Review of "CNOP based on ACPW for identifying... WRF model by Mu et al."

The paper describes an algorithm –ACPW– to compute conditional nonlinear optimal perturbation –CNOP– using the WRF–ARW model to identify sensitive areas of typhoon-target observations. The authors apply it to two cases –Filow and Matmo. Results are based on maximizing the total dry energy. They then compare their results with those obtained using the adjoint model algorithm.

The authors conclude that the ACPW provides over all better results than the adjoint algorithm, particularly in the sensitive regions, and is more efficient.

Recommendation

Reject and resubmit.

Although the idea put forward in the paper is good the writing really needs attention. Besides, I find that the notation related to the equations is not proper.
I was caught between major revision and reject/resubmit. But it seems that the paper needs major rewriting and also need to be checked by a native speaker.

Major concern

Equations and notation
Starting with the line 10, pg3, – a perturbation of a quantity φ is conventionally noted $\delta\varphi$ (like φ'), where δ is understood to be an operator. The notation $\zeta\varphi_0$ is misleading. In addition, $\delta\varphi_0$ of φ_0 not Φ_0.
Also requring $\|\varphi_0\|^2 \leq \zeta$? ζ is an operator in the text and now it is like a number?

The costfunction J is introduced in top of pg 3, but only explained and detailed 2 pages later?

P: projection operator – what kind of projection, and on which space?

Φ_t (should be φ_t for consistency) is not an operator – it is the state of the system at time t.

Eq (4): Please describes all the parameters

Eq (5): the third '+' should be '-'

Pg 6, l18 - W is not introduced before.

Writing/English
The writing really needs care all across the entire manuscript. I only give some examples

below.
Pg 3, l25: is –> are
l26: list –> listed
l26: Delete the secon Zhange et al.
Pg 4, l23: "are checked built on" ??
l29: meaning not clear
Pg 5, l20: is –> are
l21: last sentence not clear
l23: total vertical –> vertically integrated
Pg 6, l1: last sentence: rewrite.
l3: "distribution of ... then" Rewrite, and distribution is not the right word.
Section 4.2 "numerical similarity" –> spatial correlation
Section 4.3 'Benefits" ???
l18: CNOP is an optimization algorithm and not a cost-function
l23: environment idealized ??? Forecast income ???
Time consumption: CPU time.

Content

1. Above all, it is not clear what is the main difference with Zhang et al. (2108), and what is the advantage of the new algorithm. Any concrete results ?

2. The authors use PCs to reduce the problem dimension. It is not clear how the PCs are obtained: PCs of what, and what is the sample size used to get these PCs? Are the authors using the 24-hr data with 6-hr sampling?

3. Not clear how is the sensitive region determined as CNOP only identifies initial perturbations. Are the authors computing the costfunction for different regions then compare them?