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Implementation of the electromagnetic "pullback transformation scheme" in the gyrokinetic code XGC AMIL SHARMA, MICHAEL COLE, Princeton Plasma Physics Laboratory, Princeton, New Jersey 08543, USA, ALEXEY MISHCHENKO, Max-Planck-Institut für Plasmaphysik, EURATOM Association, 17491 Greifswald, Germany, SEUNG-HOE KU, BENJAMIN STURDEVANT, ROBERT HAGER, JULIEN DOMINSKI, CHOONG-SEOCK CHANG, Princeton Plasma Physics Laboratory, Princeton, New Jersey 08543, USA — The "pullback transformation scheme"[1] for electromagnetic gyrokinetic simulations is being implemented as an option in the total-f gyrokinetic code XGC.[2] This scheme significantly improves upon the conventional $p_\parallel$-formulation of electromagnetic gyrokinetics. At present, XGC uses a fully implicit $v_\parallel$-based electromagnetic scheme.[3] We describe the details of the new electromagnetic scheme being implemented. We present the necessary adaption of this scheme to XGC's particular numerical design, such as its unstructured mesh that allows simulation across the magnetic separatrix and X-point. One of the first verification tests being performed is the reproduction of the kinetic-ballooning-mode linear growth-rate threshold that is observed for finite β.[4] Progress on this and other verification tests will be reported, and performance comparisons between $p_\parallel$-based schemes and the implicit $v_\parallel$-based scheme will be detailed.

[1]A. Mishchenko et al., Phys. Plasmas 21, 092110 (2014)
[2]S. Ku et al., Phys. Plasmas 25, 056107 (2018)
[3]G. Chen, L. Chacón, Comput. Phys. Commun. 197, 73-87 (2015)
[4]T. Görler et al., Phys. Plasmas 23, 072503 (2016)

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