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The parton distributions at small momentum fractions

When parton momentum faction ⬚ of hadron becomes small, an enhancement from small-⬚ logarithms shows up, and eventually, we enter into a partonic saturation region. A consistent treatment of the small-⬚ logarithms requires an all-order resummation which can be achieved with the BFKL formalism. However, a boundary to delineate the small-⬚ resummation region from saturation one is ambiguous. In this study, we take a ⬚-dependent DIS scale motivated by the saturation model in a global analysis, which improves the QCD description of the HERA DIS data. In parallel, we also explore the BFKL improved DGLAP evolution, which achieves a similar ⬚2 for the same data set. We compare various impacts of these two methods on the parton distributions, and also phenomenological implications, including Drell-Yan or Higgs boson production at future hadron colliders (FCC), the ultra-high-energy neutrino-nucleus scattering, and structure function measurements at future electron-hadron colliders (LHeC/FCC-eh).

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