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Interactive
comment

Interactive comment on "Mass imbalances in EPANET water-quality simulations" *by* Michael J. Davis et al.

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We appreciate the interest in our work and the comments provided.

To briefly summarize, three comments were provided: (1) There is a logical inconsistency in the description of the event-driven algorithm; (2) The example in Appendix B should be simplified; and (3) The recommendations should be improved.

(1) Thanks for pointing out the inconsistency in the description of the algorithm. We will revise the discussion.

(2) The suggestion to provide a simplified example in Appendix B is reasonable; a simpler example would be easier for the reader to understand. However, accepting this suggestion would require constructing an artificial example. The example used in

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Discussion paper

Appendix B is based on a real, reproducible situation in Network N1. We believe that the extra complexity is justified because it provides an example that can be reproduced independently using one of the networks from the paper and demonstrates how mass imbalance can occur in a actual case. Opinions obviously can differ on this point.

(3) The comment on the recommendations deserves some discussion. Our goal is to provide recommendations that best serve users of EPANET and thoughts from users are welcomed. The comment has two parts. The first relates to the first recommendation in the paper. The second claims that the recommendations "do not coherently describe their urgency or expose any relevant interdependencies". We will consider the second part of the comment first.

We first provide suggestions for time steps for use "with the current time-driven water-quality algorithm", something that any user can do right away. Therefore, this recommendation could be considered the most urgent. The second recommendation is to add a capability to EPANET to provide reports on mass balance. Some effort is involved (although it is available already in TEVA-SPOT for those who want to use it), but it seems like the next, relatively easy thing to do. (An explicit warning could also be recommended, as suggested.) The third recommendation applies "[w]hen a capability to obtain an evaluation of mass balance is available", clearly relating it to the previous recommendation. The fourth recommendation is to replace the water-quality algorithm with one that conserves mass. It seems obvious that when this is accomplished there will be little motivation for a user to consider the first three recommendations. Perhaps the last recommendation is the most urgent; if it were followed, the problem would be eliminated. Therefore, the order of urgency could be Recommendation 4, followed by "in the meantime" 1, 2, and 3. Or it could be 1, 2, and 3 to first address the needs of current users, followed by, or in parallel with, Recommendation 4. The current list of recommendations does explicitly or implicitly show interdependencies. It also is ordered by urgency (at least according to one possible opinion about urgency).

The first part of the comment says that the recommendation related to specific time

steps is "both jarring and incorrect" and then goes on to say that the first recommendation should be that EPANET should be modified to provide a warning/error statement if problems or potential problems related to mass conservation are identified. Good suggestion. However, what should EPANET users do right now before such warnings are available? Our recommendation is to use a shorter time step. A shorter time step will likely reduce the magnitude of any mass imbalances. The logical alternative to providing such a recommendation seems to be a recommendation that all use of EPANET for water quality simulations be halted until the software can be modified to provide warnings or an accounting of mass balance or until a new water-quality algorithm is available. (Alternatively, we could suggest that all users use TEVA-SPOT. :)) The recommendation does not seem too jarring or incorrect; it provides a workaround until something better is available. Hopefully, users have been alerted to potential problems.

Good comment. Again, we welcome discussion on the subject of recommendations and will consider separating recommendations into two tiers, those that can be carried out soon and those that require a longer time to implement.

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