The authors provide a study of the physics potential of the Large Hadron electron Collider (LHeC) regarding possible constraints on the parton structure of the proton.

As currently written this paper contains several points regarding physics insights and the discussion of parton distributions (PDFs), which I invite the authors to comment upon.

1. The authors study the projected sensitivity of the LHeC for constraining PDFs within the framework of the PDF4LHC15 set. The PDF4LHC15 set has been averaged from MMHT, CT14 and NNPDF3.0. The latter set has been updated to NNPDF3.1 with significant changes, thus the PDF4LHC15 set is slightly outdated by now.

   More importantly, the PDF4LHC15 set mixes PDFs derived using very different theoretical treatments. This concerns for instance different heavy-quark mass schemes (ACOT, FONLL and RT) or the gluon PDF in the low-x or the high-x region. This is problematic as the chosen statistical combination of PDF sets may lead to an overestimate of the uncertainties at these kinematics.

   Such issues have been discussed extensively in:
   A Critical Appraisal and Evaluation of Modern PDFs
   A. Accardi et al.
   Published in Eur.Phys.J. C76 (2016) no.8, 471
   DOI: 10.1140/epjc/s10052-016-4285-4
   e-Print: arXiv:1603.08906 [hep-ph]

2. It is unclear, why the authors use the HERAPDF parameterization as an example for a PDF parameterization with a restricted number of parameters. This parametrization, subsequently used in the ATLASepWZ16 analysis lacks sufficient flexibility in the light flavor PDFs and has been shown to fail in comparisons to data, most recently in:
   Measurement of associated production of a W boson and a charm quark in proton-proton collisions at $\sqrt{s}$=13 TeV
   CMS Collaboration (Albert M Sirunyan et al.)
   Published in Eur.Phys.J. C79 (2019) no.3, 269
   DOI: 10.1140/epjc/s10052-019-6752-1
   e-Print: arXiv:1811.10021 [hep-ex]

3. The authors use pseudo-data for the heavy-quark neutral-current structure functions to explore additional constraints on the gluon PDFs. It is well-known that the gluon PDF in these reactions is correlated with the strong coupling constant and the quark masses m_c and m_b. See for example ABMP16:
   Parton distribution functions, α_s, and heavy-quark masses for LHC Run II
   S. Alekhin, J. Blumlein, S. Moch, R. Placakyte
   Published in Phys.Rev. D96 (2017) no.1, 014011
   DOI: 10.1103/PhysRevD.96.014011
   e-Print: arXiv:1701.05838 [hep-ph]

   Fixing the strong coupling constant and the charm and bottom quark masses (in some renormalization scheme) introduces a bias in the projections. At the same time the LHeC's potential in constraining α_s and heavy-quark masses remains unexplored.

4. The authors work with theory predictions in QCD accurate to next-to-leading order (NLO) while deep-inelastic scattering is known complete to next-to-next-to-leading order (NNLO) and some reactions even to N^{3}LO. The low theoretical accuracy leads to a lower quality of the theoretical description (larger value of χ^2/dof.) of existing data and thus to PDFs, which have larger uncertainties.

5. The choice of a tolerance criterion $\Delta\chi^2 = T^2$ with $T = 3$ is not well motivated in the study. It is currently used in some PDF fits to account for the lack of compatibility of data sets, although this is not necessary in a global fit. If a value of T different from unity is used, this mixes the projected PDF sensitivity of the LHeC with the question, whether compatible sets of data will be available then.

   In this context the authors' statement on page 10:
   "On the other hand, it has been known for some time, see e.g. [41], that fits to the HERA dataset only are found not to be consistent within the quoted uncertainties in comparison to those including collider data when using a textbook tolerance $T = 1$."
   should be revised as the ABMP16 paper cited above and reference therein provide counter examples.

6. The authors' findings on the improvements of the light flavor PDFs through LHeC data are not entirely clear, since recent LHC data on W- and Z-boson production, differential in rapidity, has greatly increased the precision of the light-flavor PDFs. Such data are, however, not included in the PDF4LHC15 set. It is thus not clear, whether the LHeC can add substantial new knowledge.