

# Ensemble Transform Adjoint Method for Adaptive Observation

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Adaptive observations provide flexibility and opportunity of much needed observations for High Impact Weather (HIW) due to the limited coverage of existing observation systems, especially over remote areas. Optimal deployment of these adaptive observations might make significant difference impacting forecast accuracy. Ensemble Transformation method (ET) has been shown a useful tool for adaptive observation deployment. In this paper, a new adjoint method is proposed for improving the ET method in efficiency and accuracy. It is named as Ensemble Transformation Adjoint (ETA). ETA improves ET in aspects, 1) ETA reflects variance impact in more meteorologically and statistically meaningful manner since its signal is proportional to the analysis error variance., i.e., areas with larger analysis error variance are more likely identified as sensitive regions; 2) ETA calculates its sensitive regions without loop over all the possible observational resource compared to ET. ETA and ET are applied to a real hurricane case: 2011 Irene. The results confirm the improvements.