

Interactive comment on “Controllability, not chaos, key criterion for ocean state estimation” by Geoffrey Gebbie and Tsung-Lin Hsieh

Anonymous Referee #2

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Main points: The perfect model and observations may not be sufficient in supporting the conclusions reached in this manuscript. Even though the reviewer agrees with the authors 4DVAR has its potential in oceanic state estimation, their case is simply too perfect for convincing the readers, particularly those from the non-variational analysis community, like EnKF or 4DEnVar. The reviewer suggests more realistic experiments and recommend this manuscript for major revision.

1. What are the values of λ ? From the true solution? I am afraid if ideal observations are used, it does not imply the conclusions made for this ideal model to be useful.
2. Page 4, line 23, The statement of “. . .the quantity inside curl brackets vanishes” is not generally true. To do so, there needs an additional term, penalizing the constraint.
3. Page 5, line 23. That is where the problem is that such as observation and prior knowledge and freely-running forward model are not enough.
4. For solving a global

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minimization problem of (6), the first guess is crucial as the authors stated in page 4 line 25-26. However, the improved initial guess of their work presented in Section 2.4 cannot guarantee the initial guess is good enough for converging to the global minimizer. The authors should at least present convincing arguments of why they believe their improved initial guess could reach their goal. To the reviewer, the improved initial guess may fall into the same valley as the original initial guess.

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