Review of the paper: "*Bridging Data Assimilation and Control: Ensemble Model Predictive Control for High-Dimensional Nonlinear Systems*" by Kenta Kurosawa, Atsushi Okazaki, Fumitoshi Kawasaki and Shunji Kotsuk

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1 General comment

The paper introduces an original framework combining control and data assimilation. The proposed method called 'ensemble model predictive control' (EnMPC) solves the MPC cost function using ensemble smoother methods such as 4DEnVar, ensemble Kalman smoother (EnKS), and particle smoother (PS). Numerical experiments are based on the Lorenz-63 model.

Despite the interesting idea of coupling control and data assimilation frameworks, the main contribution of the paper is not obvious compared to state-of-the-art methods. The new algorithm should be further detailed. Moreover, its efficiency for high-dimensional systems is not shown in the experiments.

Below are the related comments that deal with improvements, leading to a future acceptance.

2 Major comments

- The assertion in Abstract (Line 19) and Conclusion (Line 515) about the ability of the proposed method to handle high-dimensional systems is not verified in the numerical experiments. That is why it is going too far to mention this in the paper's title (Line 2). Note that though nonlinearity is mainly treated using the PS, the latter is not suitable for high-dimensional systems.

- Regarding e.q (17), what is the novelty compared to the works cited lines 141, 156 and 157 ?

3 Minor comments

- In Introduction, the difference between sequential and variational data assimilation should be more detailed (Line 73). Moreover, precise that in a variational point of view the EnKF can can be formulated as in eq. (7) (Line 160).
- What pseudo-observation means ? (Line 243)
- How the success rate is computed in Figure 7a ?
- The URL link of the paper of Fairbairn et al. (2014) is wrong, the correct one is: https://rmets.onlinelibrary.wiley.com/doi/10.1002/qj.2135
- Cite Figure 5a for ease of reference (Line 441).
- Thoughtlessness:
  - remove 'of' (Line 211)
  - index p is missing on y_t (Line 249)
  - replace the point after u_x by a comma (Line 324)
  - write 'pseudo' (Lines 334 and 399)