(Not) A Summary: pA & eA

Hua-Sheng Shao

Aussois, France
19 January 2019

6 TALKS IN THE MORNING

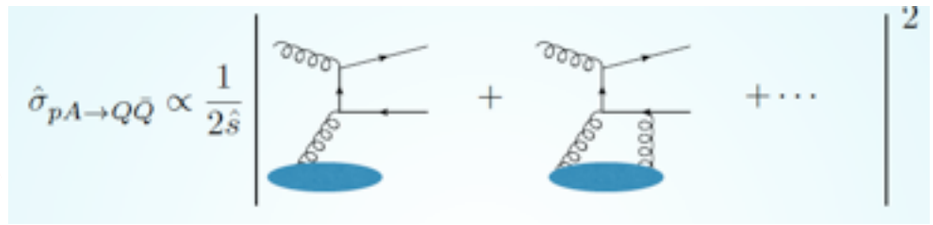
LPTHE
LABORATOIRE DE PHYSIQUE THEORIQUE ET HAUTES ENERGIES

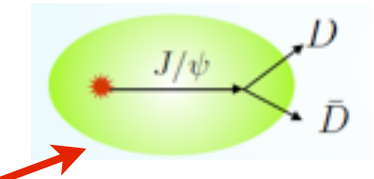
Theoretical overview of cold nuclear matter effects in quarkonium production	*Dr Kazuhiro Watanabe*	
Centre Paul Langevin		08:30 - 09:00
Experimental overview of quarkonium measurements in proton-nucleus collisions	*Dr Cesar Luiz Da Silva*	
Centre Paul Langevin		09:00 - 09:30
Overview of nuclear PDFs	*Ingo Schienbein*	
Centre Paul Langevin		09:30 - 10:10
Coffee break		
Centre Paul Langevin		10:10 - 10:40
Quarkonia, high-multiplicities, isolation, Monte Carlo and all that	*Sarah Porteboeuf*	
Centre Paul Langevin		10:40 - 11:10
HELAC-Onia and web generation with NLOAccess	*Mr Carlo Flore*	
Centre Paul Langevin		11:10 - 11:40
More thoughts on the extraction of (n)PDF with heavy quarks	*Maria Vittoria Garzelli*	
Centre Paul Langevin		11:40 - 12:00

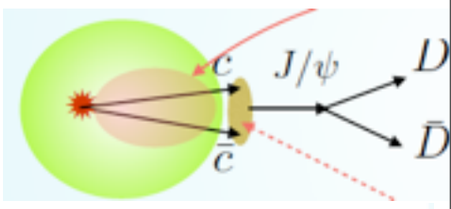
COLD NUCLEAR MATTER EFFECTS

Talk by Kazuhiro Watanabe

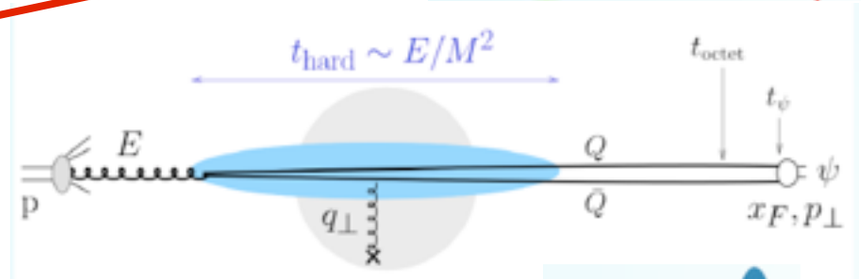
- **Initial state effects**
  - Modification of parton flux (e.g. shadowing) in nuclear PDF
  - Coherent or incoherent energy loss
  - Saturation/small x/coherence effects
  - Pt-broadening from multiple scattering
  - ...

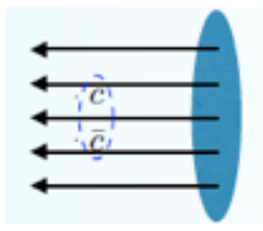






- **Final state effects**
  - Break up in the nuclear matter: absorption effect
  - Mass broadening in nuclear medium
  - Coherent energy loss
  - Break up by comoving particles
  - Pt-broadening/Cronin effect from multiple scattering
  - ...

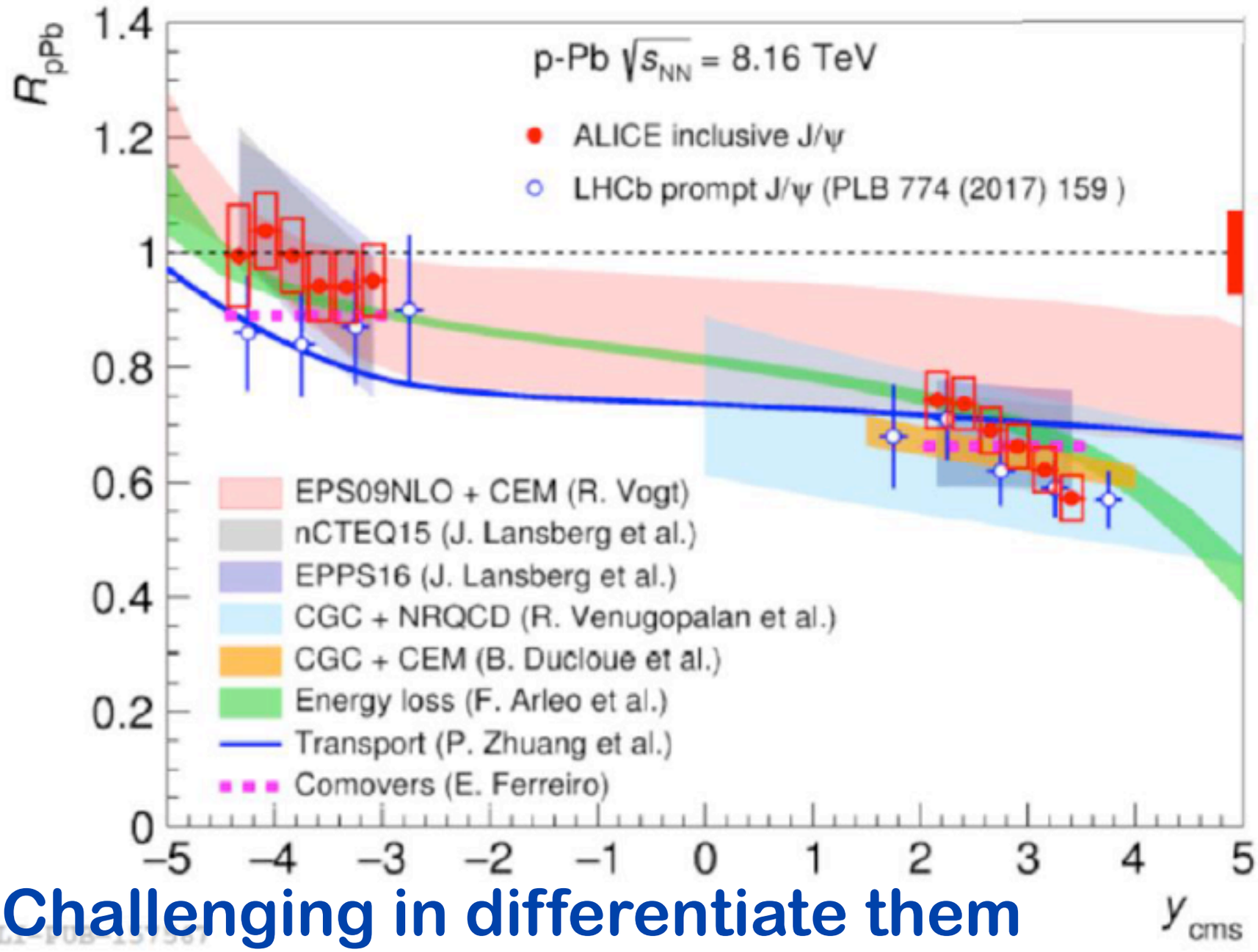




Cold nuclear matter effects are crucial to understand AA data

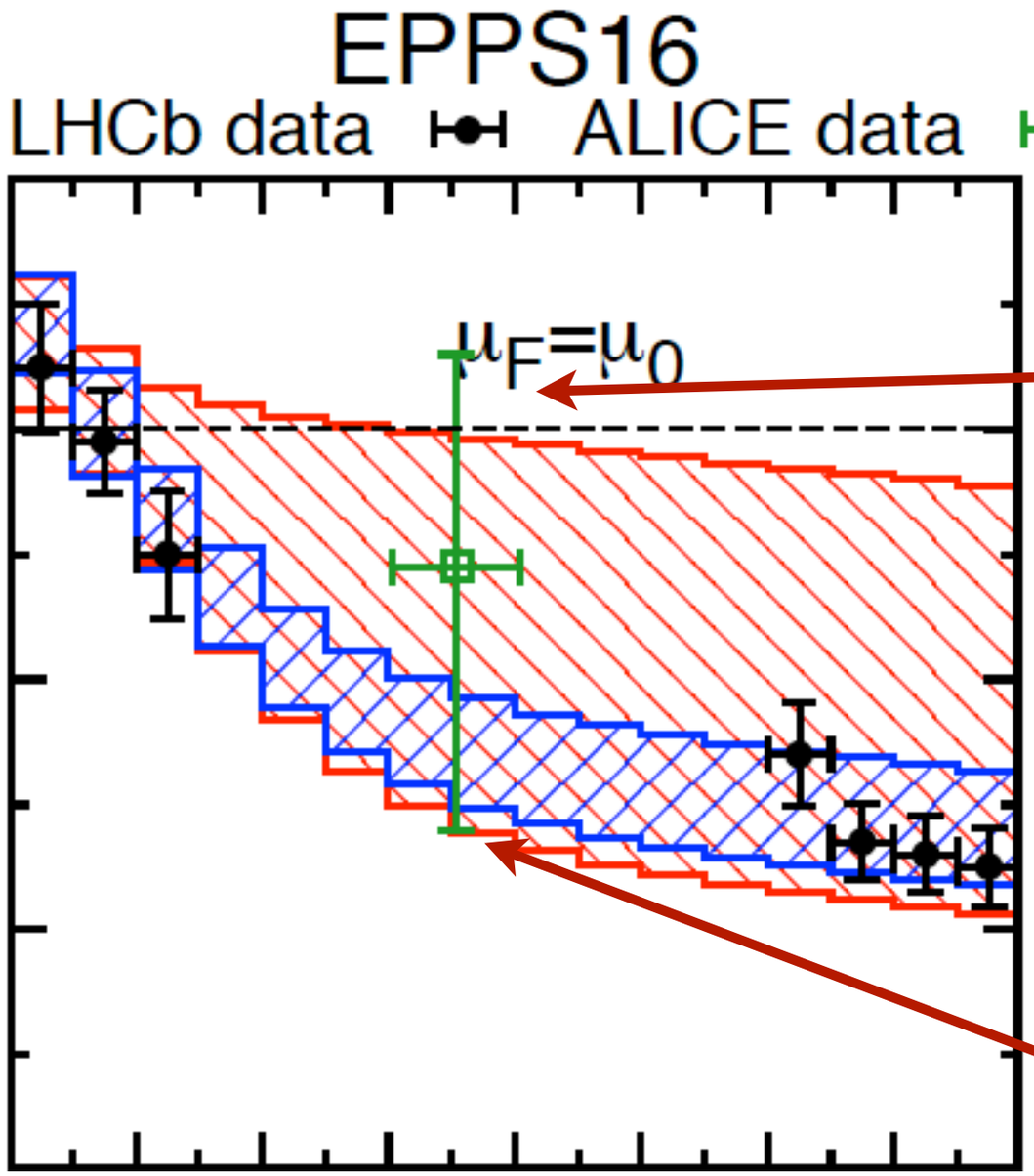
Reference to disentangle genuine QGP effect in AA collisions

A PLOT ENCODING SEVERAL CNM



- **Challenging in differentiate them**
  - Importance of systematically improving the uncertainties
  - Difficult to have a global test (first steps to improve the situation)
    - A public survey ?
    - A workshop gathering the experts to better understand each other ?

INTERPRETATION DATA



No suppression

Strong suppression

- **Be careful in drawing conclusions from central value only**

WORLDWIDE GLOBAL NPDF FITS

LPTHE
LABORATOIRE DE PHYSIQUE THEORIQUE ET HAUTES ENERGIES

Talk by Ingo Schienbein

	EPPS16	nCTEQ15	KA15	DSSZ12	EPS09
lA DIS	✔	✔	✔	✔	✔
DY in p+A	✔	✔	✔	✔	✔
RHIC π d+Au	✔	✔		✔	✔
νA DIS	✔			✔	
DY in π+A	✔				
LHC p+Pb dijets	✔				
LHC p+Pb W,Z	✔				

Order in α_s	NLO	NLO	NNLO	NLO	NLO
Q-cut in DIS	1.3 GeV	**2 GeV**	1 GeV	1 GeV	1.3 GeV
W-cut	-	**3.5 GeV**	-	-	-
Data points	1811	708	1479	1579	929
Free parameters	20	16	16	25	15
Error tolerance	52	35	N.N.	30	50
Proton baseline	CT14NLO	CTEQ6M-like	JR09	MSTW08	CTEQ6.1
GM-VFNS	✔	✔		✔	
Flavour sep.	valence+sea	valence			

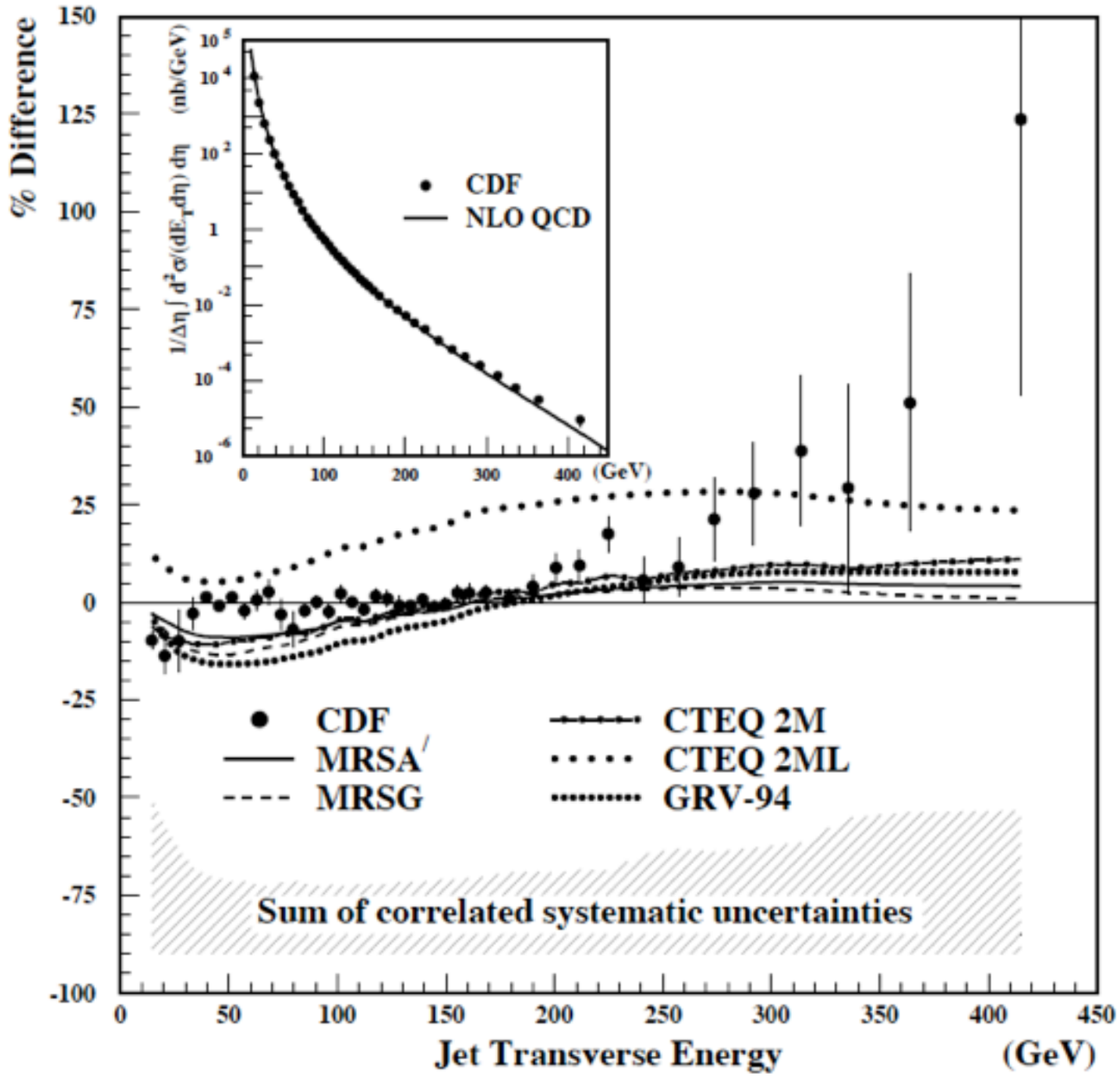
A LESSON FOR PDF (20 YEARS AGO)

hep-ex/9601008

Inclusive jet cross section in $\bar{p}p$ collisions at $\sqrt{s} = 1.8$ TeV

(CDF Collaboration)

- High-pT excess in inclusive jet by CDF was initially triggering a lot of BSM studies, like quark compositeness.



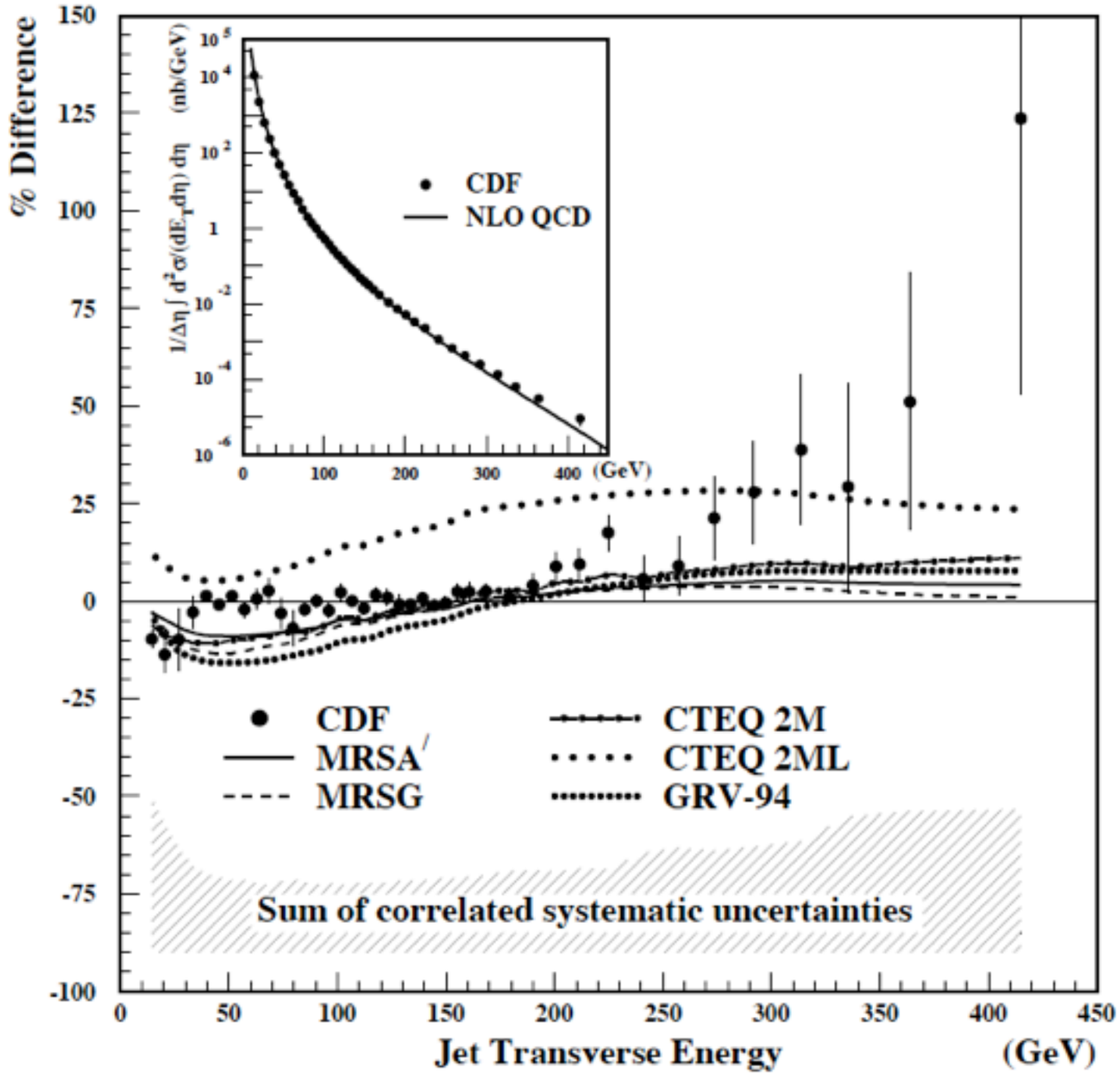
A LESSON FOR PDF (20 YEARS AGO)

hep-ex/9601008

Inclusive jet cross section in $\bar{p}p$ collisions at $\sqrt{s} = 1.8$ TeV

(CDF Collaboration)

- High-pT excess in inclusive jet by CDF was initially triggering a lot of BSM studies, like quark compositeness.
- It is finally known that due to our poor knowledge of gluon PDF in high x.



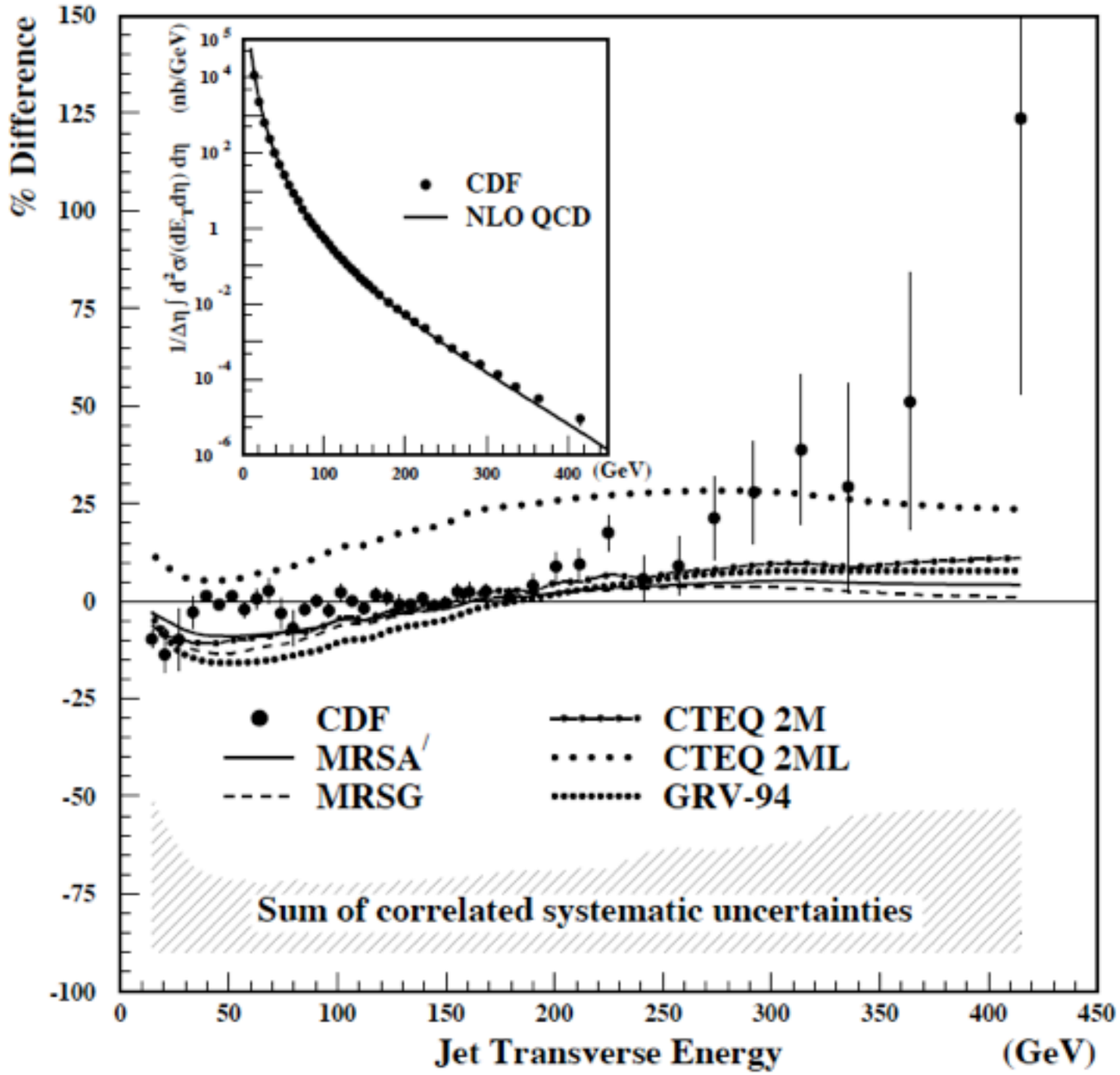
A LESSON FOR PDF (20 YEARS AGO)

hep-ex/9601008

Inclusive jet cross section in $\bar{p}p$ collisions at $\sqrt{s} = 1.8$ TeV

(CDF Collaboration)

- High-pT excess in inclusive jet by CDF was initially triggering a lot of BSM studies, like quark compositeness.
- It is finally known that due to our poor knowledge of gluon PDF in high x.
- Also important thing is no PDF uncertainty at that time.



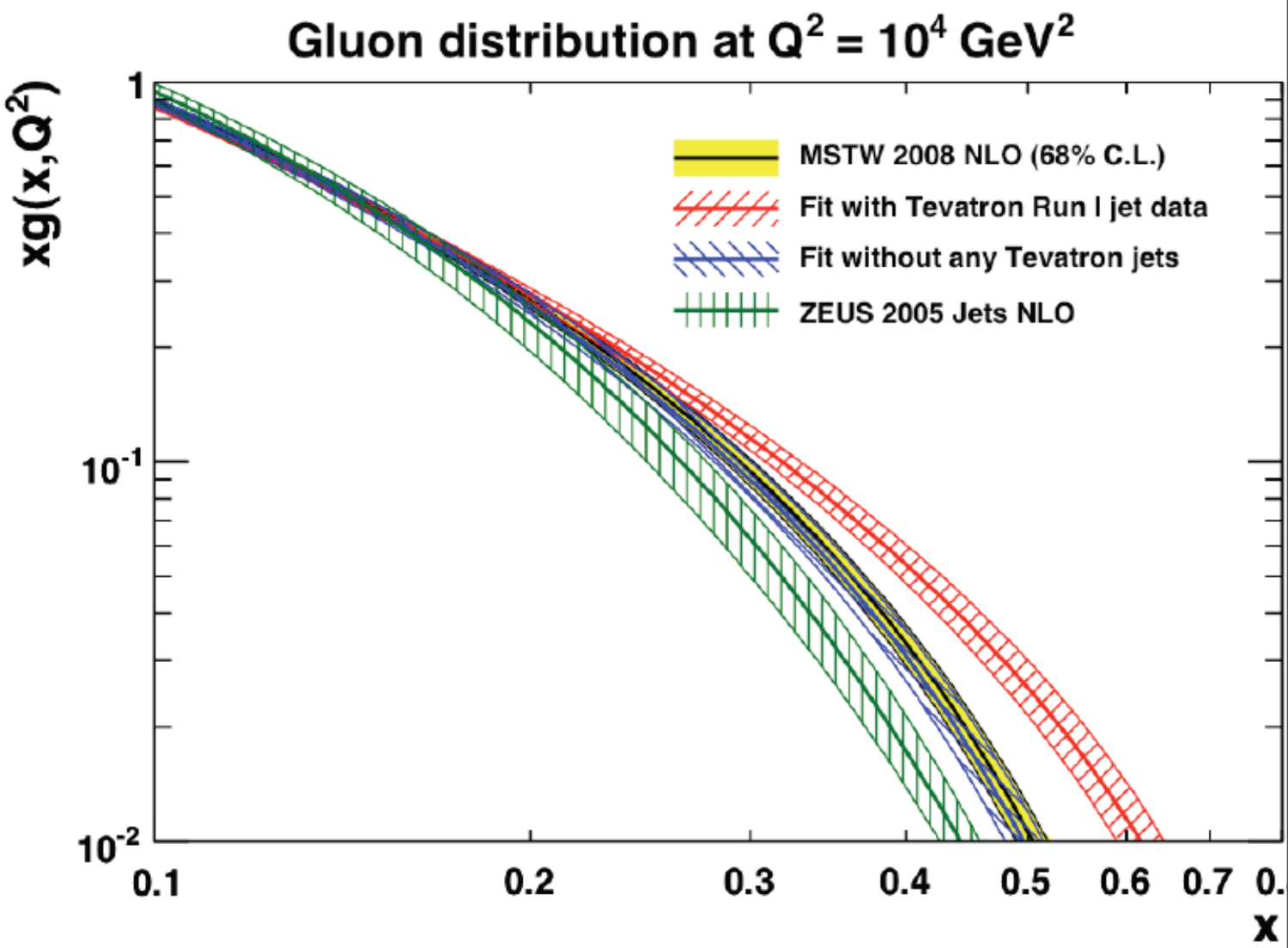
A LESSON FOR PDF (20 YEARS AGO)

LPTHE
LABORATOIRE DE PHYSIQUE THEORIQUE ET HAUTES ENERGIES

hep-ex/9601008

Inclusive jet cross section in $\bar{p}p$ collisions at $\sqrt{s} = 1.8$ TeV
(CDF Collaboration)

- High-pT excess in inclusive jet by CDF was initially trigger a lot of BSM studies, like quark compositeness.
- It is finally known that due our poor knowledge of glu PDF in high x.
- Also important thing is no PDF uncertainty at that tim
- PDF uncertainty in the extrapolated region can be underestimated.



A LESSON FOR PDF (20 YEARS AGO)

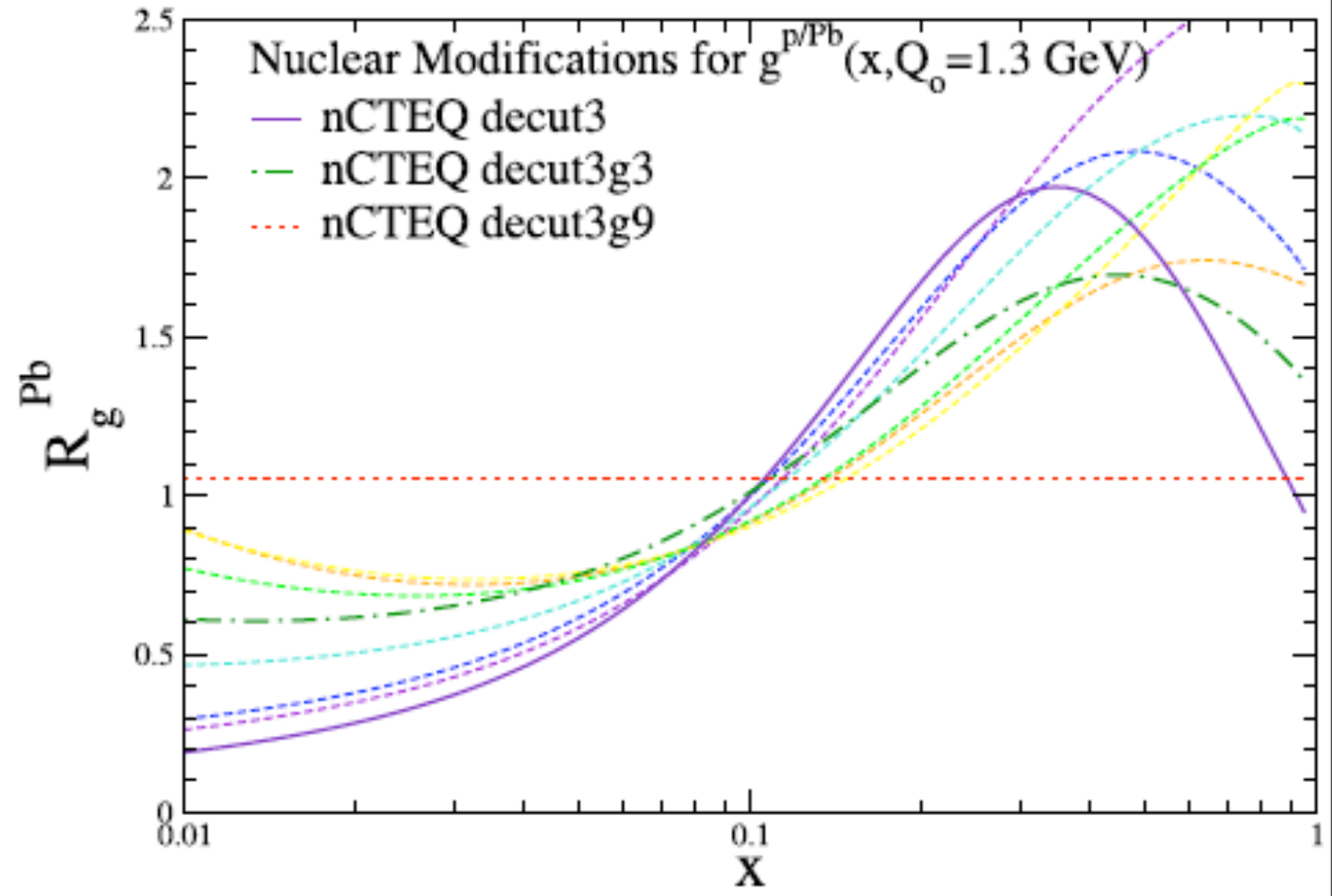
LPTHE
LABORATOIRE DE PHYSIQUE THEORIQUE ET HAUTES ENERGIES

hep-ex/9601008

Inclusive jet cross section in $\bar{p}p$ collisions at $\sqrt{s} = 1.8$ TeV

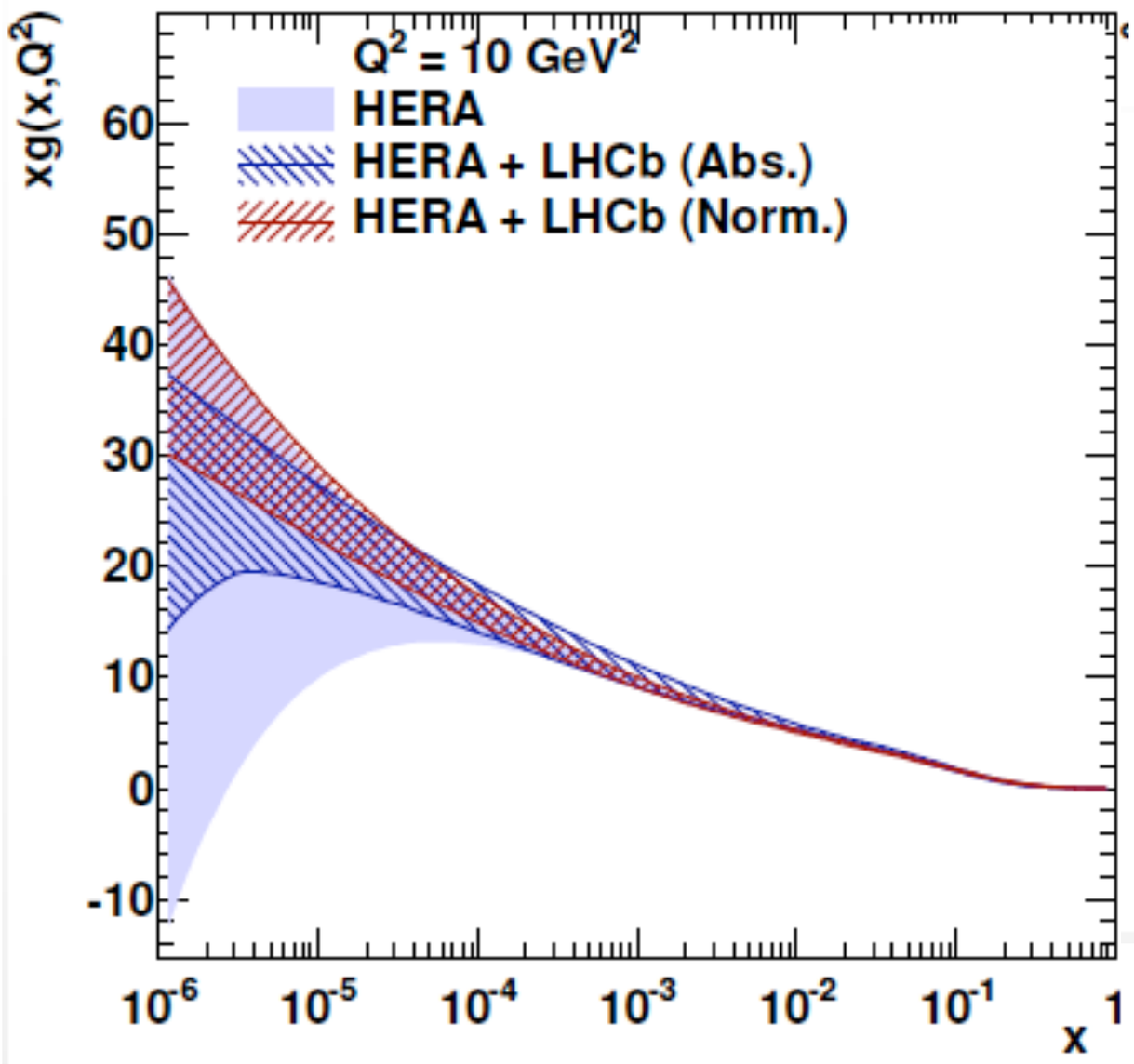
(CDF Collaboration)

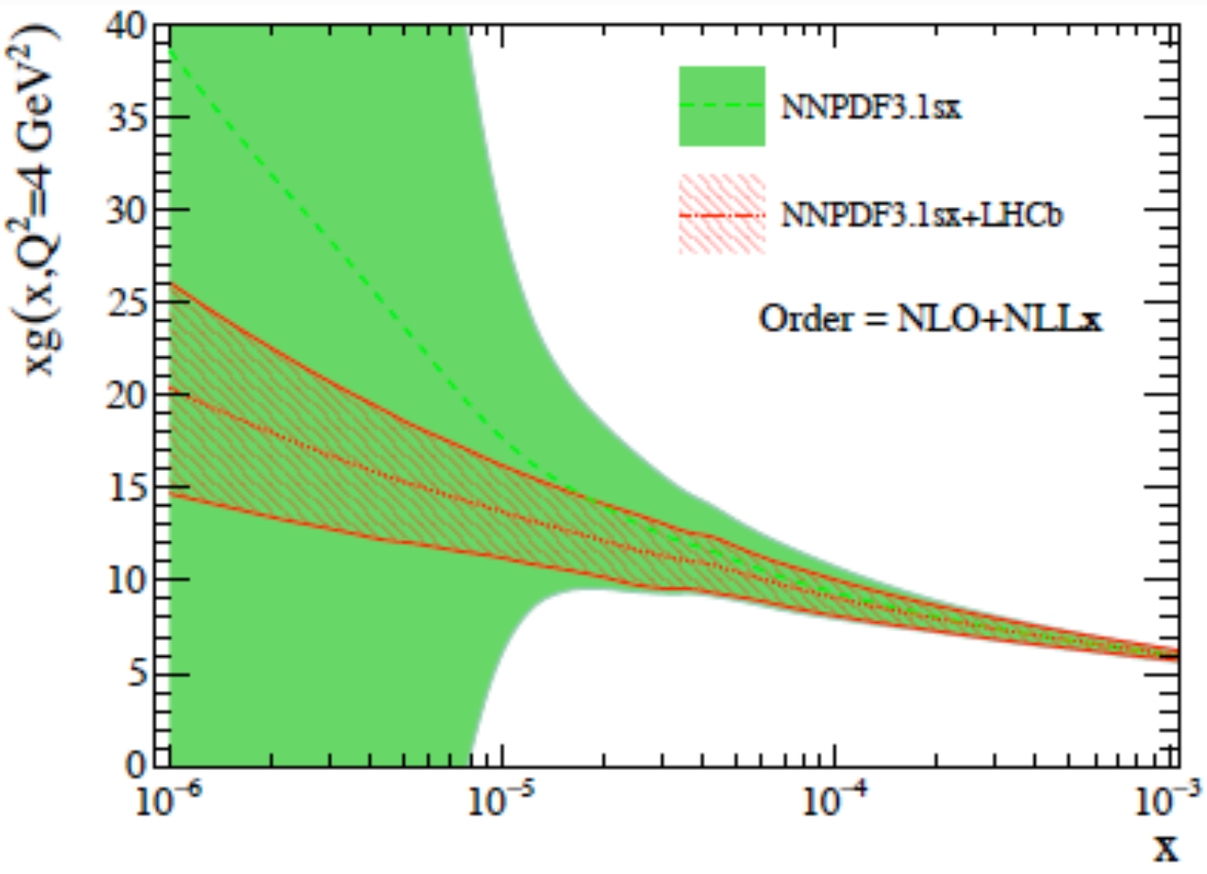
- High-pT excess in inclusive jet by CDF was initially triggering a lot of BSM studies, like quark compositeness.
- It is finally known that due to our poor knowledge of gluon PDF in high x.
- Also important thing is no PDF uncertainty at that time.
- PDF uncertainty in the extrapolated region can be underestimated.
- Similarly, the conclusions based on nPDFs without taking into account the nPDF errors should be reexamined.



OPEN QUARK AT SMALL X IN PP

Talk by Maria Vittoria Garzelli



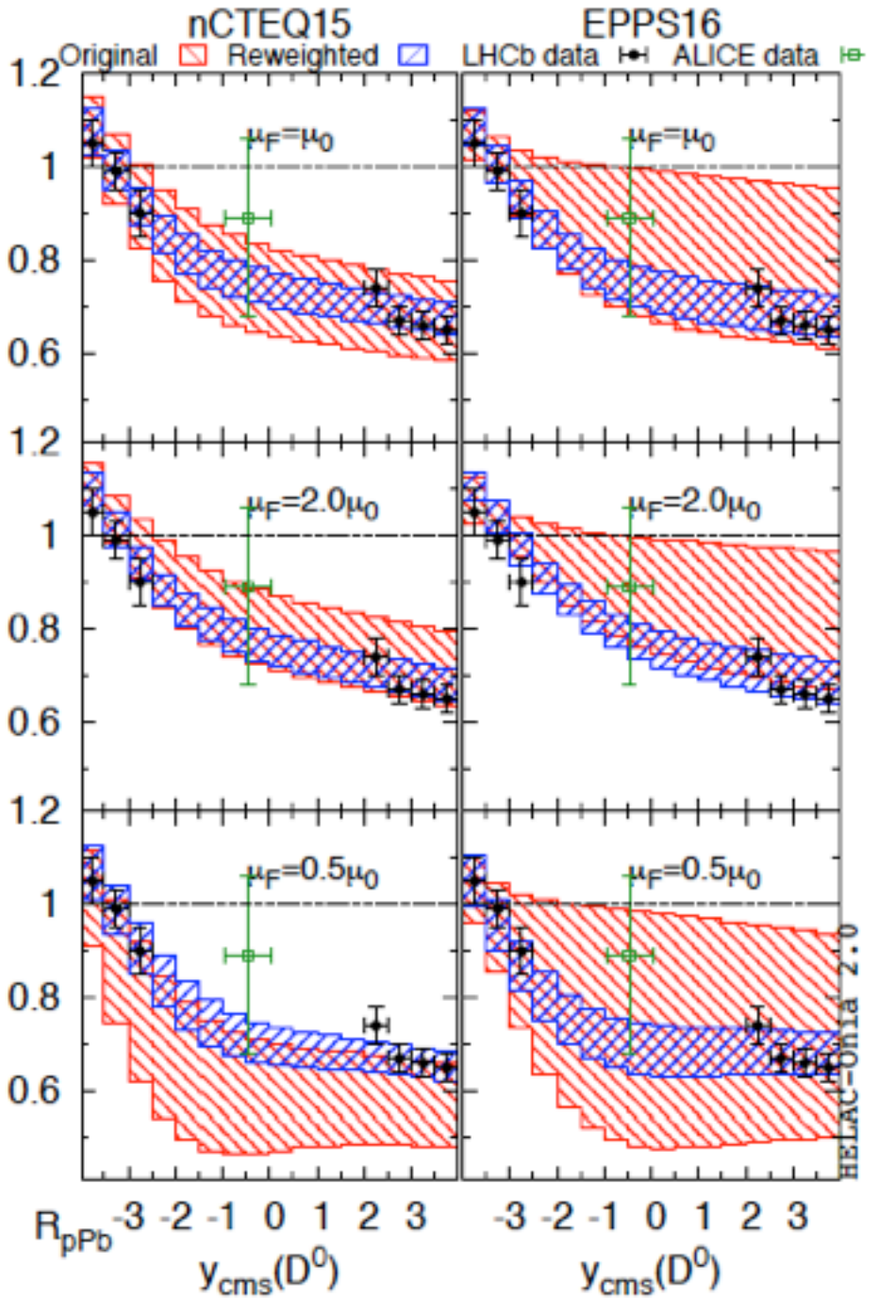


- Heavy quark in pp is crucial in determining small-x PDF.
- Heavy quarkonium in pp seems to be dangerous to be used in PDF fit due to its poor understanding ? Can we use part of them (e.g. eta_c data) ?

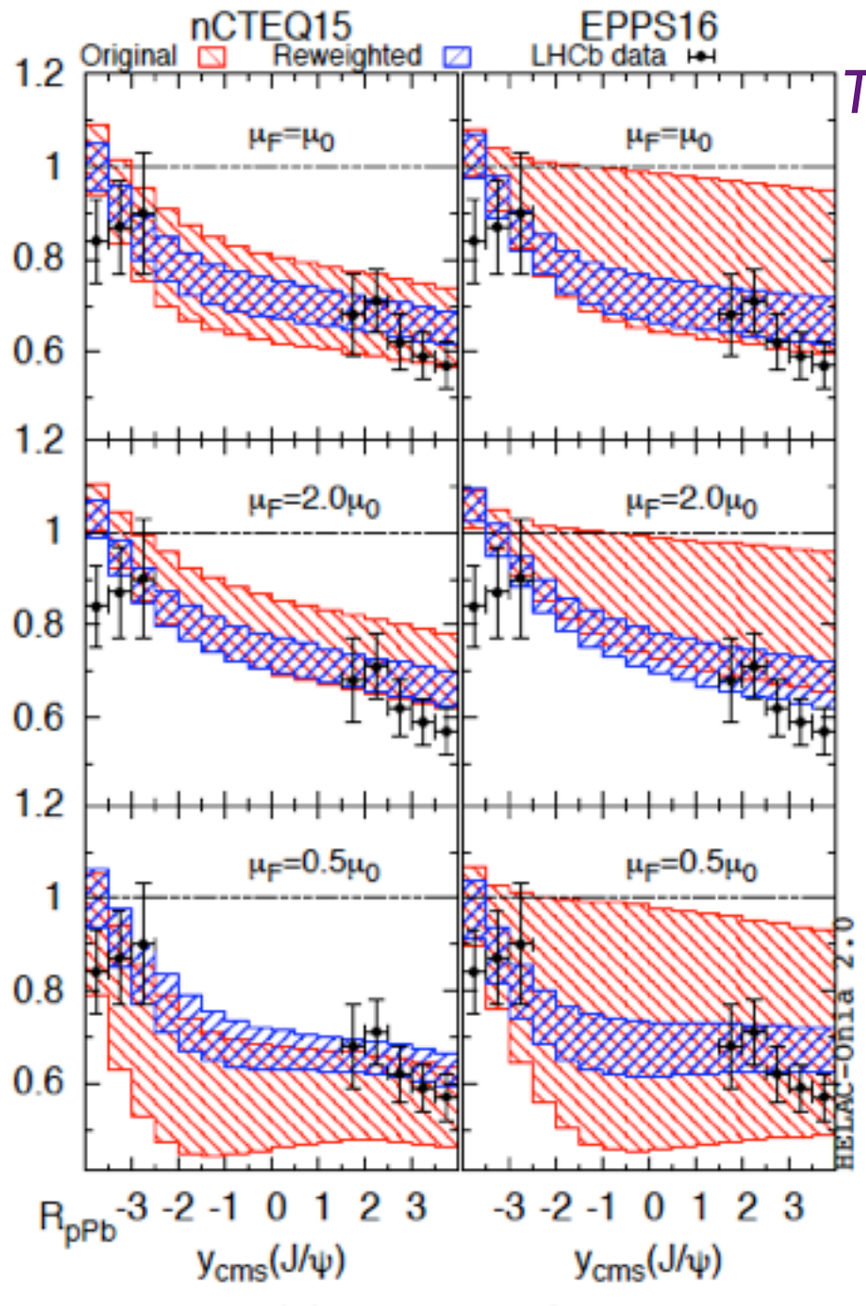
HEAVY QUARK(ONIUM) AT SMALL X

LPTHE
LABORATOIRE DE PHYSIQUE THEORIQUE ET HAUTES ENERGIES

Talk by Ingo Schienbein



(a) Prompt D^0

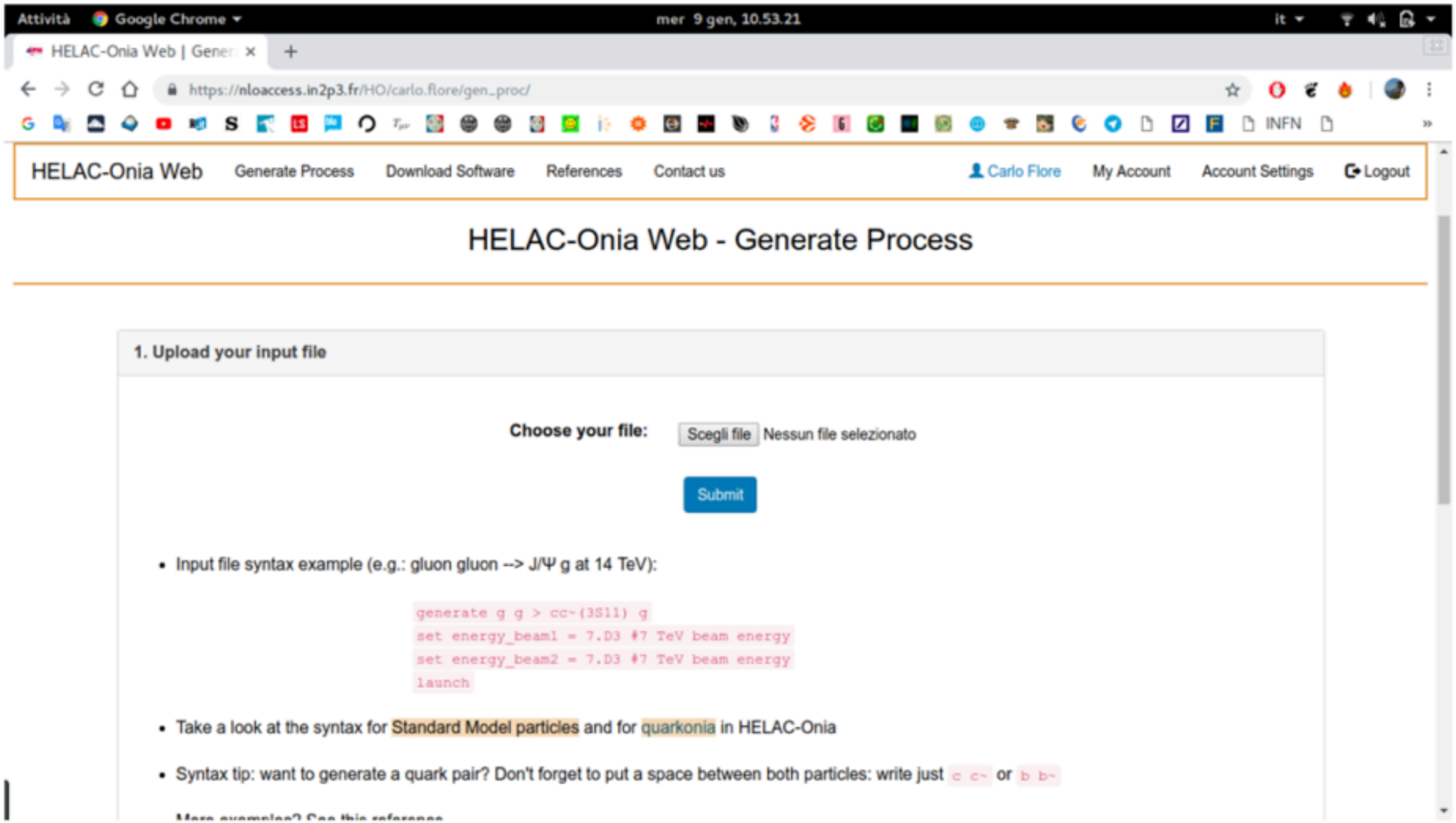


(b) Prompt J/ψ

- Heavy quark(onium) clearly play important role in determine small-x nPDF.
- Preciser bottom(onium) measurements can help to reduce the scale uncer.
- Caveats: other CNM effect cannot be excluded; Possible QGP in MB is not easy to include (are they relevant ?)

HELAC-Onia Web - Job submission

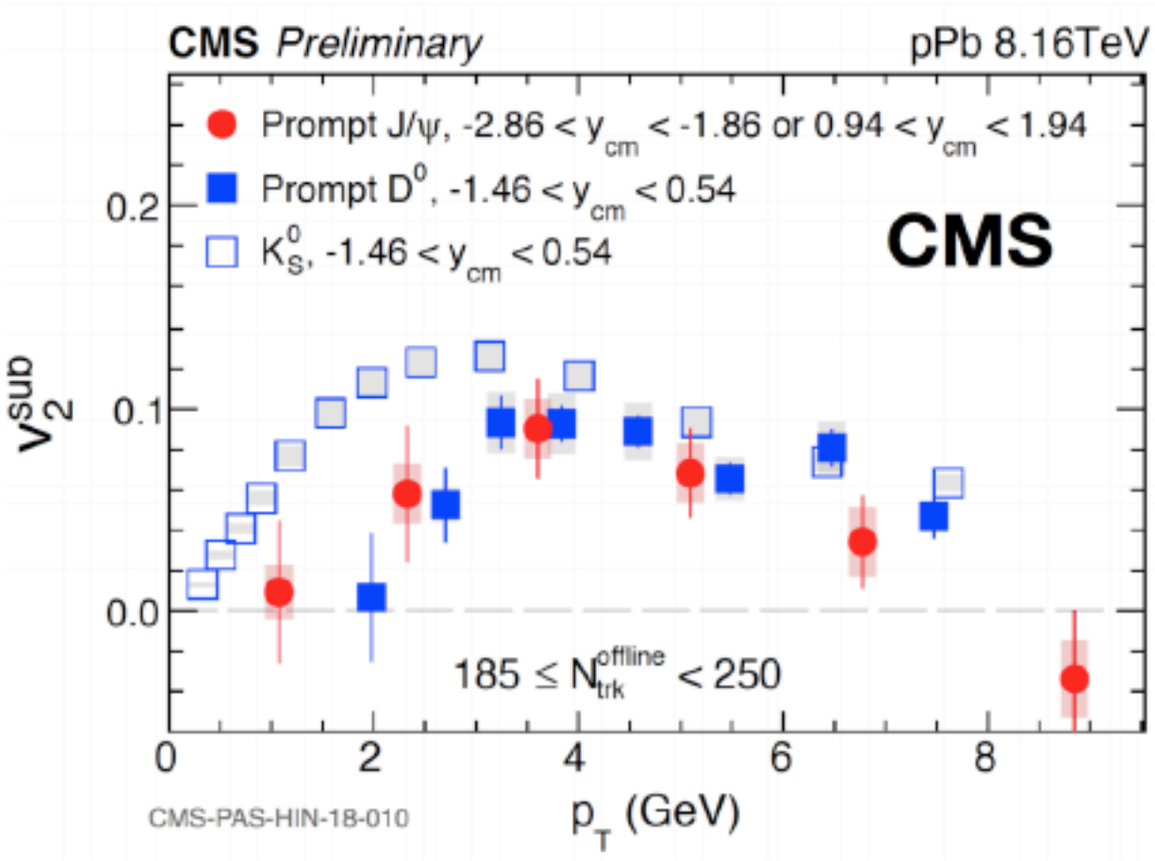
Talk by Carlo Flore

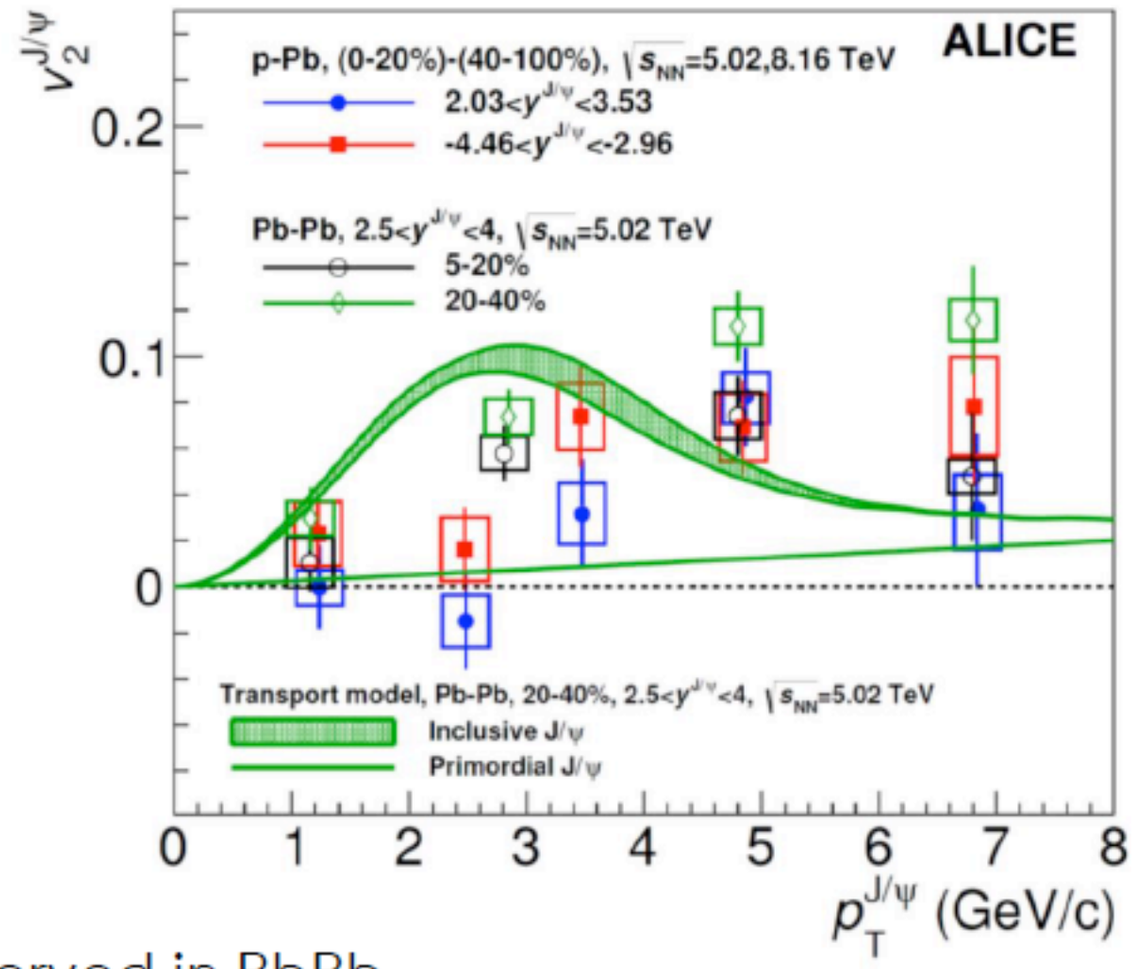


- nPDF simulation on web makes theoretical predictions easier !

COLLECTIVITY IN PA

Talk by Cesar Luiz da Silva





- Charm and J/Ψ "flow" in pPb, as observed in PbPb
- There is not enough cc-bar pairs in these events to produce charmonium coalescence
- May indicate that collectivity has nothing to do with QGP Hydrodynamics
- It is certainly crucial to understand it in the future !

MULTIPLICITY DEPENDENCE

Talk by Sarah Porteboeuf-Houssais

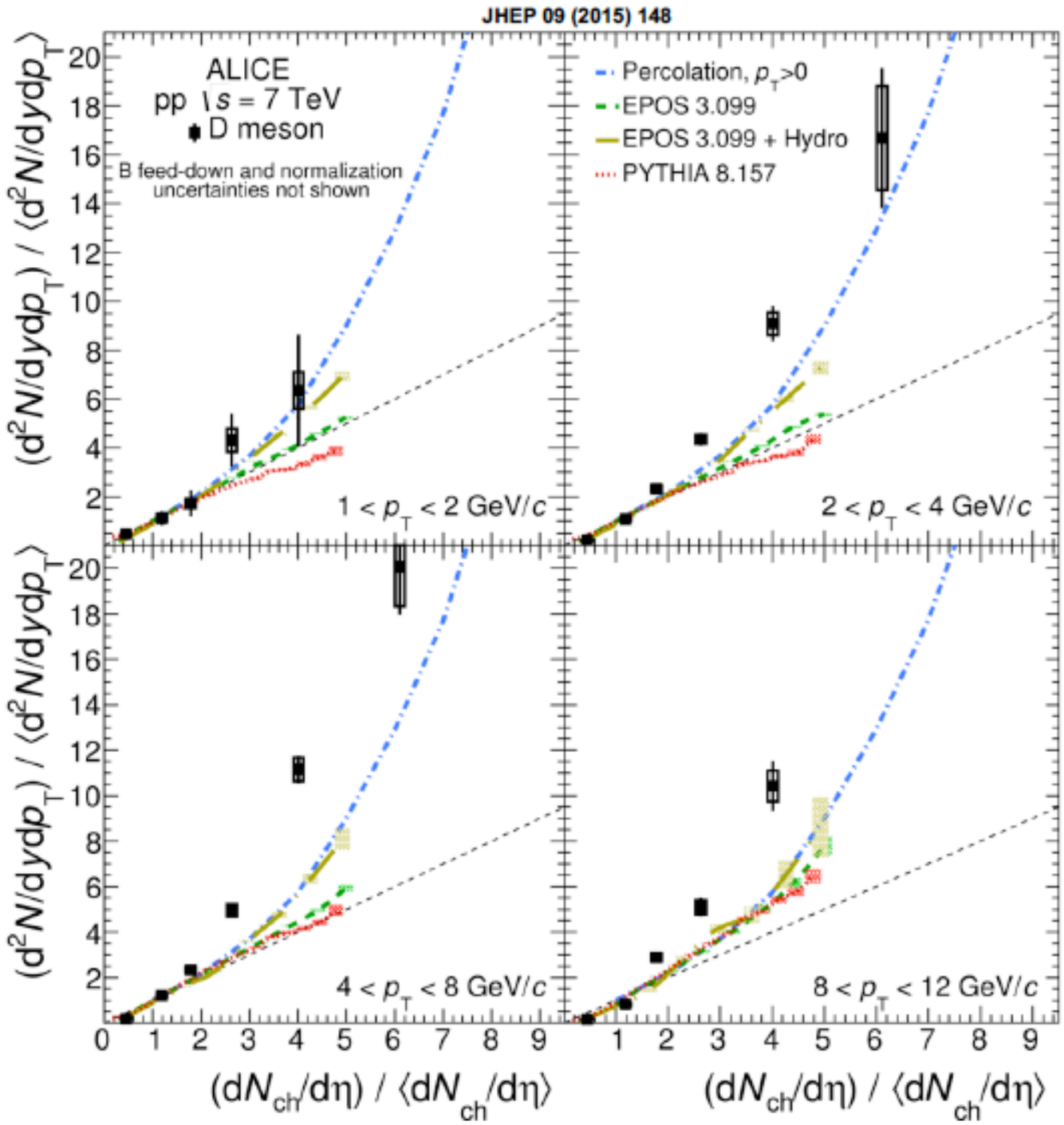
- PYTHIA and EPOS wo hydro

  Linear behavior fails to reproduce the data for the highest multiplicities

- EPOS w hydro and percolation

  Departure from linearity help to describe the data.
  Reduction of the number of charged particles
  - hydro evolution for EPOS

    arXiv:1602.03414
  - string percolation for the percolation model



- What do we learn from these measurements (final or initial effects) ?
- Help to improve Monte Carlo tuning.
- Can they help us to understand the collectivity in pA ?