Introduction to PDF4LHC benchmarking session …on the road to PDF4LHC21

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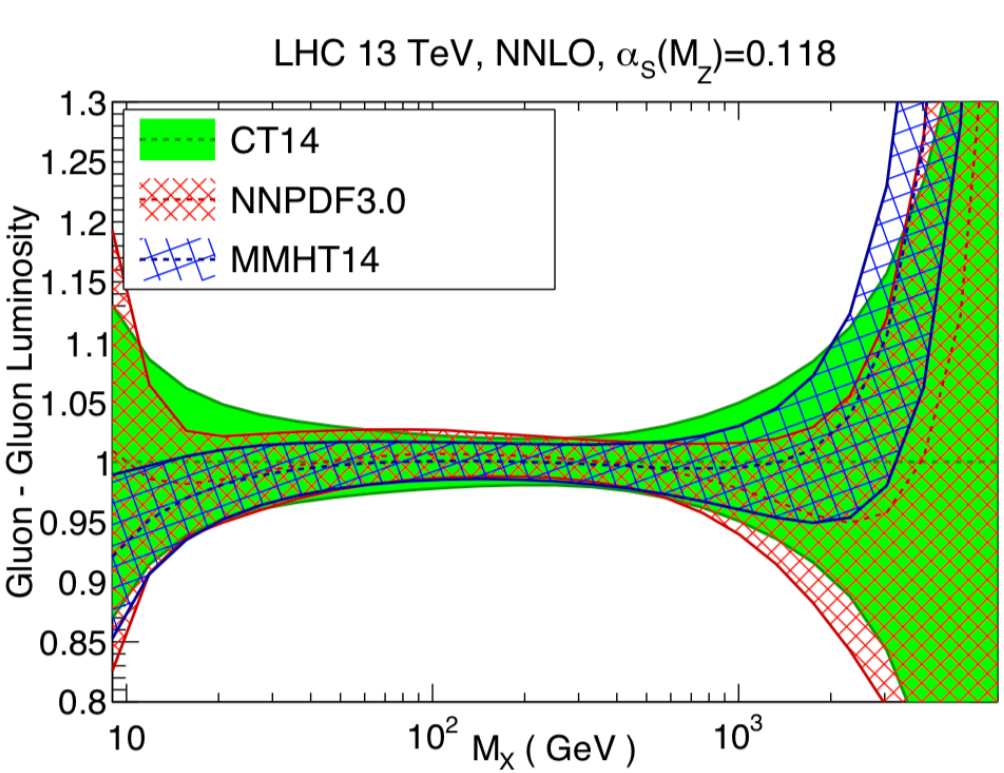
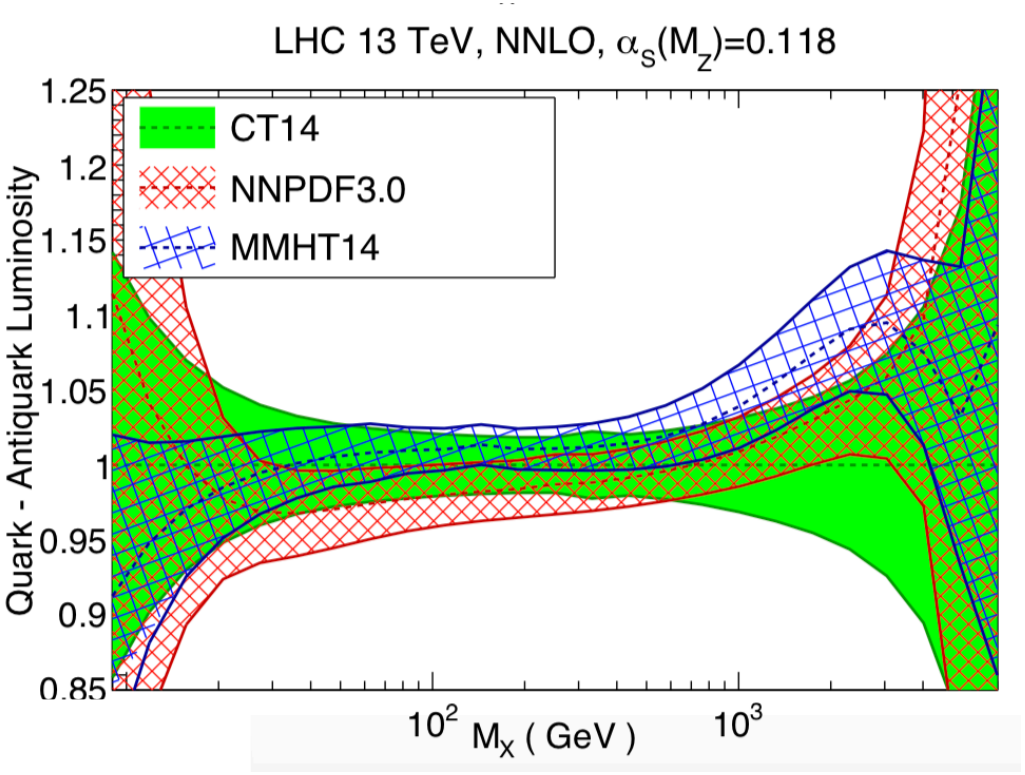
PDF4LHC15

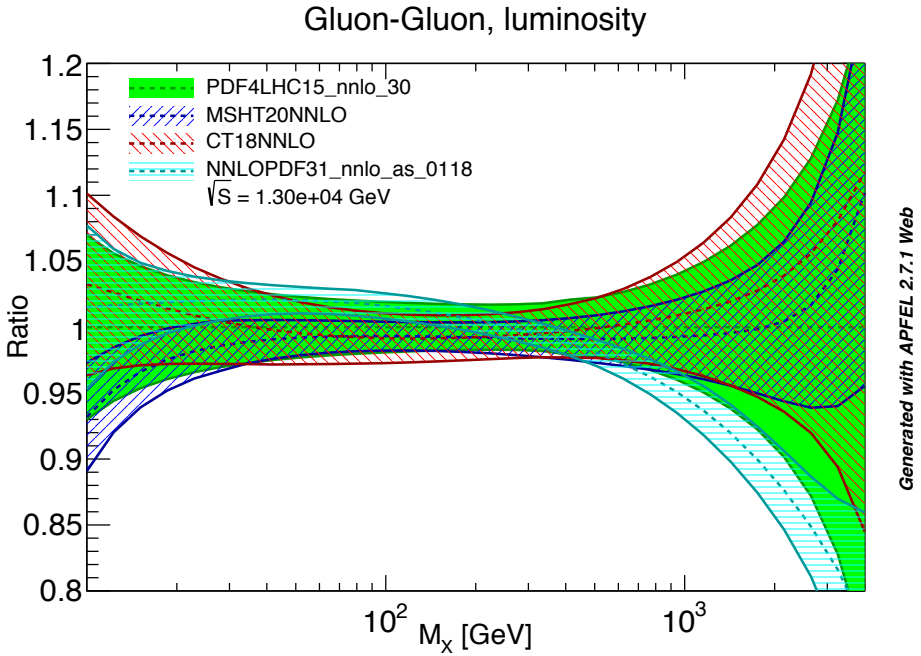
- combination of CT14, MMHT2014, NNPDF3.0
  - 1 year benchmarking exercise comparison of above PDFs
  - 300 Monte Carlo replicas generated for each of the above PDFs
  - condensed to Hessian sets with from 30-100 members for distribution to users with central PDFs and error PDFs representing the three published PDFs
  - good (too good?) agreement for gluon-gluon luminosity





PDF4LHC21

- new PDFs CT18, MSHT2020, NNPDF3.1, containing large amount of LHC data
- some new/different techniques, i.e. fitted charm for NNPDF3.1



consistency with PDF4LHC15, a bit more of a spread of the gg uncertainty bands than for the 2015 combination

- exercise: start with a reduced data set large enough to provide constraints, small enough that resulting PDFs should be similar
  - add more data sets, ttbar, jets … leading to something close to full data sets
- progress report today: Tom Cridge
- end result in ~6 months: central PDFs and Hessian error sets representing the 3 published PDFs->30-50 error PDFs should be sufficient
- paper on archive

Some points for discussion

- Any lessons from experience with PDF4LHC15 that we should take into account?
- There are some variations that we could consider for additional PDF4LHC21 results
  - perturbative vs fitted charm for NNPDF
  - small x resummation effects->affects low x gluon
    - very important for 100 TeV collider (PDF4100TeV?)
  - any need for such additional sets?
- Discussion after Tom's talk

Extra

In 2014-15, we carried out a year-long exercise to (1) perform a benchmarking exercise for all PDFs, and (2) to present recommendations for LHC Run II (PDF4LHC15 PDFs)

The PDF4LHC report on PDFs and LHC data: Results from Run I and preparation for Run II

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Stephen Farry[8], *James Ferrando*[9], *Stefano Forte*[10], *Jun Gao*[11], *Lucian Ha*
Alexander Glazov[14], *Maxime Gouzevitch*[15], *Claire Gwenlan*[6], *Katerina L*
Michelangelo Mangano [5], *Pavel Nadolsky*[17], *Luca Perrozzi*[18], *Ringaile Pl*
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OUTP-15-11P, LCTS/2015-14, GLAS-PPE/2015-01, DESY 15-088, JL CERN-PH-TH-2015-150

125 citations

PDF4LHC recommendations for LHC Run II

Jon Butterworth[1], Stefano Carrazza[2,4], Amanda Cooper-Sarkar[3], Albert De Roeck[4,5], Joël Feltesse[6], Stefano Forte[2], Jun Gao[7], Sasha Glazov[8], Joey Huston[9], Zahari Kassabov[2,10], Ronan McNulty[11], Andreas Morsch[4], Pavel Nadolsky[12], Voica Radescu[13], Juan Rojo[14] and Robert Thorne[1].

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Abstract:

We provide an updated recommendation for the usage of sets of parton distribution functions (PDFs) and the assessment of PDF and PDF+α_s uncertainties suitable for applications at the LHC Run II. We review developments since the previous PDF4LHC recommendation, and discuss and compare the new generation of PDFs, which include substantial information from experimental data from the Run I of the LHC. We then propose a new prescription for the combination of a suitable subset of the available PDF sets, which is presented in terms of a single combined PDF set. We finally discuss tools which allow for the delivery of this combined set in terms of optimized sets of Hessian eigenvectors or Monte Carlo replicas, and their usage, and provide some examples of their application to LHC phenomenology.

This paper is dedicated to the memory of Guido Altarelli (1941-2015), whose seminal work made possible the quantitative study of parton distribution functions.

1054 citations

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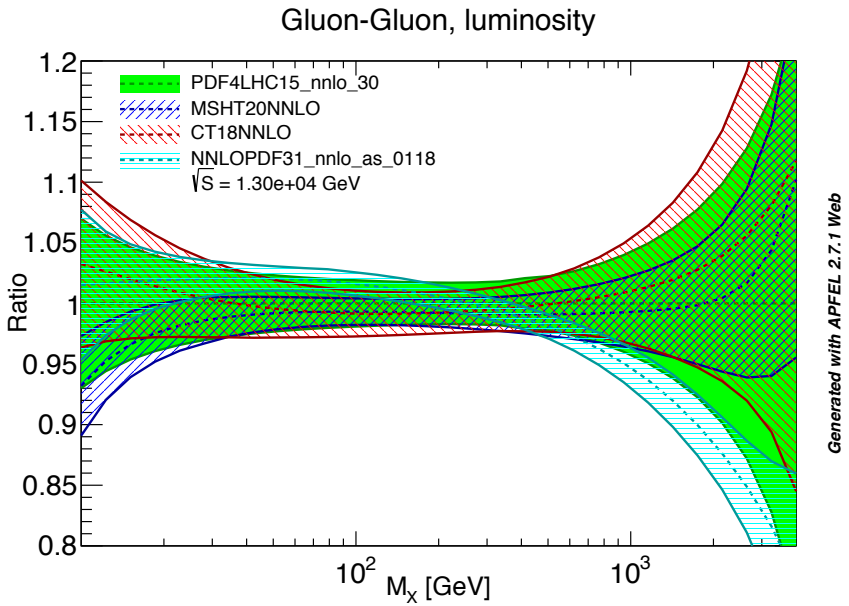
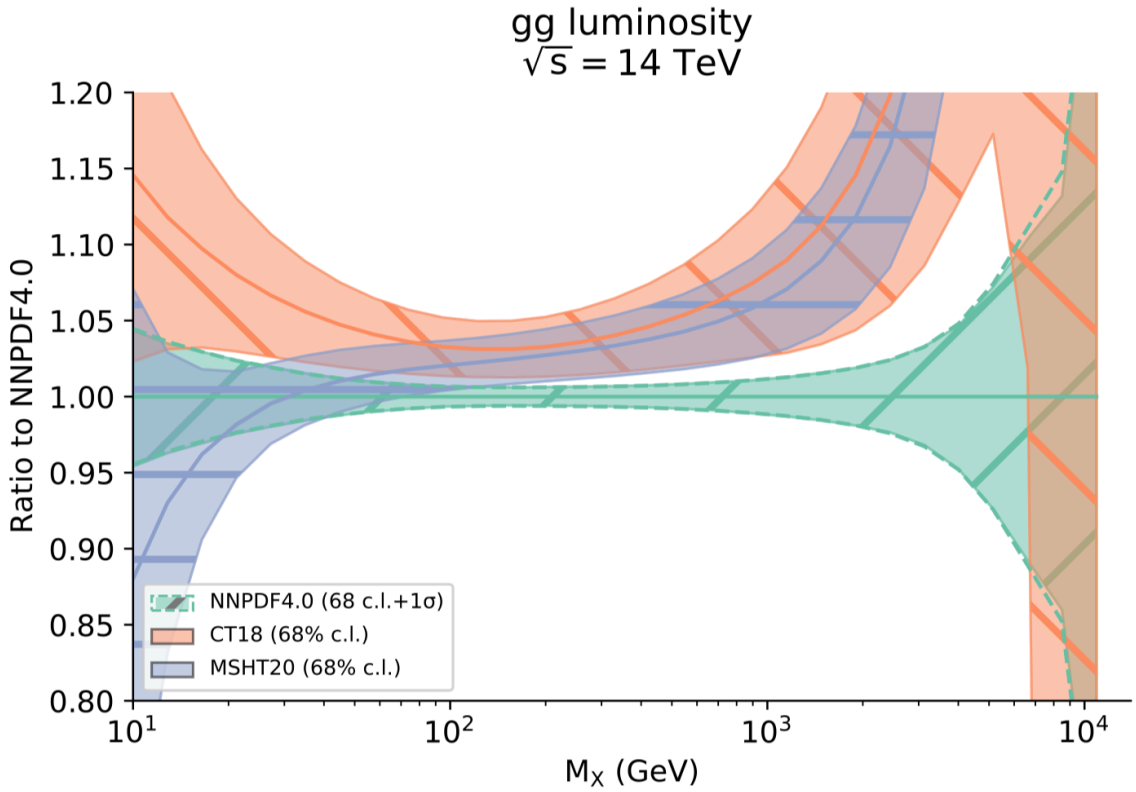
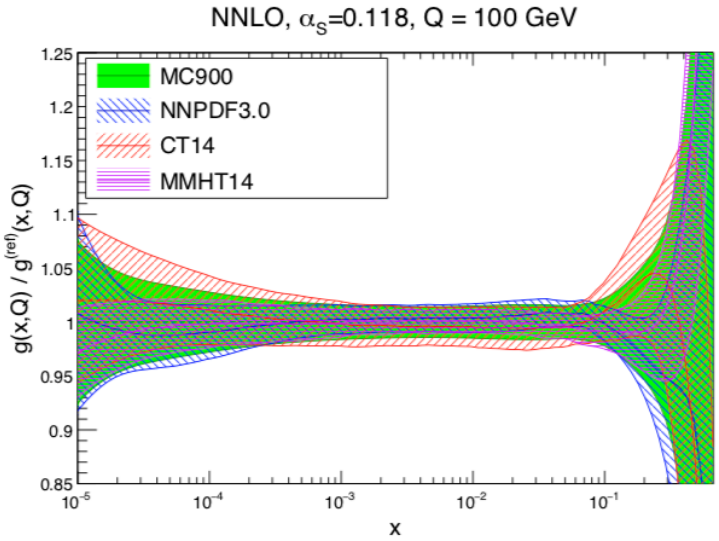


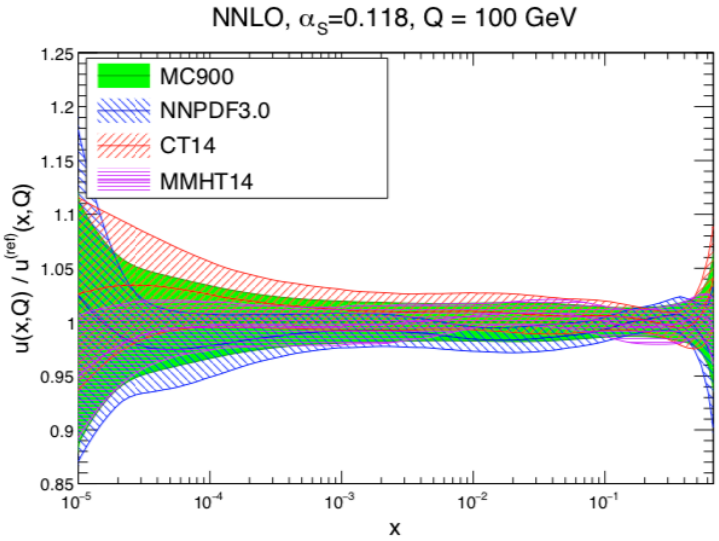
just found out yesterday that the situation looks somewhat different for NNPDF4.0 than for 3.1

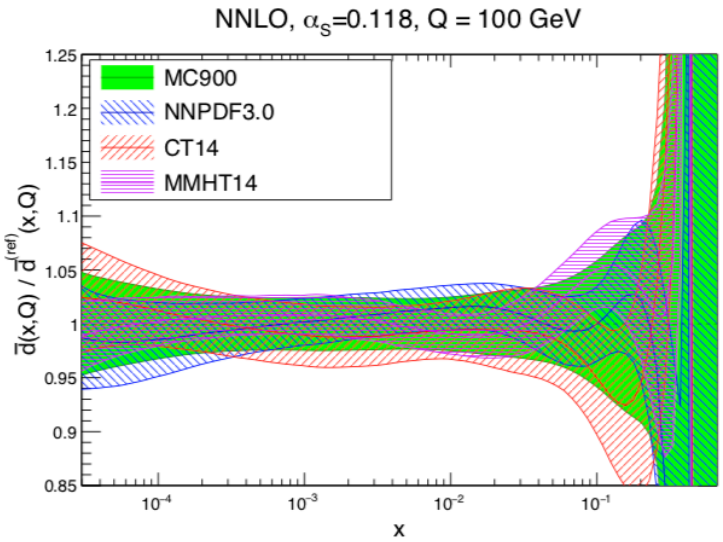


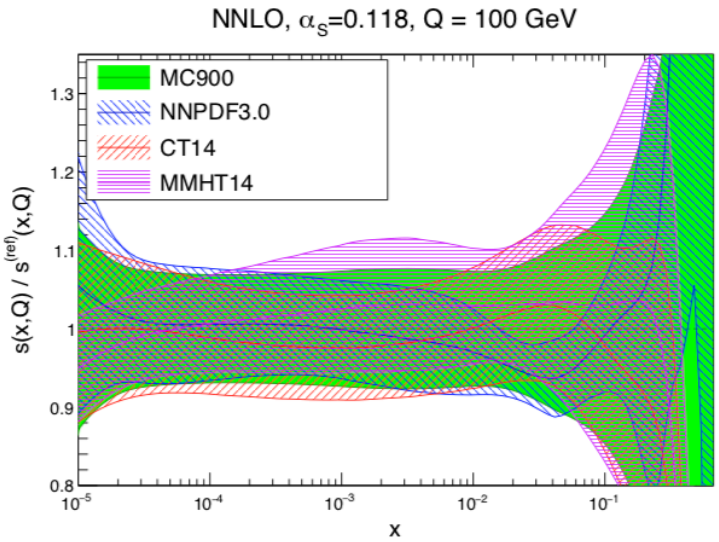
PDF4LHC15 exercise

- 300 Monte Carlo replicas generated from error sets of each of the 3 global PDF sets; information can be summarized in far fewer error PDFs










You know, it's very strange
I have been in the Remove Trump business so long, now that it's over, I don't know what to do with the rest of my life
Have you ever considered PDF benchmarking?