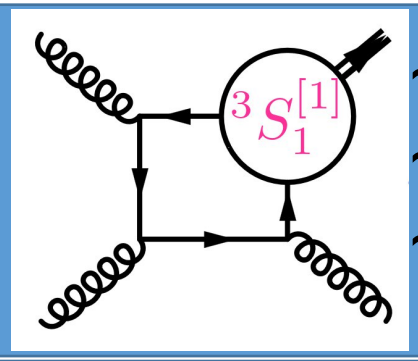
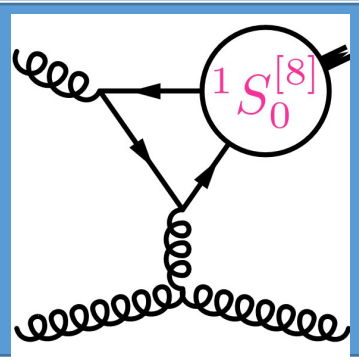
Round table / questions

CO/NRQCD perturbative `instability'

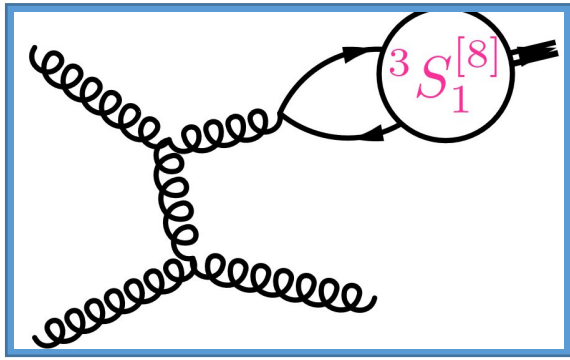
`~' means up to PDF effects



~ $1/p_T^8$ (LO)
~ $1/p_T^6$ (NLO)
~ $1/p_T^4$ (NNLO)

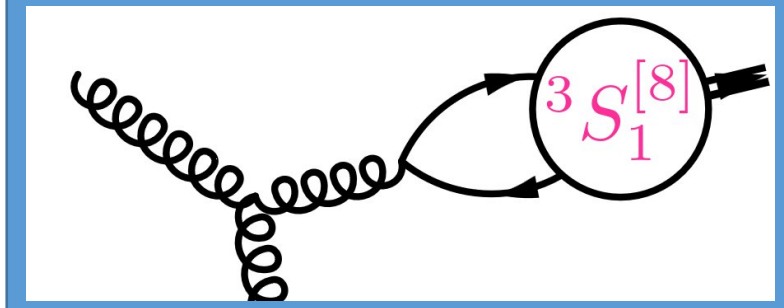


~ $1/p_T^6$ (LO)
~ $1/p_T^4$ (NLO)



~ $1/p_T^4$

BUT



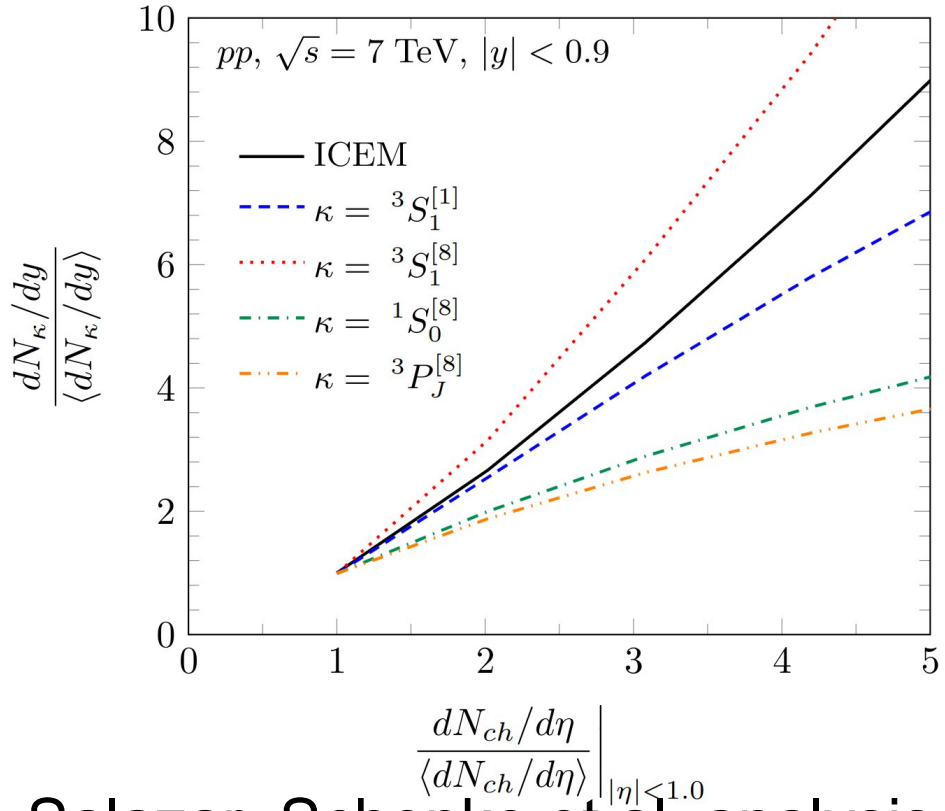
~ gluon off shellness

→ **vanish** for real gluons at LO for pT ~0 !

Expect large NLO/LO variation !

CO/NRQCD perturbative `instability'

1. LO vs NLO LDMEs
2. In BFKL studies, g g*(k_T^2) → $^3S_1^8$ at LO artifically sensitive on k_T^2
3. Same in CGC NRQCD studies, artificial sensitivity at LO on the multiplicity



Y.Q Ma et al. PRD 98 (2018) 7, 074025

- Is it the same in the Salazar, Schenke et al. analysis ?
- Stasto et al demonstrated the irrelevance of *pomeron-loop effect* (gg+g→J/ψ).
  - Does that means that LO CGC CSM studies are unreliable ?

Unlike in inclusive J/ψ production, theory work really well in exclusive production.

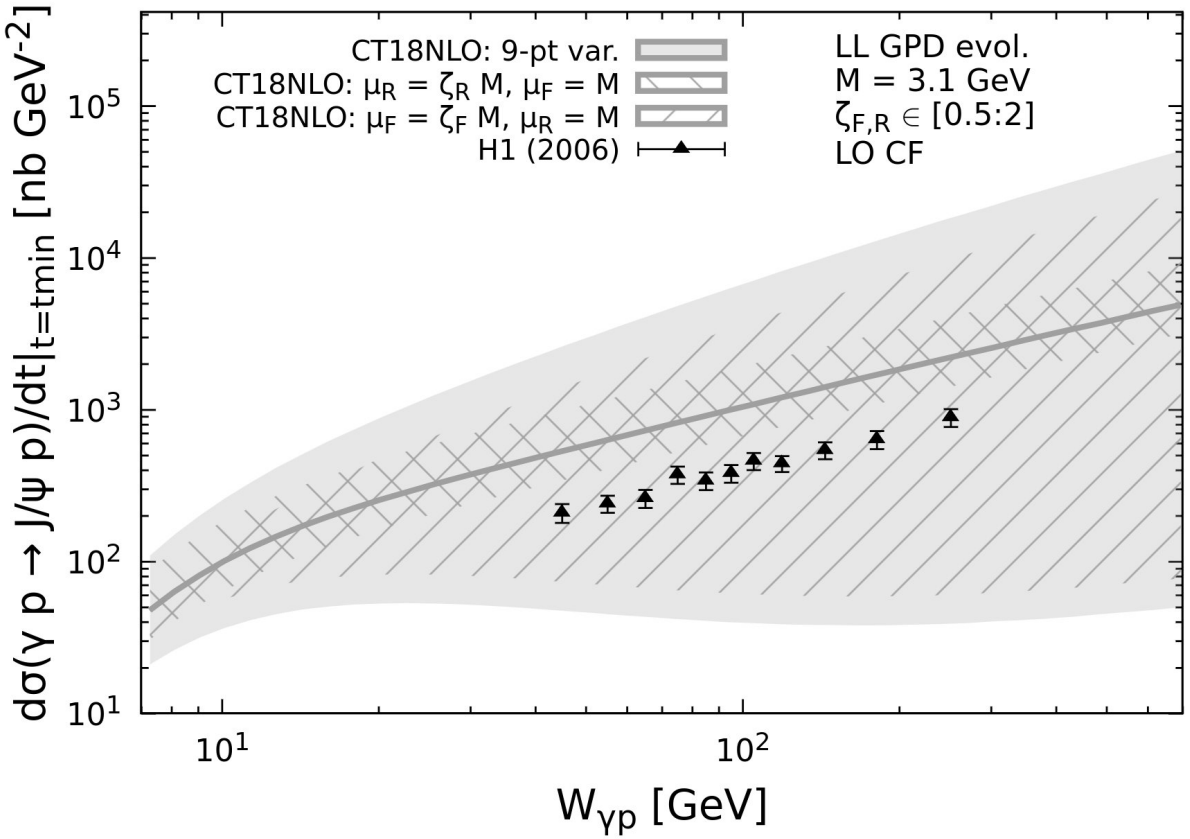
R. McNulty, Trento, July 11, 2024 (~ 9:15am)

Really ?

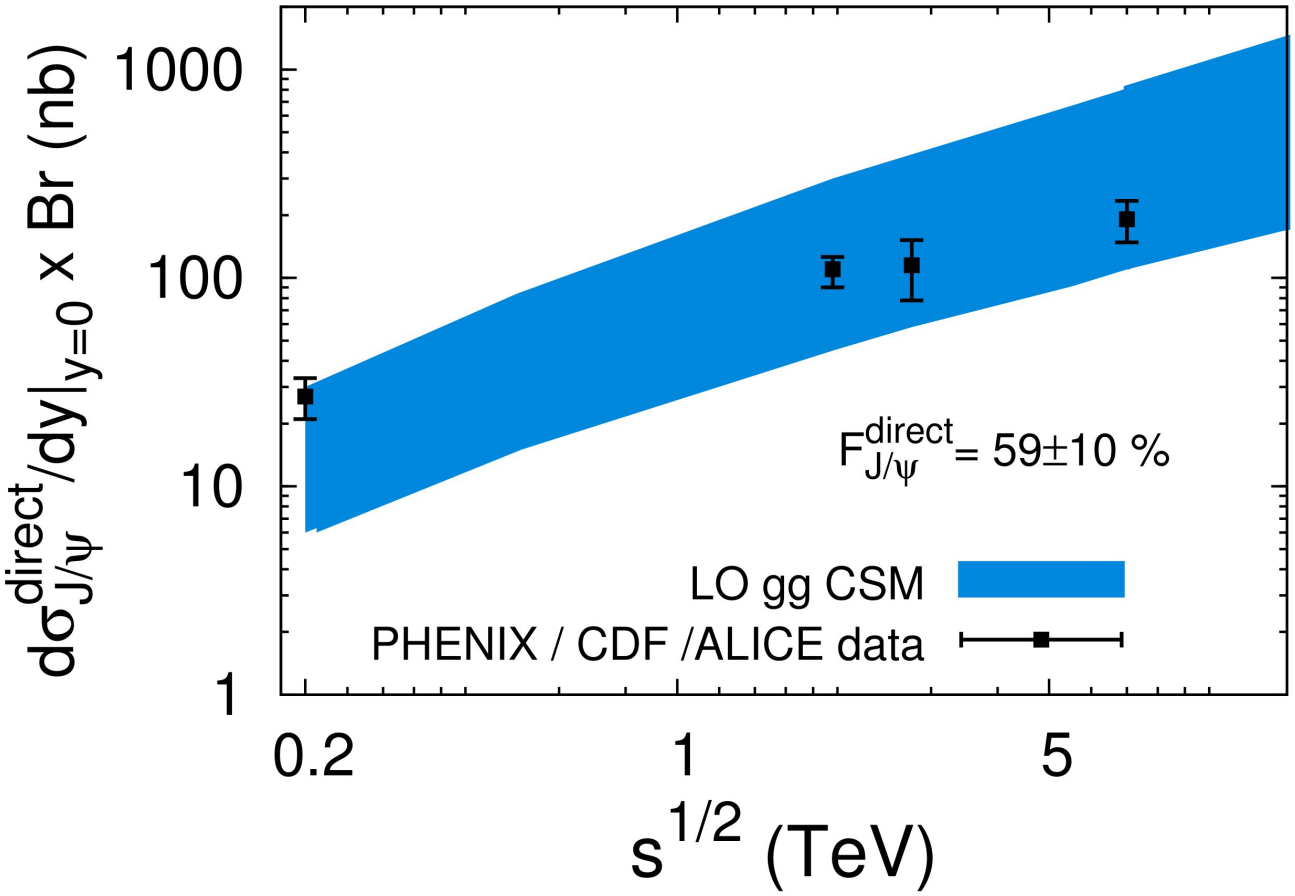
J.P. Lansberg, Trento, July 11, 2024 (~ 3pm)

LO : equally good/unprecise

- **Exclusive** photoproduction

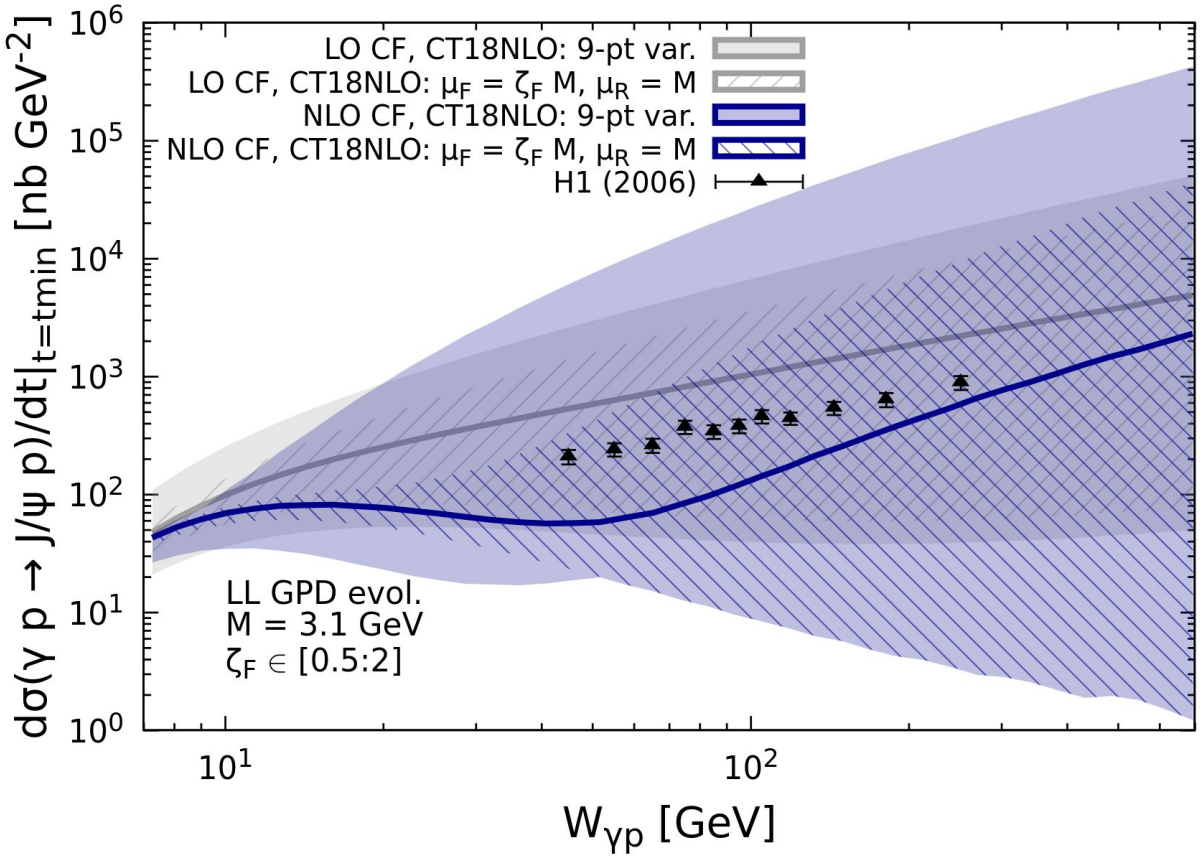


- **Inclusive** hadroproduction

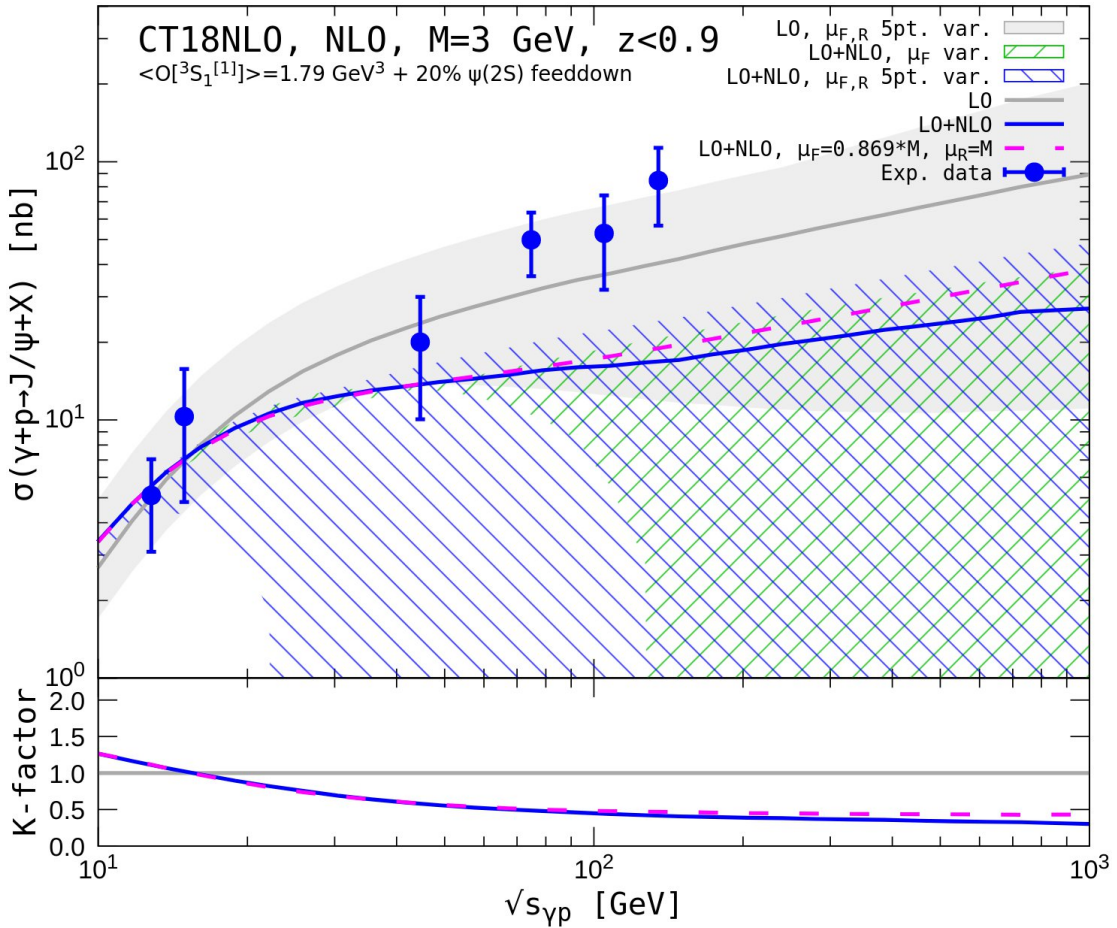


NLO : equally unstable

- **Exclusive** photoproduction



- **Inclusive** photoproduction



In the inclusive regime, the **issues** only come for $\boldsymbol{p_T >> M}$

If one integrates in p_T, the CSM at LO is **equally good** (with admittedly very large uncertainites) for **inclusive** and **exclusive** reactions

At **NLO**, in both cases, **perturbative instabilities**.

2 solutions :

- **scale fixing** => could give the **impression** that **uncertainties** gets **small**
- **resummation** => work well, but **only** at **LL** ; qualitatively not much different than LO. **Need for NLL**

In the inclusive case, the complications arise when describing the **production of quarkonia recoiling on some particles**.

My understading is that the 3-gluon coupling requirement complexifies a lot the production : high-order needed in α_s, v, p_T, ...