Geophysical Research Abstracts
Vol. 15, EGU2013-2405, 2013
EGU General Assembly 2013


# Conditions under which CNOP Sensitivity Is Valid for Tropical Cyclone Adaptive Observations

Xiaohao Qin (1), Wansuo Duan (1), and Mu Mu (2)

(1) LASG, Institute of Atmospheric Physics, Chinese Acedemy of Sciences, Beijing, China (xhqin@lasg.iap.ac.cn), (2) Key Laboratory of Ocean Circulation and Wave, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China (mumu@lasg.iap.ac.cn)

To determine whether significant improvements in tropical cyclone (TC) forecasting are achievable by deploying dropwindsondes according to conditional nonlinear optimal perturbation (CNOP) sensitivity, observing system simulated experiments (OSSEs) were conducted on 20 TCs that developed over the western North Pacific during 2010 using Mesoscale Model 5 and its 3DVar assimilation system. Of the 20 cases, 13 showed neutral or improved track forecasts of between 0% and 51.2%. Eliminating initial errors within the CNOP pattern, which are related to either the storm directly or the surrounding regimes indirectly, reduced the subsequent track forecast errors. The remaining seven TCs showed deterioration in the accuracy of the track forecasts over the 48 h forecast period. Accurate forecasts made without adaptive observations, a low sensitivity of forecast errors to initial errors, or major forecast errors associated with regimes other but TC, can lead to a decline in the accuracy of TC track forecasts.
Following analysis of the potential causes of inaccuracy in the track forecasts, we find that TC cases with significant positive effects on track forecasts often satisfy following four conditions: i) an inaccurate initial forecast without additional observation data); ii) proper sensitivity of the forecast errors to the initial errors; iii) a large proportion of the forecast errors fall within the verification region; and iv) the TC system is the dominant regime in the verification region at verification time. Seven TCs satisfied these four conditions, and showed a mean reduction of 28.75% in track forecast errors over periods of 12 to 48 h. This result suggests that the TC cases satisfying these four conditions often show significant improvements on track forecast by dropwindsondes guided by CNOP sensitivity.