Ragusa, Jean C

From: eesserver@eesmail.elsevier.com on behalf of Journal of Computational Physics <eesserver@eesmail.elsevier.com>
Sent: Monday, August 07, 2017 11:48 PM
To: Ragusa, Jean C; jean.ragusa@gmail.com
Subject: JCOMP-D-17-00823

Re: JCOMP-D-17-00823

Dear Dr. Ragusa,

Based on the received referee report, which is appended below, I have come to a decision on your manuscript entitled "Flux-Corrected Transport Techniques Applied to the Radiation Transport Equation Discretized with Continuous Finite Elements".

In view of the referee report, I have come to the conclusion that after minor revisions your paper can be reconsidered for publication in the Journal of Computational Physics. Therefore, I am looking forward to receiving the revised version (mandatory) of the paper together with a reply to the reports (mandatory) and a summary of the revisions made (mandatory).

The changes you will have made must be described in a separate file labeled "Response to Reviewers" that carefully addresses, point-by-point, the issues raised in the comments appended below. You should also include a suitable rebuttal to any specific request for change that you have not made. Mention the page, paragraph, and line number of any revisions that are made. It is mandatory to indicate in the revised manuscript the changes you have made by highlighting the text in different colors for different reviewers. Failure to address any of these 3 points (changes made, changes not made, highlight of change) without justification may lead the associate editor in charge of your submission to send the revised submission back to you.

While submitting the revised manuscript, please double check the author names provided in the submission so that authorship related changes are made in the revision stage. If your manuscript is accepted, any authorship change will involve approval from co-authors and respective editor handling the submission and this may cause a significant delay in publishing your manuscript.

The revised version of your submission is due by Nov 06, 2017.

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With best regards,

Jim E. Morel, Ph.D.
Associate Editor
Journal Of Computational Physics

The reviewers' comments are as follows:

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Reviewer #1: This paper presents a well-written, informative, and appropriately comprehensive overview of the authors' application of Flux Correction Transport (FCT) techniques that have recently appeared in the larger world of fluid dynamics and applied mathematics to the Boltzmann particle transport world. This application is both novel, as there are unique difficulties introduced with the application of FCT to radiation transport, and important, as the appearance of "spurious solutions" due to ray effects and/or numerical oscillations have been a largely intractable problem since numerical solution techniques were first developed for radiation transport decades ago. The paper provides appropriate references to both previous efforts within the radiation transport field targeted at dealing with spurious oscillations as well as to the development of FCT methods within the broader community. Most (but not all, in my opinion) of the strengths and weaknesses of FCT are identified and discussed within the paper, and the conclusions are well-supported by the test problems. . My recommendation is that this paper should be accepted after revision to address the detailed comments listed below.

1. Pg. 2, para. 1 - It should be noted that Monte Carlo solution techniques also exist for the solution of the radiation transport equation.
2. Pg. 2, para. 1 - I believe that the solution of the discrete ordinates equations during source iteration are only decoupled for Cartesian geometries, but not curvilinear, as an angular derivative is present for these geometries. The possible difficulties that might arise from the use of FCT for curvilinear geometries should be mentioned.
3. Pg. 2, para. 2 - "Traditionally, the" -> "One common".
4. Pg. 3, para. 1 - A reference should be provided for Hamilton's work.
5. Pg. 4, para. 3 - The assumption that q >= 0 is strictly true in the continuous sense, and also true if isotropic scattering is assumed, but fails when truncated Legendre expansions are used for the scattering term. The question of whether still applicable for this scenario needs to be addressed within the article.
6. Pg. 7, para. 1 - The first sentence ("Hence,…) appears to be misworded. The second sentence should be supported by a reference as it is quite general.
7. Pg. 8 - In Eq. (20) and Eq. (21a) shouldn't U(t) be U^L(t)?
8. Pg. 9, third equation - It would be helpful to the reader if this equation was annotated to note that it only applies when I /= j.
9. Pg. 10, para. 3 - Again, the assumption that q is non-negative does not necessarily hold true for anisotropic scattering.
10. Pg. 11, para. 1 - I believe the off-diagonal terms are actually non-positive, with the minus sign in the preceding equation then making the inequality true.
11. Pg. 17, para. 2 - "algebraic operator" -> "algebraic operators".
12. Pg. 18, para. 3 - It should be noted by the authors if they have attempted if they have attempted multiples passes of the anti-diffusive fluxes through the limiter.
13. Pg. 20, Section 4.2 - What was the quadrature order used for this?
14. Pg. 23, Section 4.3 - From the standpoint of reducing the overall solution time shouldn't the goal be minimizing the Total, not the Average, number of iterations to solve the problem? Of course, one must also consider how the quality of the solution is affected by the CFL. More discussion might be needed here by the authors on the possible tradeoffs between iterations, solution quality, and CFL, especially for cases where source and material properties might be time-dependent.
15. Pg. 24, Section 4.4 - What were the boundary conditions for this problem.
16. Pg. 24, Fig. 5 - The U- and U+ lines are presented on the plot but not discussed.
17. Pg. 26, Fig. 6 - No Galerkin results are presented.
18. Pg. 27, para. 1 - "is employs" -> "employs".

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