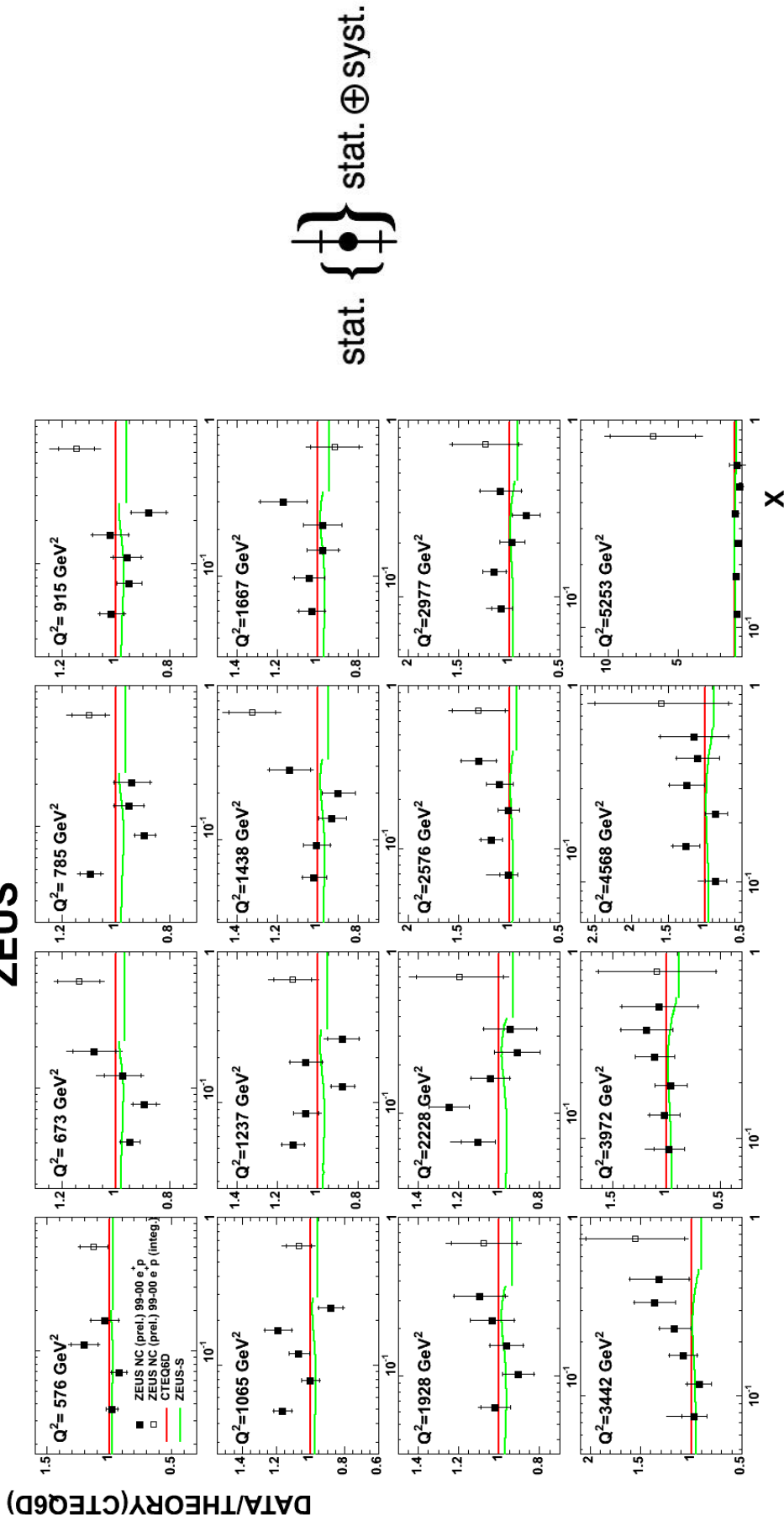
ZEUS



Theories describe data well.

Ratio to theory

ZEUS



With new method, the cross section was measured as precisely as other x range.

Summary

- ZEUS has developed a new method which allows us the measurement of ep DIS cross sections up to $x=1$ for the moderate Q^2
- First results from 65 pb⁻¹ of e⁺p data from 99-00 HERA running
- Other data sets under analysis
- New sensitivity to PDF at very high x
 - Under analysis with the framework of NLO QCD fitting