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Geoscientific
Model Development
Discussions

Interactive comment on "Implementation and evaluation of an array of chemical solvers in a global chemical transport model" *by* P. Eller et al.

P. Eller et al.

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1 Responses to Review 2

- There should be separate sections for technical implementation and scientific evaluation. The Implementation section should deal with all the technical aspects of KPP, GEOS-Chem, specific instruction formats and Perl. The Evaluation section should clearly describe the methods and measures.
  Modified titles to more clearly and accurately describe the implementation and results sections.

- Specifically, in which chemical regimes the implemented solvers were evaluated and why a given chemical regime was selected.
  Added line to beginning of evaluation section mentioning that GEOS-Chem works

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on a wide variety of chemical regimes during a simulation since it is a global model.

- In addition, evaluation of the new solvers against the SMVGEARII should address issues that relate to the computer hardware. As acknowledged in the manuscript, SMVGEARII is a vectorized solver. Thus, I would like to know to what extent the vectorization of the Gear method resulted in the perceived âEURŸunderperformance of the SMVGEARII code. In order to address this issue I would like the authors to elaborate on the processor architecture (disclosing the name and make of the processor) including the size of all levels of cache, inter-processor connectivity (motherboard, switch if any, name and make), compiler name, version and options used.
  Added Appendix containing the test setup used for our experiments, and added a line to the beginning of the evaluation section.

- Also, the size of the domain and memory requirements of GEOS-Chem have to be clearly stated so the reader can have a clear understanding of how the model relates to the hardware used for testing.
  Added line to beginning of evaluation section with this information.

- And finally, the authors should state whether their methods and findings would apply to other models and different computer architectures and configurations.
  Added line to beginning of evaluation setup. This is a typical configuration for small sharedmemory machine since most machines have multiple cores, memory hierarchies, etc. These results should hold.

- The tile should be more specific and reflect which chemical transport model was used. Also, please include the version number of the model in question.
  Added the model to the title, added the version number to the introduction.

- There is no clear statement why the work was undertaken. If the GEOS-Chem

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model is already "state-of-the-science" (page 186 line 16) or as stated later "state of the art"(page 197 line 14) there should not be any need for improvements, should there? Also, please decide whether you are writing about the art or the science.
Changed to state-of-the-science in all places.

- The Abstract is almost identical to the Conclusions section. One would expect more from the later section.
Condensed the last paragraph, adding this information to the end of the first paragraph, broke the first paragraph into two paragraphs, one on the implementation, one on the results.

- A large part (page 195, starting at line 6) of the Results section is taken (with very minor changes) from the paper by Henze et al., 2007. It has been noted that the paragraphs are taken from a paper of one of the co-authors; however, please remove or rewrite.
The paragraphs explaining the test setup have been rewritten to more concisely explain how the test is being performed.

- It is the opinion of this reviewer that scientifically meaningful and technically accurate statements should be used. Please address the following colloquial phrases:
The present paper presents (page 187, line 19) to *We present*
Extreme flexibility (page197, line24) to *user options*
Immediate access (page 197, line 27) to *access*
Etc. (page 188, line 23, and 3 more places)
188, 23 *removed*
190, 15 to *and additional characteristics*
191, 13 to *and additional characteristics*
Chemically meaningful values (page 195, line 14) to *concentrations with very*

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small values
Chemical Jacobian and Hessian (page 188, line 25) to *Jacobian and Hessian of the chemical ODE function*
The results are visually identical (page 194, line 18) *is fine as is*
Practically identical (page 194, line 26). to *very similar to each other.*

- It is a general impression that figures are of poor quality and do not communicate with the reader. Specifically, please correct and modify the following figures:

  Fig. 2. One cannot see any differences. Please replace with a difference of the presented fields. Also, the scale is not readable, units are not defined, Ox is not defined.
  Added a figure showing the differences, fixed the scale, defined the units.

  Fig. 3. The value of this figure is questionable. Units in the caption do not match the scale. These are NOT concentrations, are they?
  Fixed figure to use the same units as the previous figure.

  Fig. 5. Solution methods are in a different order in the caption and on the legend. Also, the caption is hard to understand "Speedup plot for..."
  Fixed ordering. "Speedup" is a standard parallel performance metric that measures how fast the simulation is on p cores compared to 1 core.

  Fig. 6. Units are not defined, the caption is hard to understand, the scale is not.
  Added units.

Interactive comment on Geosci. Model Dev. Discuss., 2, 185, 2009.