

## **Review of: Ensemble Transformation Adjoint Methods for Adaptive Observations**

By Yu Zhang, et al.

### **General Remark:**

This is an interesting manuscript and could potentially be a contribution to JAS. However, there are some significant problems and questions that arise in the results, as currently presented. These are substantial enough that I must reject the paper. In addition, the writing (English grammar and phrasing) is a rough and could be improved by some editing.

### **Major Comments:**

lines 34-39: it could be true that ETA better reflects the actual analysis error variance, but it is not shown in this manuscript. There are no maps to show what actual analysis error variance is believed to look like, so the reader has no way to verify the claim that ETA is better.

lines 125-126: with current satellite data coverage, there are really no “data sparse” regions anywhere on the globe. Over oceans there are few in-situ observations (e.g. radiosondes, which are provide very accurate data), but the atmosphere over oceans is by no means “data-sparse.” The issue is more one of variations in data quality, rather than amount of data. It is likely true that analysis variance is generally larger over oceans but that is not demonstrated here. A reference such as Langland et al. 2008, Tellus 598-603, or some other paper could be included to help make the argument that the authors seem to be attempting.

lines 220-223: “**we found** the ET method recommends placing observations in regions where the analysis variance in small.” This is a significant criticism of the ET method, which has been widely used as an observation targeting method for many years. If this is actually true, the basic theory of ensemble transform is called into question, casting possible doubt on many papers that are in the literature. It is absolutely essential that if the authors state “WE FOUND,” there must then be some very good evidence presented to back up this statement. Currently there is no evidence shown in the manuscript, or even a reference to a previous study. This is not acceptable.

line 394: “The summary maps are similar.” Yes, they are, which seems to refute the basic claim of the paper, which is that the ETA shifts sensitivity to regions which have larger analysis variance. The results and figures show no evidence of this.

lines 427-428: Now it is claimed that “ETA seems more reasonable resulting in high sensitivity over large analysis error variance regions.” Where is this shown? It appears that: 1) there is no result in this paper to show any coherent shift in sensitivity, and 2) there is no evidence to show what regions have large analysis error variance. Note that

Fig. 5 (difference of ETA and ET signal) appears essentially random, and does not show any coherent improvement from the ETA results.

lines 513-518: "... revealed from this study is that the forecast error variance reduction is inversely proportional to analysis error variance." Where is this illustrated?

**Minor Comments:**

line 62: the first adaptive observing field campaign ....

lines 107-109: if some adaptive observation cases do not have large impact, it could be due to poor sampling of the target area, rather than a deficiency in the ET ability to define the target area ...