Responses to Reviewers

NSE19-11

Reviewer #1: Recommend to accept as is.

No responses required.

Reviewer #2: Review of Dynamic Mode Decomposition for Subcritical Metal Systems Z. Hardy, J. Morel and C. Ahrens

Recommendation after review - Publication in Nuclear Science and Engineering after minor revisions.

The paper "Dynamic Mode Decomposition for Subcritical Metal Systems" authored by Z. Hardy, J. Morel and C. Ahrens is an original contribution of interest to the readership of Nuclear Science and Engineering. The title and abstract are adequate for the proposed paper and to the reviewers knowledge the cited references seem complete.  
The manuscript is complete and clear. The reviewer appreciates the narrow scope described in the manuscript, and that the work and conclusions drawn do not stray from the scope of work presented in the paper.

The reviewer recommends the following typographical changes be made:  
  
Page 1, I. Introduction, paragraph 2 line 4 - "might not contribution significantly" - change to "might not contribute significantly".

Changes made as suggested.

Page 12, IV. Discretrization of the Diffusion Equations, paragraph 2, line 6 - "that source" - change to "that the source".

Changes made as suggested.

Page 13, IV. Discretrization of the Diffusion Equations, paragraph 2 of page, line 10 - "flux at ther next half-time" - change to "flux at the next half time".

Changes made as suggested.

Page 14, V. Numerical Results, paragraph 1, line 10 - "scalar group flux will and the" change to "scalar group flux and the".

Changes made as suggested.

Page 14, V.A. DMD with the Scalar Group Flux, fig. 2 - The  y axis label sigma\_i/sigma\_0 - Is this the first use of symbol sigma in this context?  Please define the symbol sigma for this figure.

Added definition of \sigma’s in text before Fig. 2.

Page 15, V.A  DMD with the Scalar Group Flux, paragraph 2 - "This is code verification is demonstrated" - change to "This code verification is demonstrated".

Changes made as suggested.

Page 15, V.A  DMD with the Scalar Group Flux, paragraph 1 of page - "Practicallty" misspelled  - change to "Practically".

Changes made as suggested.

Page 18, paragraph starting with "The exact solution" - line 2 - DMD modes bear so resemblance" - change to "DMD modes bear no resemblance".

The word “so” was changed to “some.” The dynamic modes should bear resemblance to the alpha-modes in shape and time-scale. This is further demonstrated later in the paper. In addition, “DMD modes” was changed to dynamic modes.

Page 18, paragraph starting with "The exact solution" - line 5 - "the epithermal mode, set" - remove comma.

Changes made as suggested. Also changed the word decay rates to time scale.

Page 19, paragraph starting with "These results give" - line 2 - give is present tense, "showed" and "preserved" in line 2 should be "shows" and "preserves", and "produced" in line 3 should be "produces".

Changes made as suggested.

Page V.B., DMD with the Fission Rate - line 1 - "the size of solution" - change t "the size of the solution".

Changes made as suggested.

Page 21, 2nd paragraph, line 3 - "singular value spectrum, indicates" - remove comma.

Changes made as suggested.

Page 22, line 2 - on an in between times" - change to "on and in between times".

Correction made as suggested.

Page 23, line 4 - "should take note that the increase in error only increased by" - change to "should take note that the error only increased by".

Changes made as suggested and added an additional sentence about extrapolation.

Page 23, VI. Conclusion - line 2, "and the fission rate and to compare it to a truncated" - change to "and the fission rate has been compared to a truncated".

Revised to make two separate sentences.

Page 23, VI Conclusion - General comments - The author states - "superior efficiency to other methods".  The reviewer only saw a comparison to "alpha eigenfunction expansions" and no other methods. It is suggested that the authors state this and not the open ended statement "other methods". The 3rd and 4th sentences read awkwardly, it is suggested that it be reworked to be more clear conclusion that alpha eigenfunction expansions try to solve the thermal portion of the dynamic modes, whereas DMD by design of the method, does not waste effort on solving essentially zero.

Rephrased this portion of the conclusion to get rid of the open-ended statement and make it clearer.

Page 23, last line - "more accurately reflect the problems of" change to "more accurately reflect problems of".

Made a slightly different change to better make the point.

Page 24 - Los Alamos National Laboratory is not managed by Los Alamos National Security, LLC.  It is managed by Triad, LLC.  The acknowledgement should read:  
This work was supported by the US Department of Energy through the Los Alamos National Laboratory. Los Alamos National Laboratory is operated by Triad National Security, LLC, for the National Nuclear Security Administration of U.S. Department of Energy (Contract No. 89233218CNA000001).

Added NSF acknowledgement and made change as suggested.

We made the following additional changes to eliminate small inconsistencies in notation that we found.

Changed A in Eq. (28) and Eq. (29) to be bolded as is the notation in Section II (The DMD Method).

Changed Fig. 8 and Fig. 9 titles to reflect indices from exact solution (i.e., starting at 1, not 0).