General comment

The authors used an approach (ACPW), combining the PSO and the WSA, to solve reduction conditional nonlinear optimal perturbations (CNOPs), then applied them (reduction CNOPs) to identify the sensitive regions of TC adaptive observations. The validity of ACPW were also verified by comparing the similarity of the reduction CNOP yielded by ACPW with the CNOP produced by the traditional optimization algorithm based on the adjoint model. Considering the applications of CNOP, it is an interesting work.

Major remarks

The blend optimization algorithm ACPW combines two intelligent algorithms, the PSO and the WSA, to capture the CNOP associated with TC adaptive observations. Please state the advantages of the both PSO and SWA algorithms, and their performance difference in detail, so that readers can know the motivation that you combine them to coevolve to solve the CNOP.

As we know that the largest challenge in intelligent algorithms is to solve high dimension optimization problems. However, the authors, following their previous works (such as Mu et al., 2015a, b), have reduced solving high dimensional CNOPs to an optimization problem in a lower dimensional feature space by using the PCA method, with the number of principal components being 50 in their numerical experiments. For such low dimensional optimization problems, both the PSO and the WSA can also obtain the global optimal solutions quickly. Please use statistical method to demonstrate the better optimization performance of ACPW comparing with the PSO and the SWA in perspective of optimization time and accuracy.

There is a great difference at the operation rules of the WSA between the standard version given by Rui Tang et al. (2012) and the formula (6) of this study, please make explanation or correction.

Specific remarks:
(1) Page 3, line 24, 26: The variants given in the propagation operator M should be uniform.
(2) Page 5, line 8~9: Please state in detail the rule setting adaptive subswarm coefficient a.
(3) Page 5, line 17~19: It is better to delete these three lines since the description is unnecessary.