The fastNLO Project

High-precision data require equally accurate theory

→ **higher-order perturbative calculations (N^{x}LO)**

→ **increasingly more time consuming**

→ **not usable in fits of proton structure (PDF) or the strong coupling α$_S$**

Solution: Use fast-grid technique

C. Pascaud, F. Zomer (1994), Orsay LAL-94-42.
M. Wobisch, RWTH Aachen, PITHA 00/12, DESY-2000-049.

→ **fast interpolation of PDF and perturbative scale dependence**

→ **first demonstrated with NLO jet cross sections,**

NLOJet++, Z.Nagy,
PRD68 2003, PRL88 2002

   but valid for any order or process

→ **jets usable in fits!**
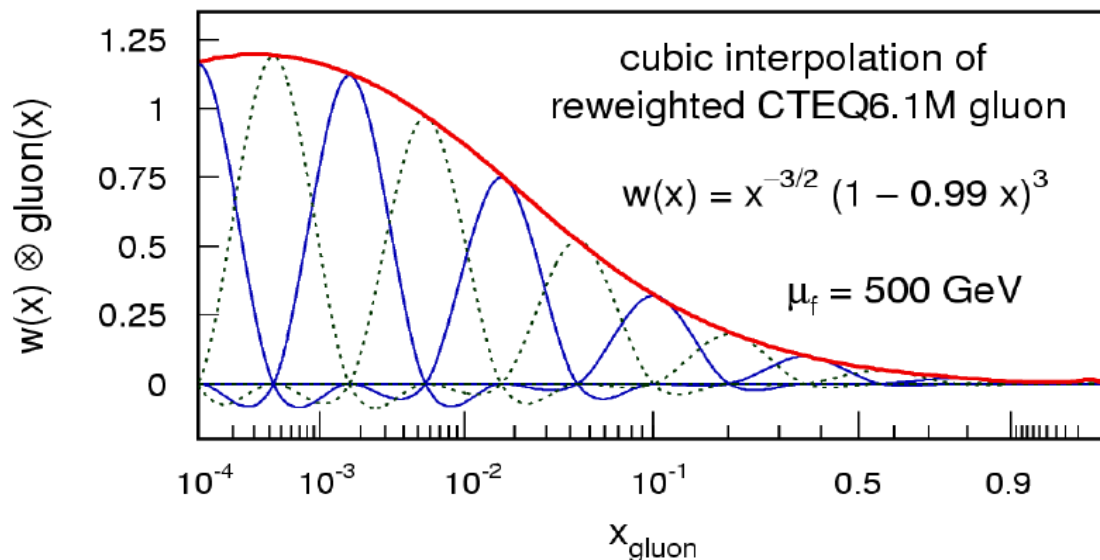
Latest progress:

- **flexibility to change scale definition, not only multiplicative factor**
- **extended to approximate NNLO ttbar (→ DiffTop)**
- **integrated into → HERAFitter (alongside alternative fast-grid tool APPLGRID)**
- **available as open source library with numerous tables for public data**
- **work in progress interfacing multi-process MC generators with NLO**

Inclusive Jets and PDFs

Agreement with predictions of QCD over many orders of magnitude in cross section and beyond 2 TeV in jet p_T
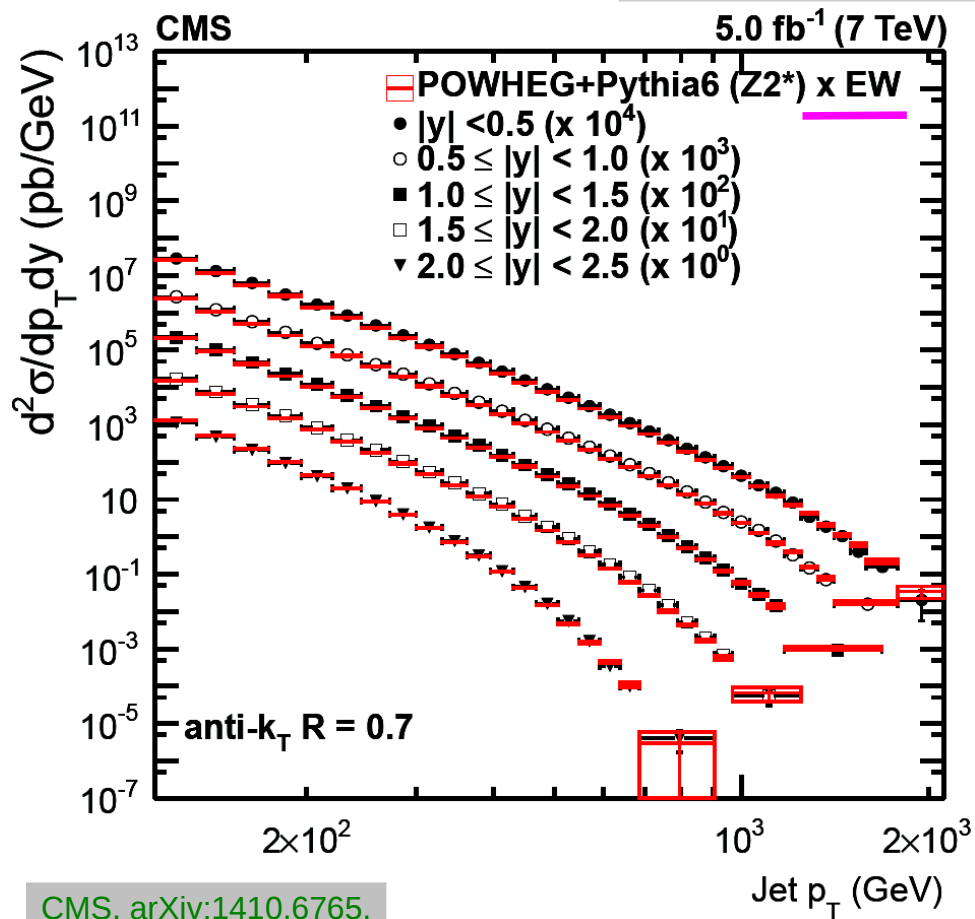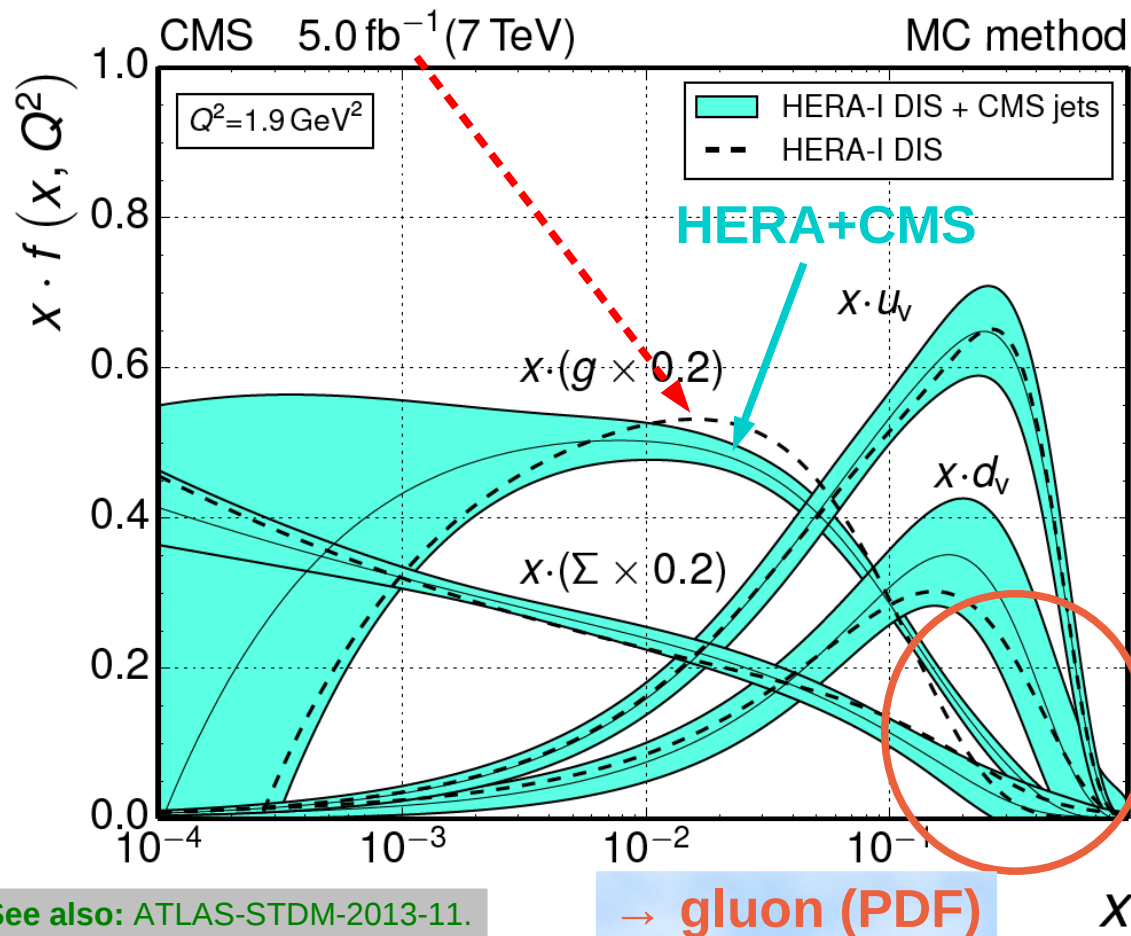
Constrains PDFs
"Harder" gluon at high x compared to DIS

Data vs. NLO+PS ⊗electroweak corrections

anti-kT, R=0.7, 7 TeV, 2011

$$\frac{d^2\sigma}{dp_T dy} \propto \alpha_s^2$$

"HERA-I" gluon

HERA+CMS

CMS, arXiv:1410.6765.

See also: ATLAS-STDM-2013-11.

→ gluon (PDF)

Fitting the strong Coupling Constant