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Re-splitting δf method for gyrokinetic simulation of tokamak plasmas

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A new method based on a re-splittingδ f technique is proposed to mitigate the cancellation problem in electro-magnetic gyrokinetic PIC simulation. This new scheme, together with the pull-back mitigation (PBM) scheme [A. Mishchenko, R. Kleiber, M.Cole, Physics of Plasmas 21 (9) (2014) 2095], have recently been implemented in the GEM code [Y. Chen and S. E. Parker, J. Comput. Phys. 189, 463 (2003)]. These two algorithms are systematically compared with the original GEM algorithm for the simulation of the ion temperature gradient (ITG) mode, the kinetic ballooning mode (KBM), the toroidal Alfvén eigenmode (TAE) and the energetic particle mode (EPM). The three algorithms agree well for all of these modes. Moreover, both the re-splitting method and PBM can mitigate the cancellation problem and improve the computational efficiency.

References

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