The Gribov problem arises from ambiguities in the choice of gauges in non-abelian gauge theories. This problem has been known for over 40 years. One of the cogent schemes to deal with the problem is the so-called Gribov-Zwanziger (GZ) approach; see, e.g., [1] for a review. Recently there is progress on the understanding in the GZ approach. In the original GZ approach the BRST invariance is supposed to be broken but recent studies show that there exists a BRST-invariant formulation of the GZ procedure, see, e.g., [2, 3, 4]. This article under review lies along these lines of developments. The authors apply the new procedure to *topological* Yang-Mills theories in the (anti-)self-dual Landau gauges. For a review of topological Yang-Mills theories, see, e.g., [5].

One of the main results of the paper, the authors claim, is that due to the BRST-invariant nature of the new GZ approach a massive parameter which appears in the original GZ approach to topological YM theories can be trivialized or can be dynamically vanished. This result is derived from an analysis of the so-called Gribov gap equation at one-loop level. The result is also argued from a perspective of the relevant renormalization properties [6].

References

[1] N. Vandersickel and D. Zwanziger, Phys. Rept. **520**, 175-251 (2012) doi:10.1016/j.physrep.2012.07.003 [arXiv:1202.1491 [hep-th]].

[2] M. A. L. Capri, D. Dudal, D. Fiorentini, M. S. Guimaraes, I. F. Justo, A. D. Pereira, B. W. Mintz, L. F. Palhares, R. F. Sobreiro and S. P. Sorella, Phys. Rev. D **92**, no.4, 045039 (2015) doi:10.1103/PhysRevD.92.045039 [arXiv:1506.06995 [hep-th]].

[3] M. A. L. Capri, D. Dudal, D. Fiorentini, M. S. Guimaraes, I. F. Justo, A. D. Pereira, B. W. Mintz, L. F. Palhares, R. F. Sobreiro and S. P. Sorella, Phys. Rev. D **94**, no.2, 025035 (2016) doi:10.1103/PhysRevD.94.025035 [arXiv:1605.02610 [hep-th]].

[4] D. Dudal, C. P. Felix, L. F. Palhares, F. Rondeau and D. Vercauteren, Eur. Phys. J. C **79**, no.9, 731 (2019) doi:10.1140/epjc/s10052-019-7235-0 [arXiv:1901.11264 [hep-th]].

[5] P. van Baal, Acta Phys. Polon. B **21**, 73 (1990) CERN-TH-5453/89.

[6] O. C. Junqueira, A. D. Pereira, G. Sadovski, R. F. Sobreiro and A. A. Tomaz, Phys. Rev. D **98**, no.10, 105017 (2018) doi:10.1103/PhysRevD.98.105017 [arXiv:1807.01517 [hep-th]].