Appendix D

HWRF Sensitivity to Cumulus Parameterizations Final Report

Point of Contact: Ligia Bernardet

12/4/2012

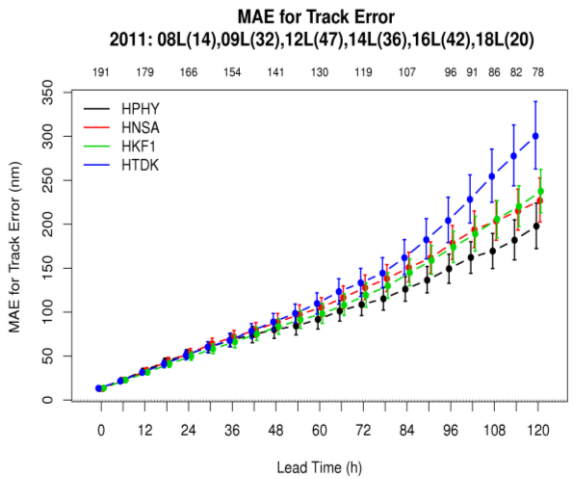

Figure 1

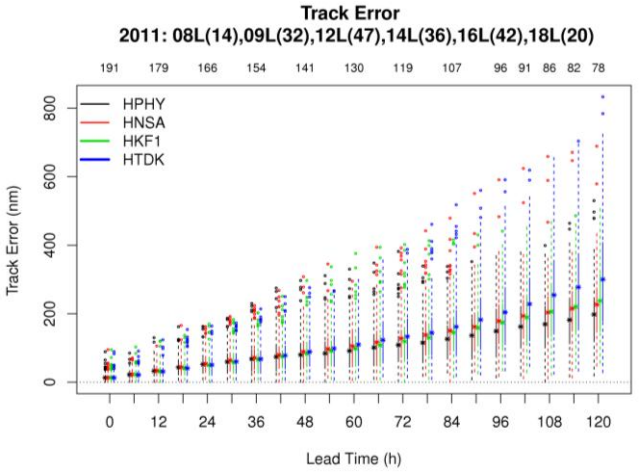

Figure 2

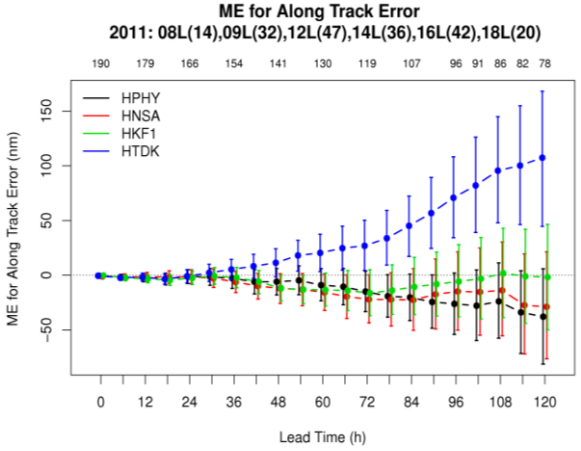

Figure 3

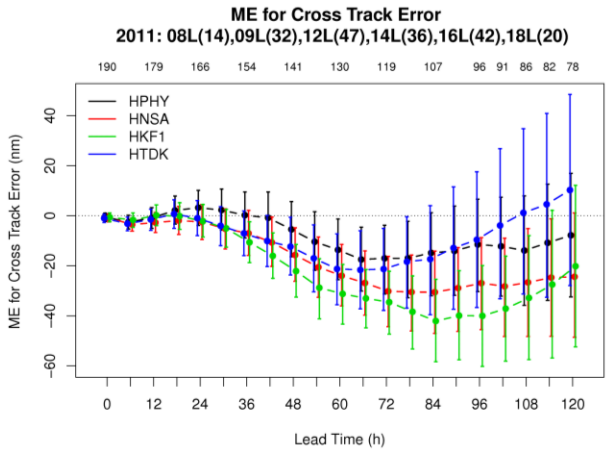

Figure 4

Figure 1. Mean track error (nm) for HPHY (black), HNSA (red), HKF1 (green) and HTDK (blue) as a function of forecast lead time for all cases in the Atlantic basin. The 95% confidence intervals are also displayed. The sample size is listed above the graphic

Figure 2. Modified boxplots of mean track errors for the HPHY (black), HNSA (red), HKF1 (green) and HTDK (purple) configurations as a function of forecast lead time (h) for AL. The bottom and top of the solid lines denote the 25th and 75th percentiles, respectively. Outliers are represented as circles. A star represents the mean.

Figure 3. Same as Fig. 2, except for along-track mean error (nm).

Figure 3. Same as Fig. 2, except for cross-track mean error (nm).

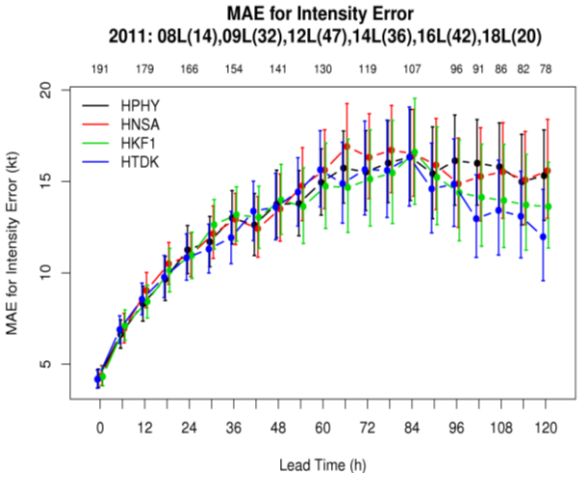

Figure 5

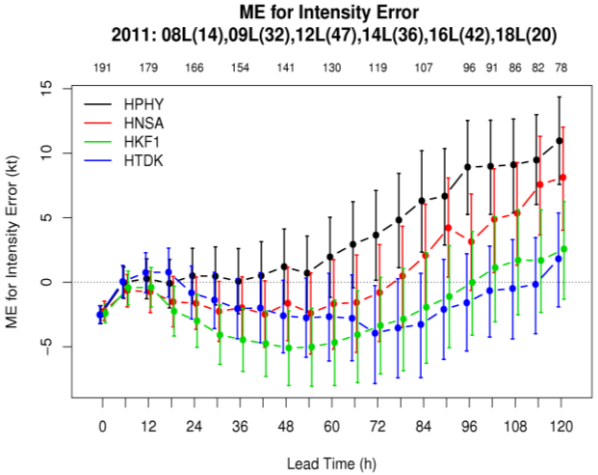

Figure 6

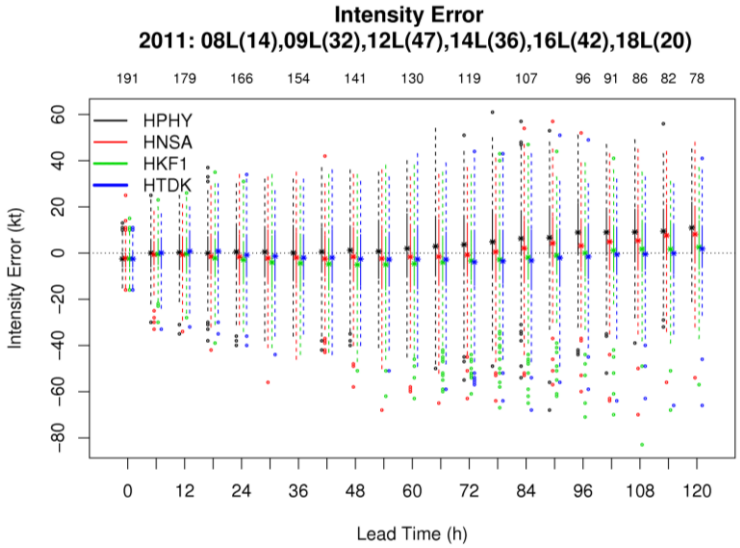

Figure 7

Figure 5. Same as Fig. 1, except for absolute intensity error (kt).
Figure 6. Same as Fig. 1, except for mean intensity error (kt).
Figure 7. Same as Fig. 2, except for mean intensity error (kt).

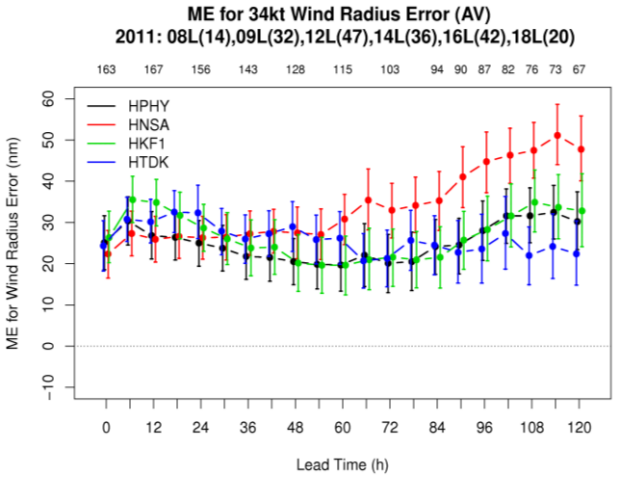

Figure 8a

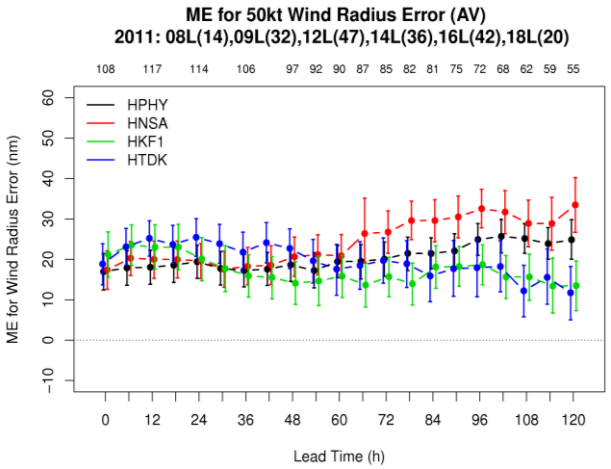

Figure 8b

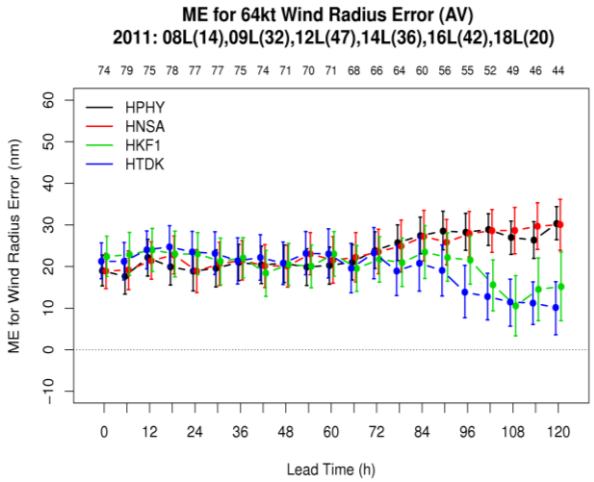

Figure 8c

Figure 8. Same as Fig. 2, except for (a) 34-kt (b) 50-kt and, (c) 64-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants

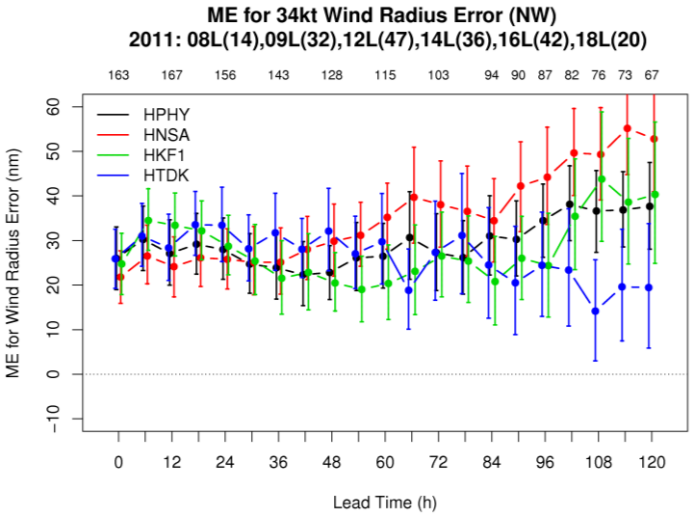

Figure 9a

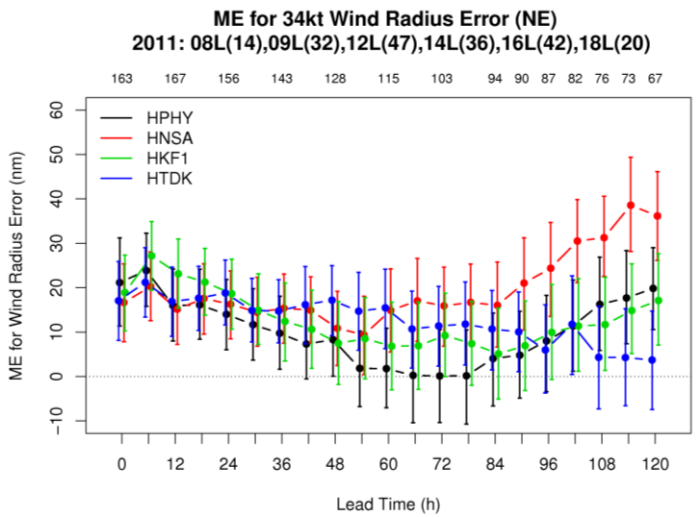

Figure 9b

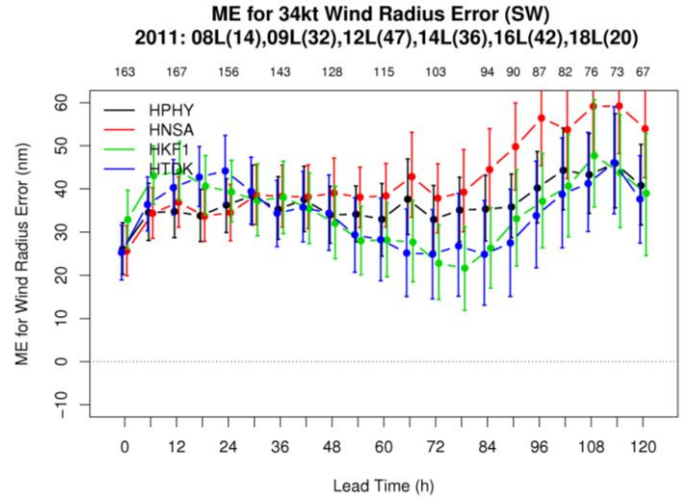

Figure 9c

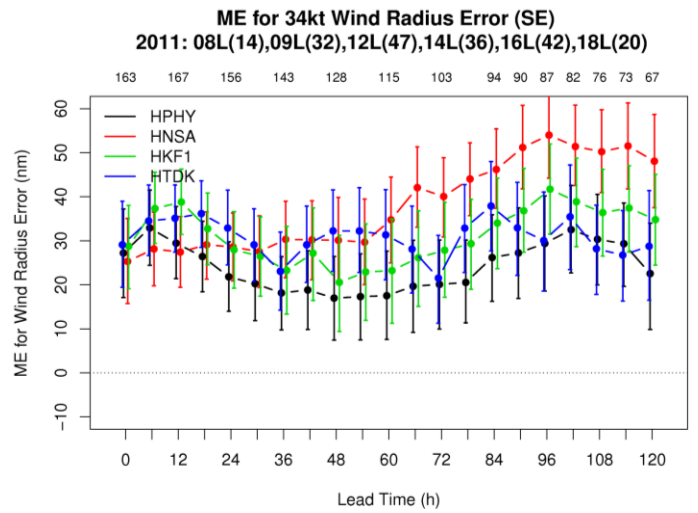

Figure 9d

Figure 9. Same as Fig. 1 except for 34-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant

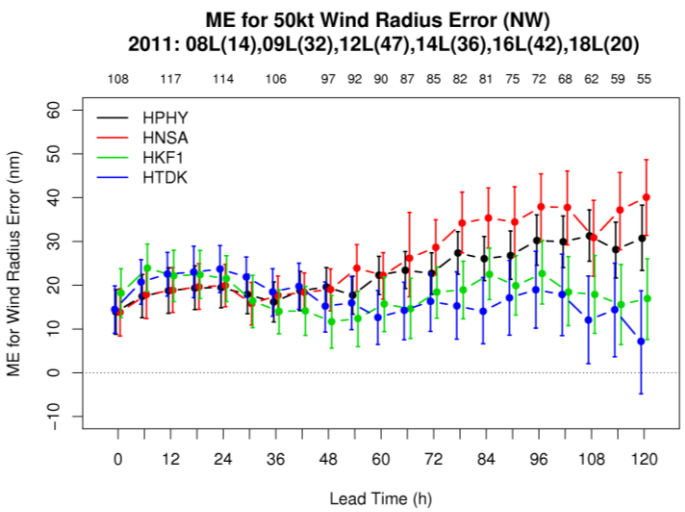

Figure 10a

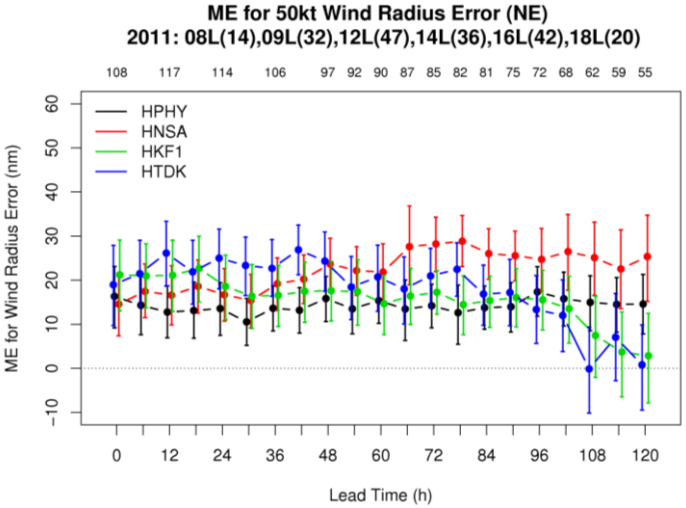

Figure 10b

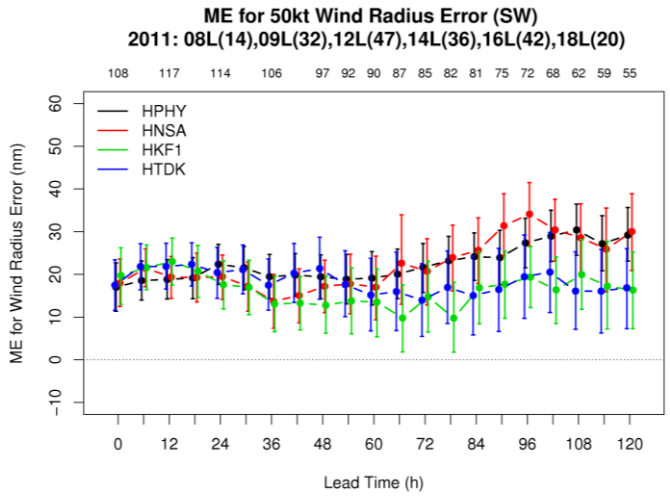

Figure 10c

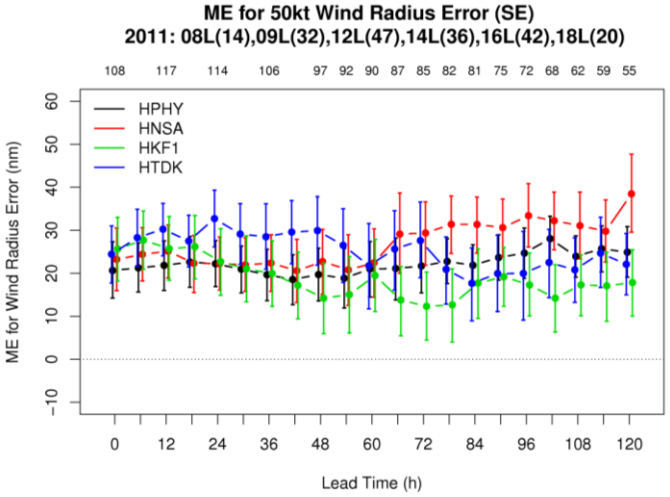

Figure 10d

Figure 10. Same as Fig. 1 except for 50-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant

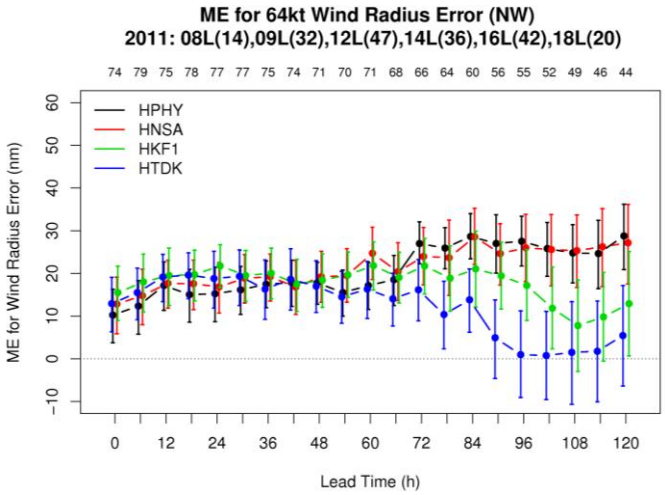

Figure 11a

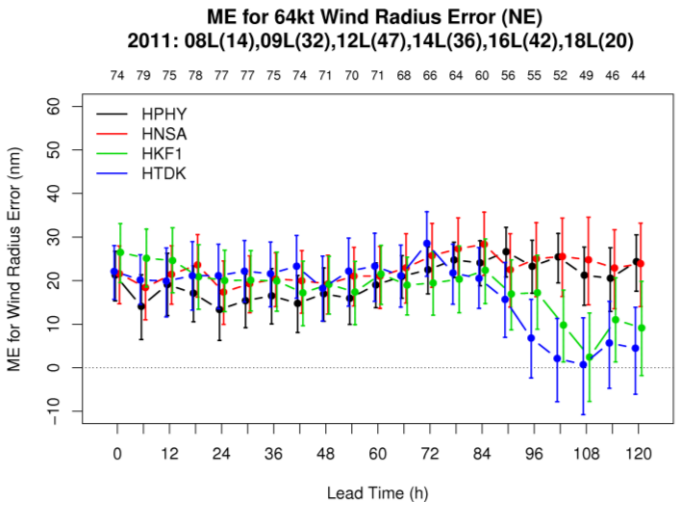

Figure 11b

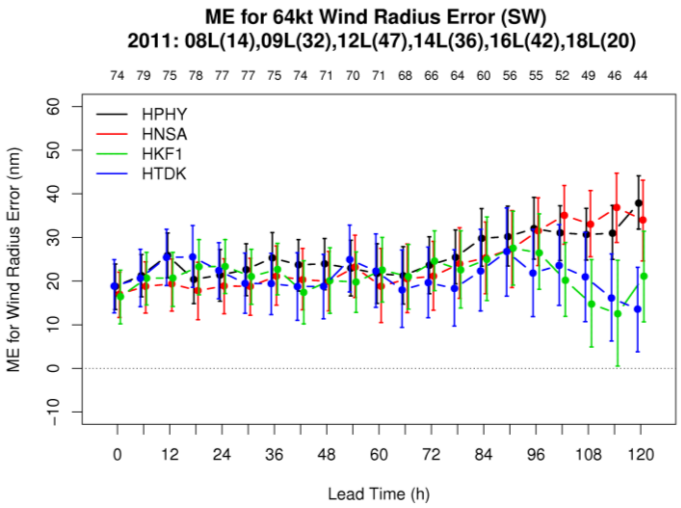

Figure 11c

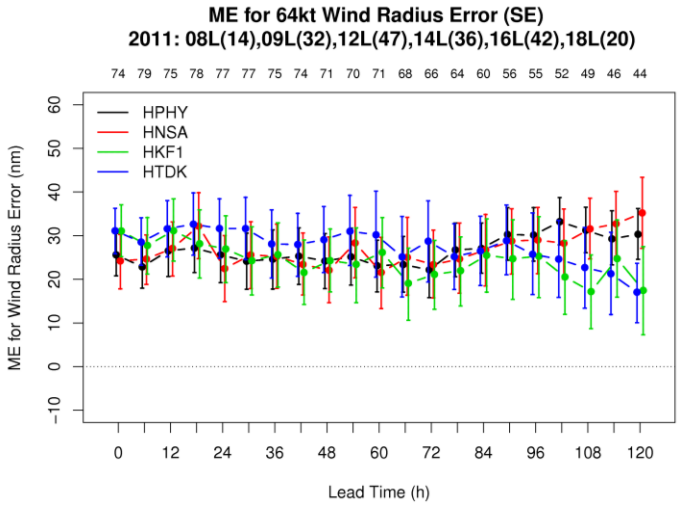

Figure 11d

Figure 11. Same as Fig. 1 except for 64-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant

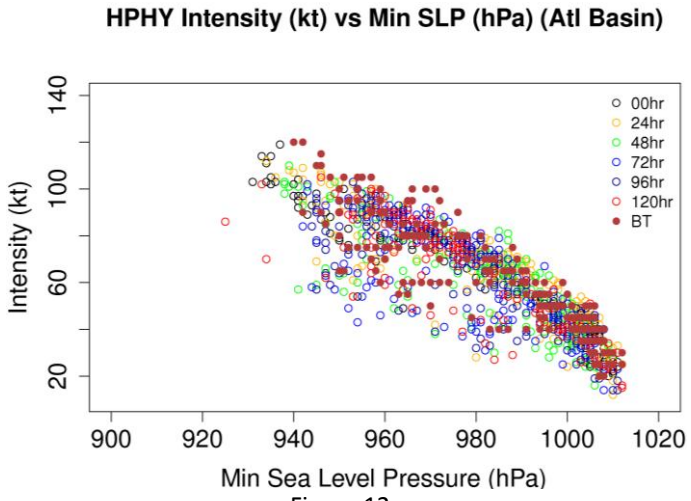

Figure 12a

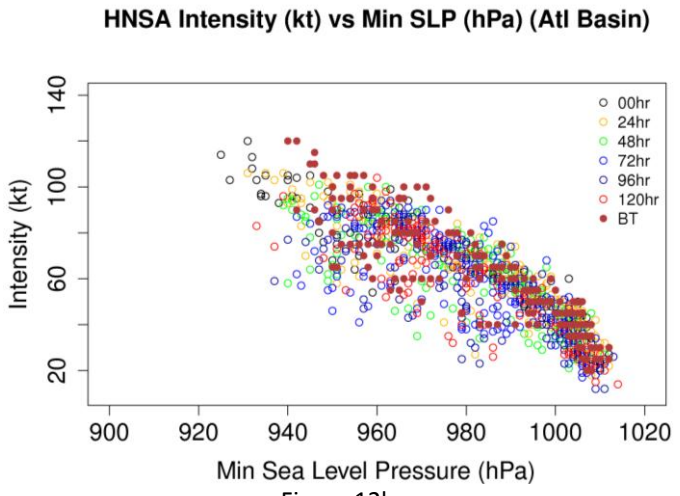

Figure 12b

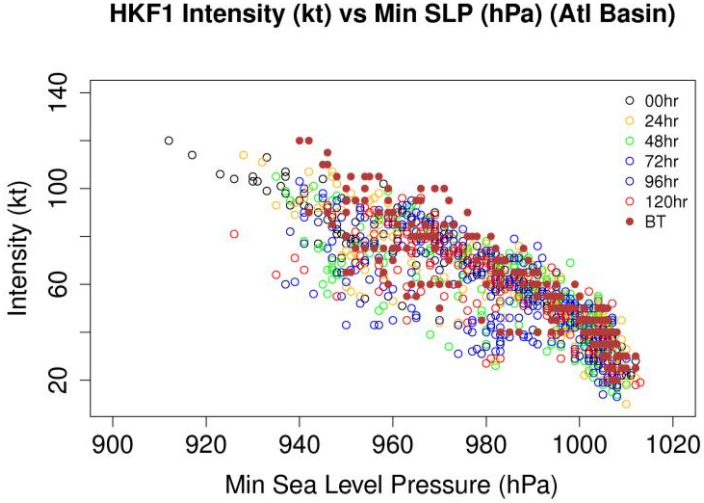

Figure 12c

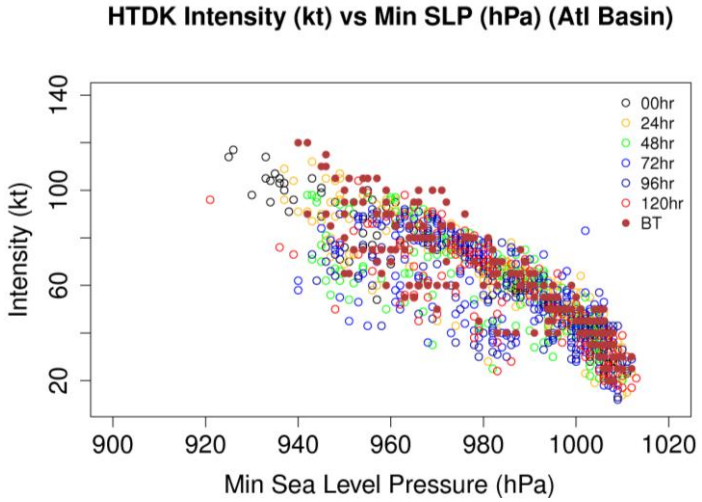

Figure 12d

Figure 12. Scatter plot of intensity (kt) versus MSLP (hPa) for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the rightmost corner of the plots. The Best track values are shown in brown filled circles.

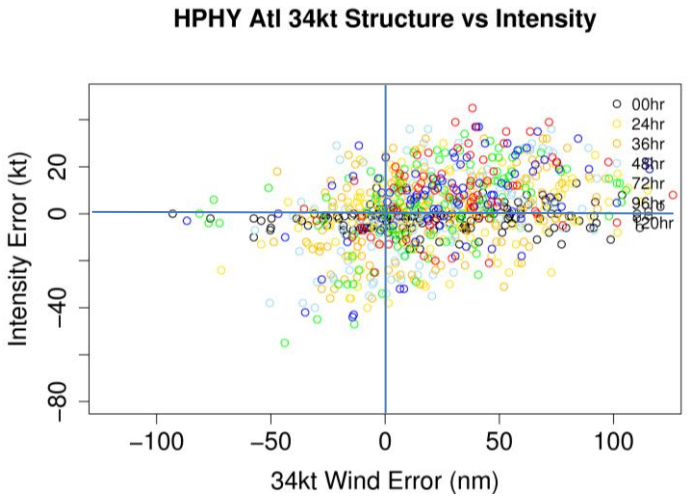

Figure 13a

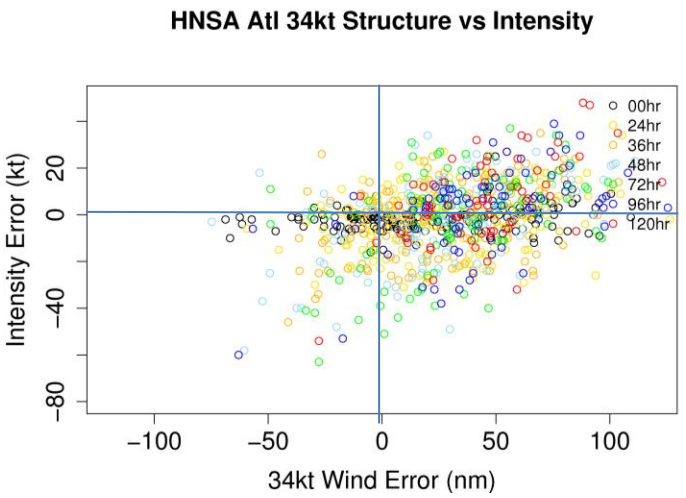

Figure 13b

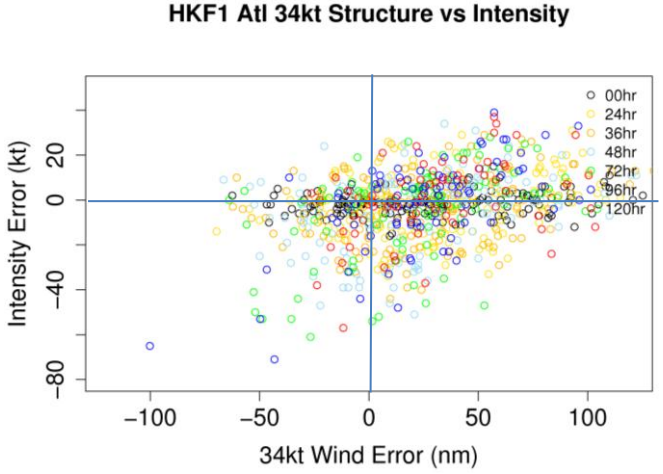

Figure 13c

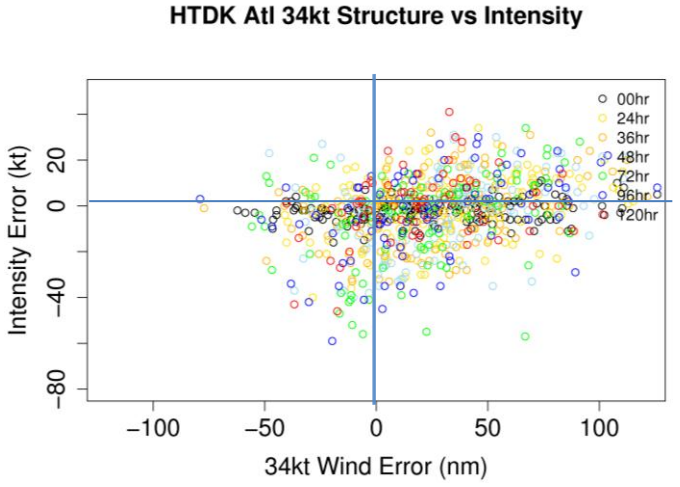

Figure 13d

Figure 13. Scatter plot of intensity error (kt) versus 34-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the top right corner of the plots.

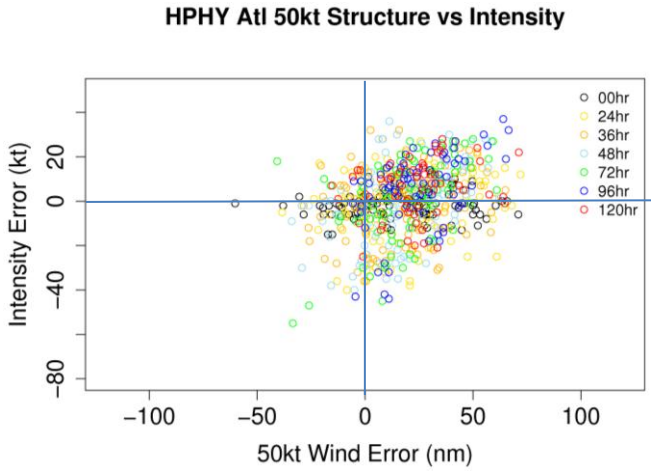

Figure 14a

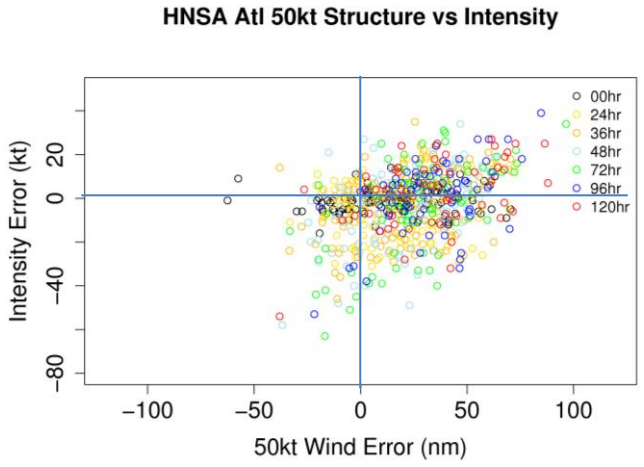

Figure 14b

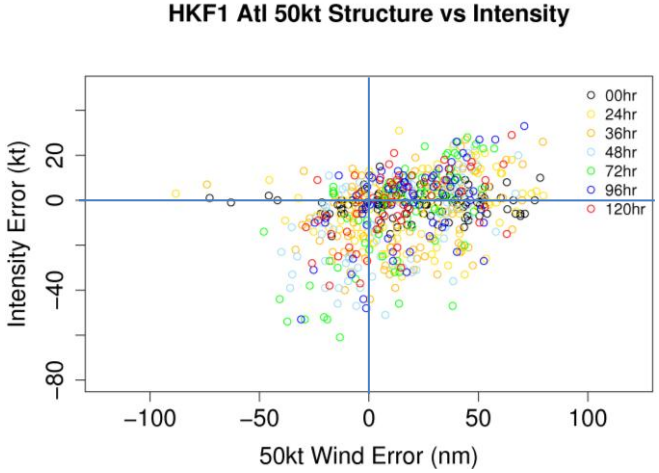

Figure 14c

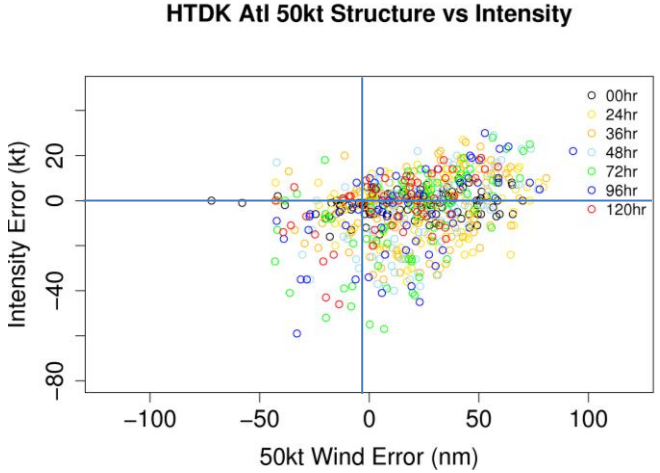

Figure 14d

Figure 14. Scatter plot of intensity error (kt) versus 50-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the top right corner of the plots.

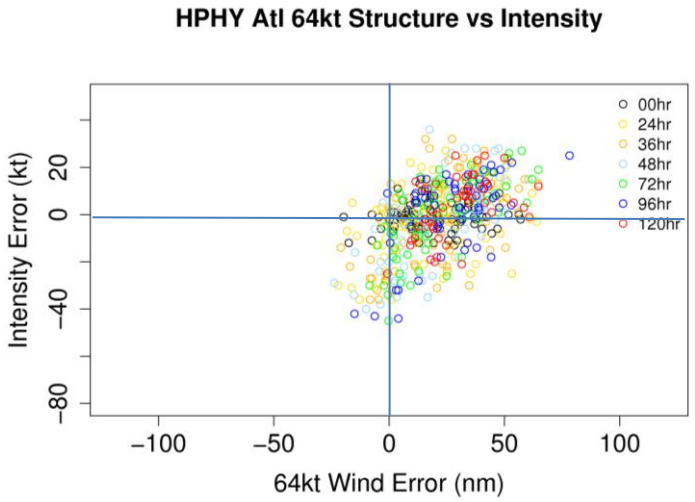

Figure 15a

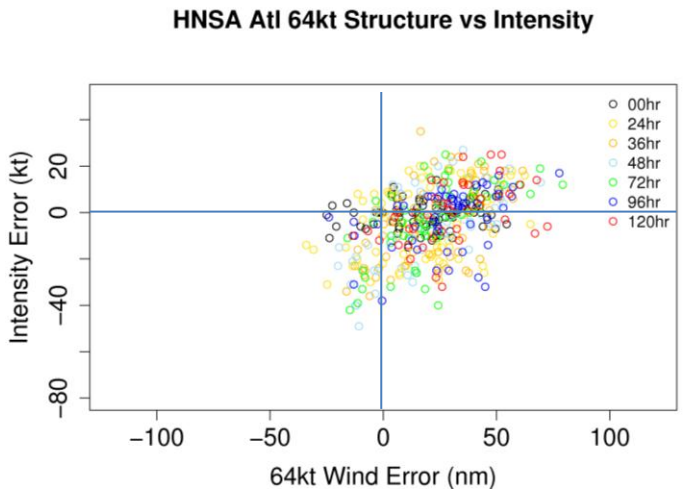

Figure 15b

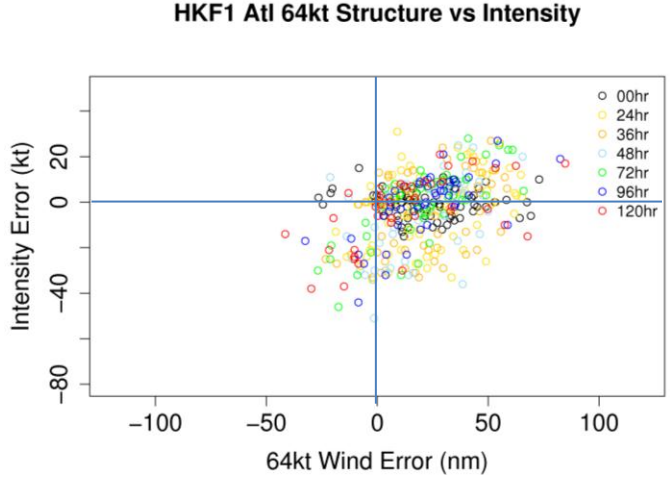

Figure 15c

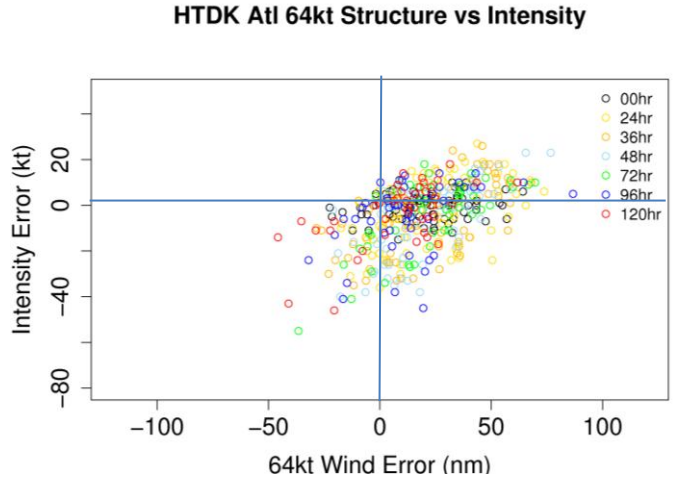

Figure 15d

Figure 15. Scatter plot of intensity error (kt) versus 50-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the top right corner of the plots.

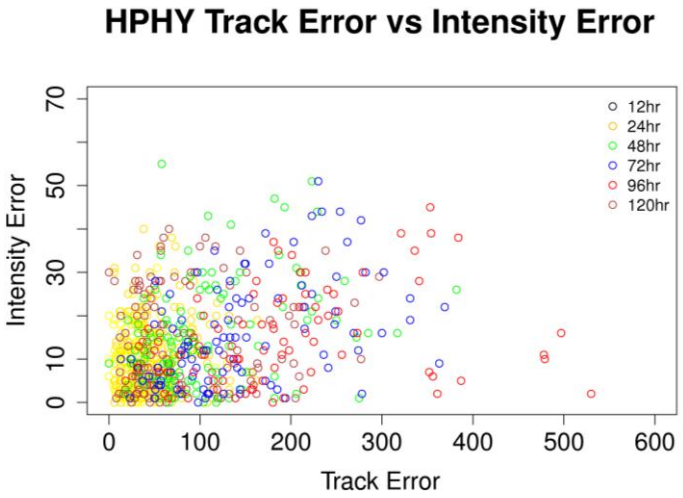

Figure 16a

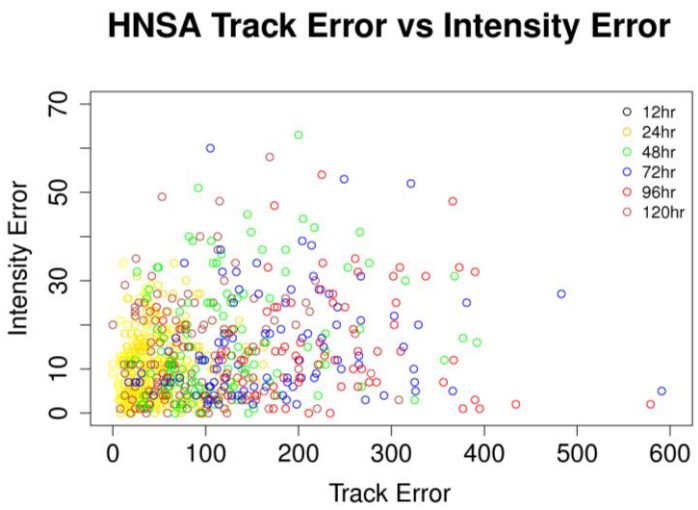

Figure 16b

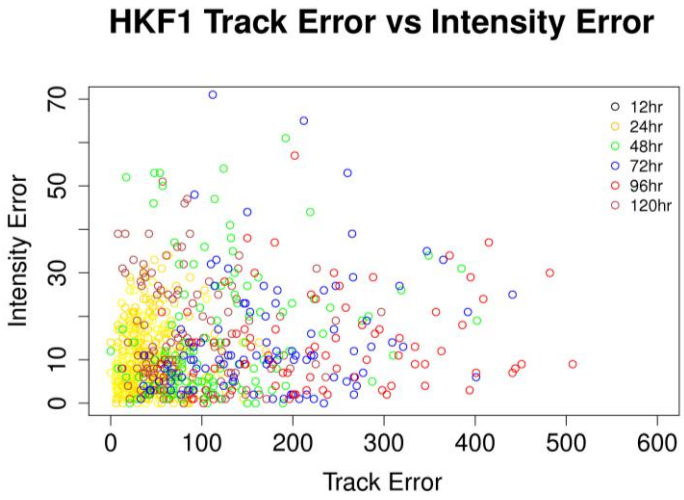

Figure 16c

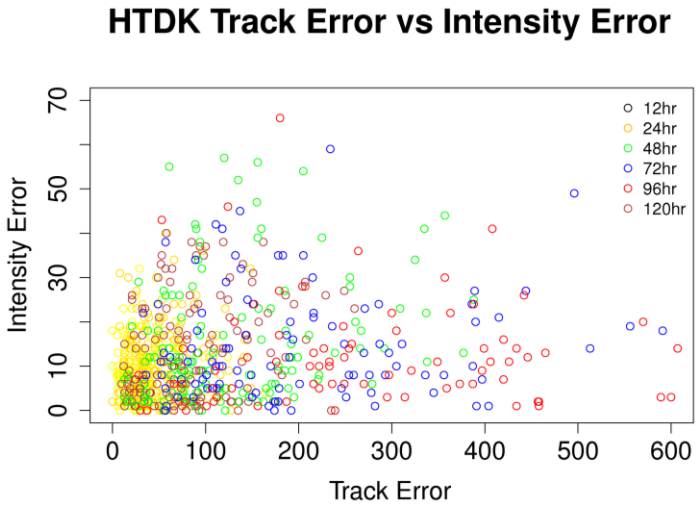

Figure 16d

Figure 16. Scatterplot of intensity (kt) versus track (nm) errors for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The forecast lead times are provided on the right side.

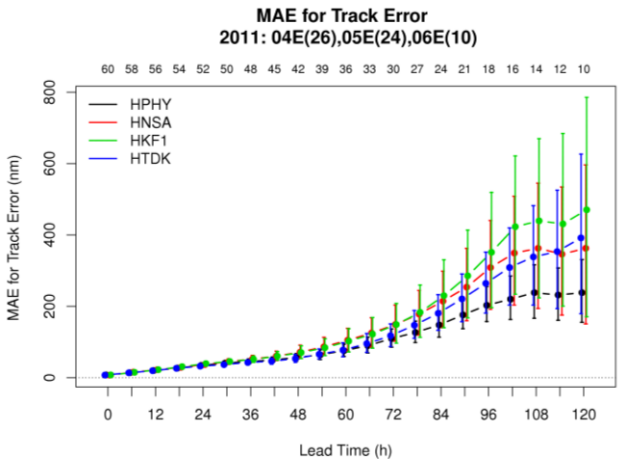

Figure 17

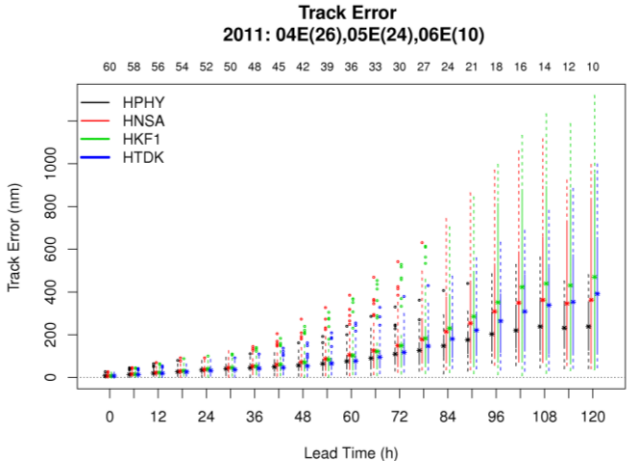

Figure 18

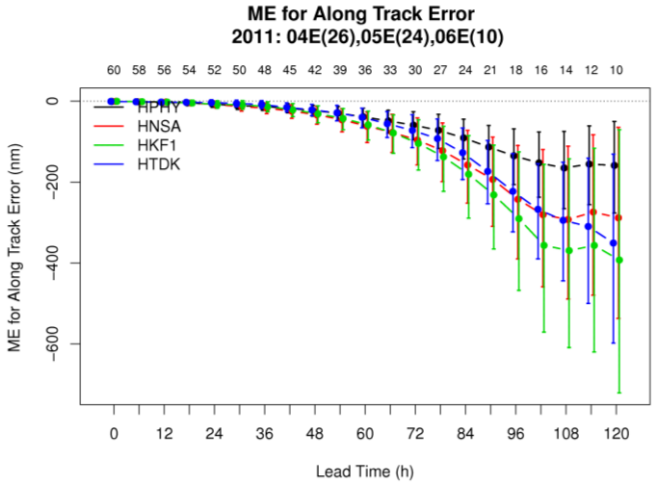

Figure 19

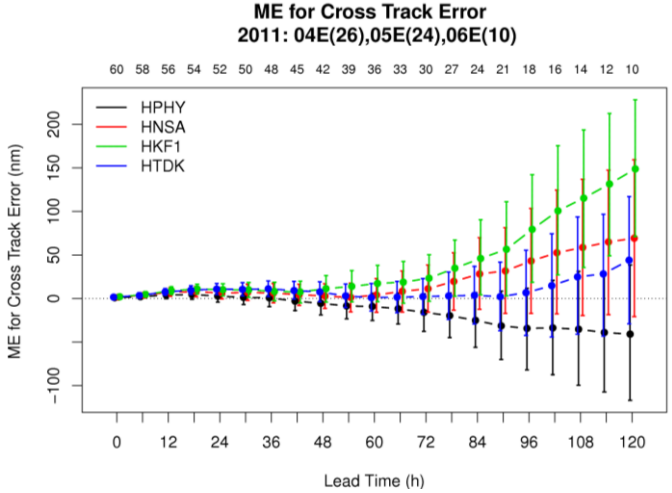

Figure 20

Figure 17. Mean track error (nm) for HPHY (black), HNSA (red), HKF1 (green) and HTDK (blue) as a function of forecast lead time for all cases in the Eastern Pacific basin. The 95% confidence intervals are also displayed. The sample size is listed above the graphic

Figure 18. Modified boxplots of mean track errors for the HPHY (black), HNSA (red), HKF1 (green) and HTDK (purple) configurations as a function of forecast lead time (h) for AL. The bottom and top of the solid lines denote the 25th and 75th percentiles, respectively. Outliers are represented as circles. A star represents the mean.

Figure 19. Same as Fig. 17, except for along-track mean error (nm).

Figure 20. Same as Fig. 17, except for cross-track mean error (nm).

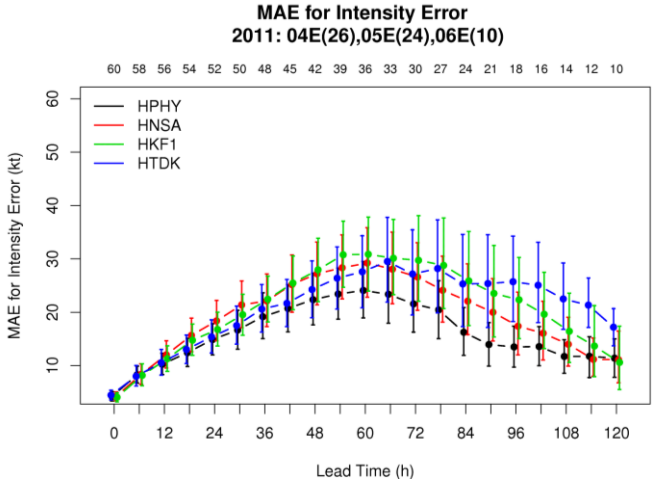

Figure 21

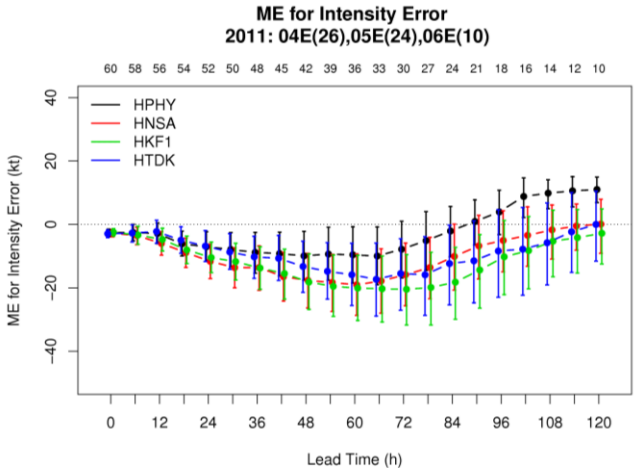

Figure 22

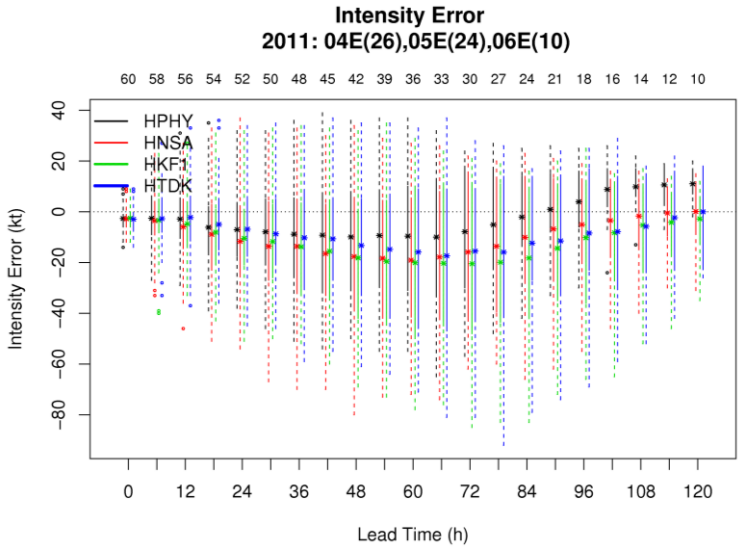

Figure 23

Figure 21. Same as Fig. 17, except for absolute intensity error (kt).
Figure 22. Same as Fig. 17, except for mean intensity error (kt).
Figure 23. Same as Fig. 18, except for mean intensity error (kt).

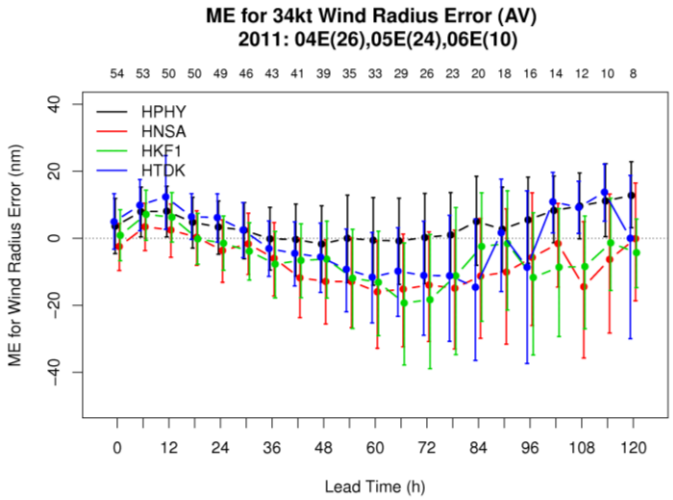

Figure 24a

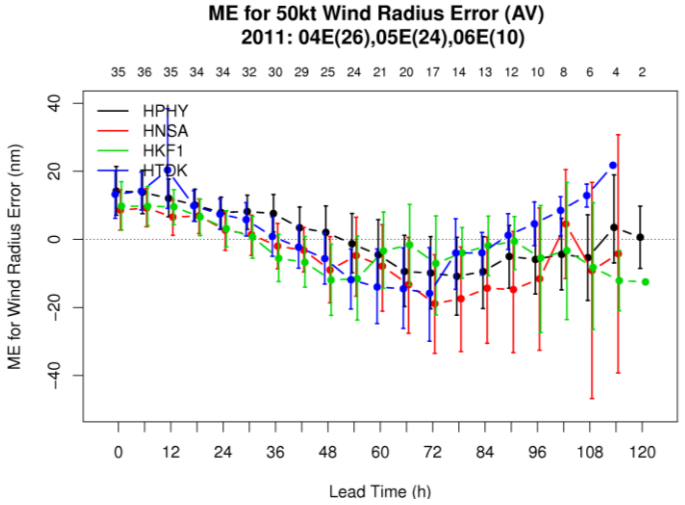

Figure 24b

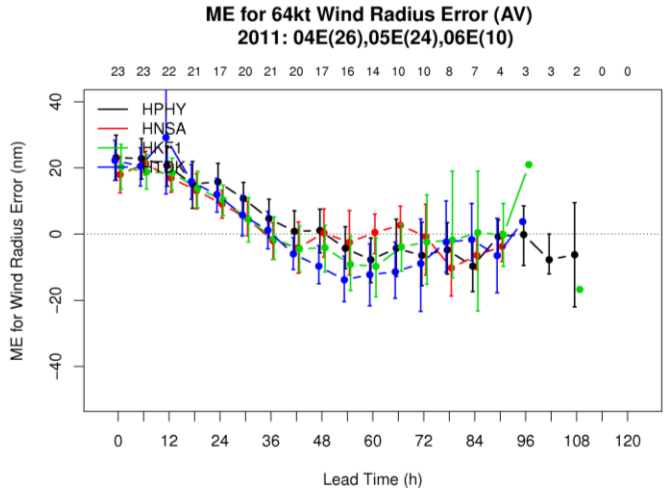

Figure 24c

Figure 24. Same as Fig. 17, except for (a) 34-kt (b) 50-kt and, (c) 64-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants

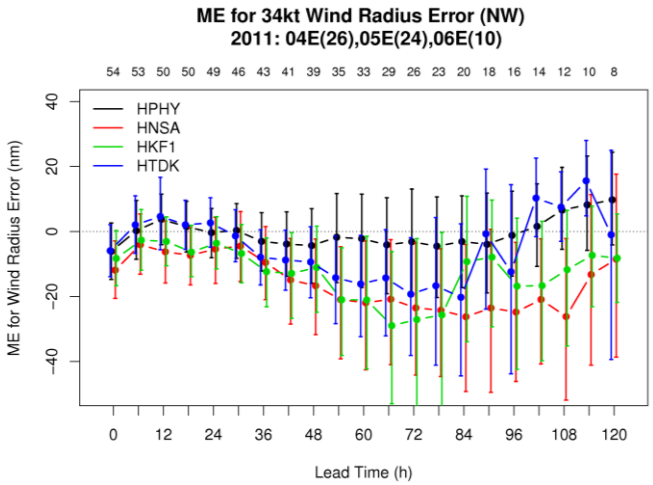

Figure 25a

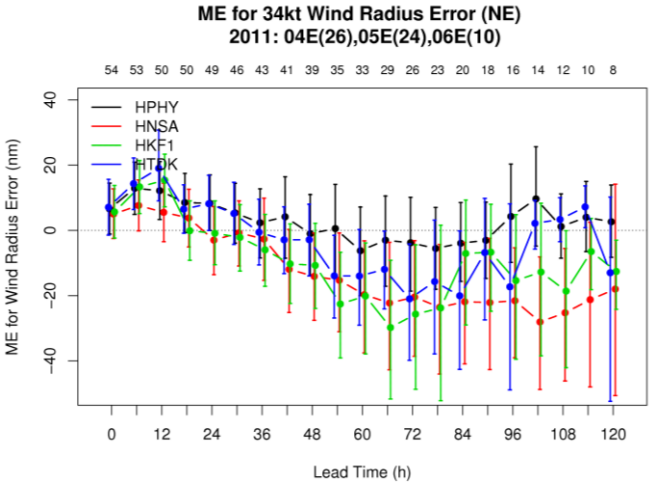

Figure 25b

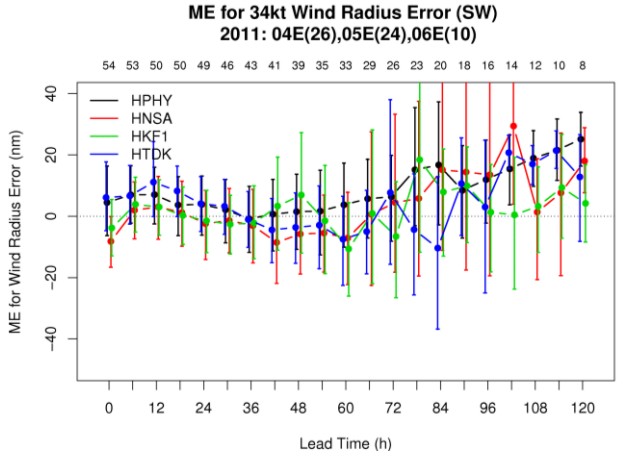

Figure 25c

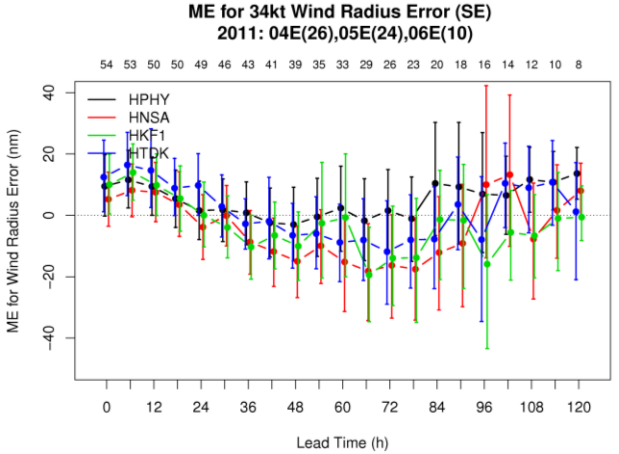

Figure 25d

Figure 25. Same as Fig. 17 except for 34-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant

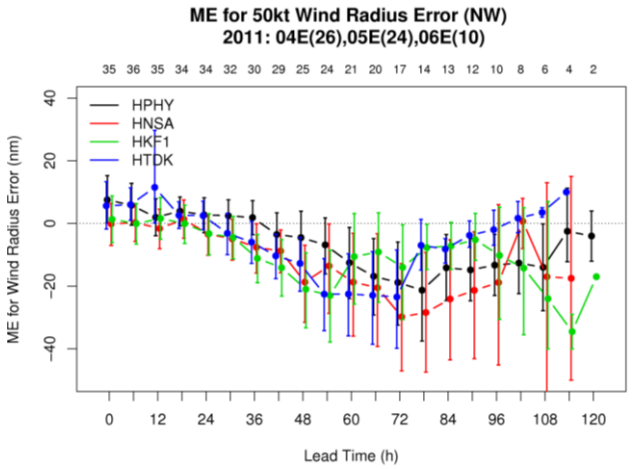

Figure 26a

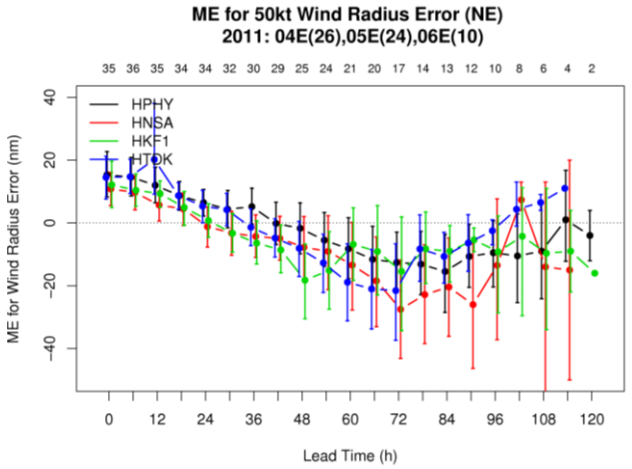

Figure 26b

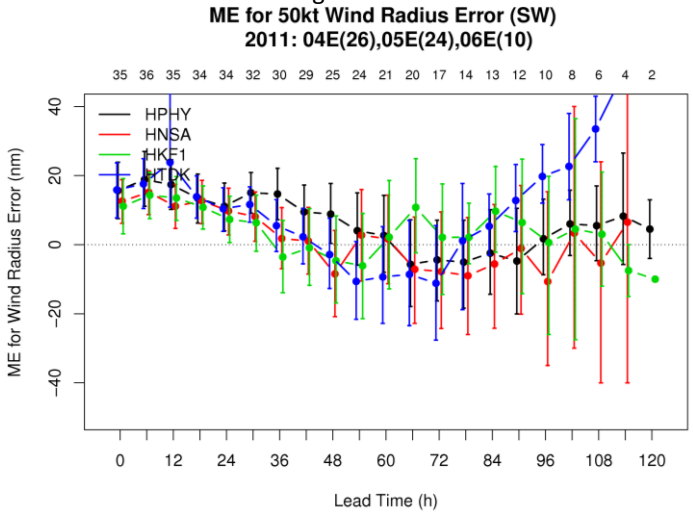

Figure 26c

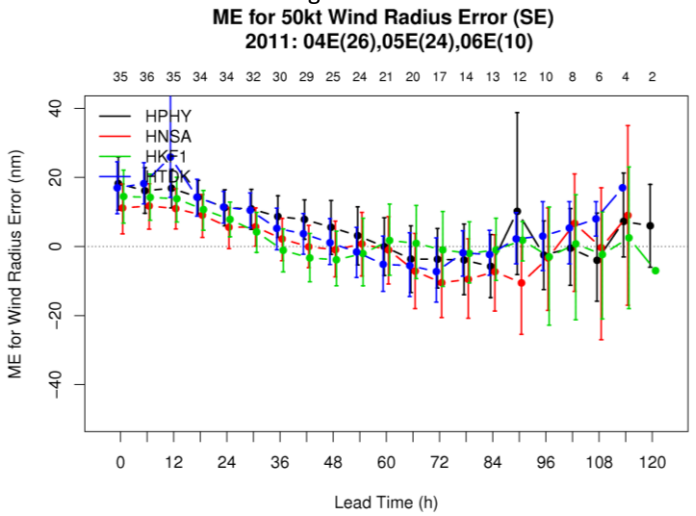

Figure 26d

Figure 26. Same as Fig. 17 except for 50-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant

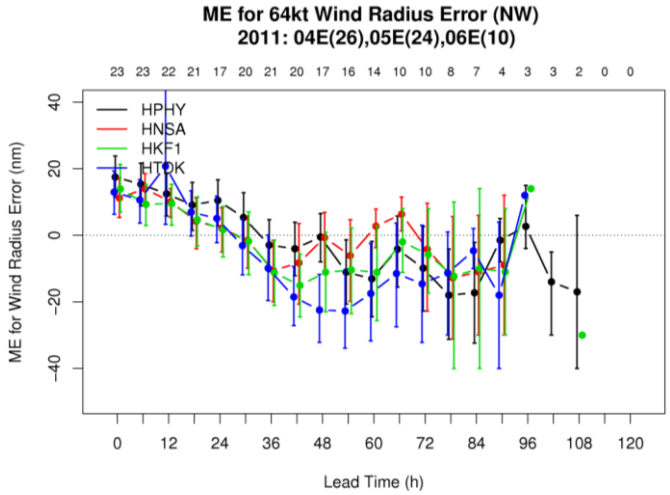

Figure 27a

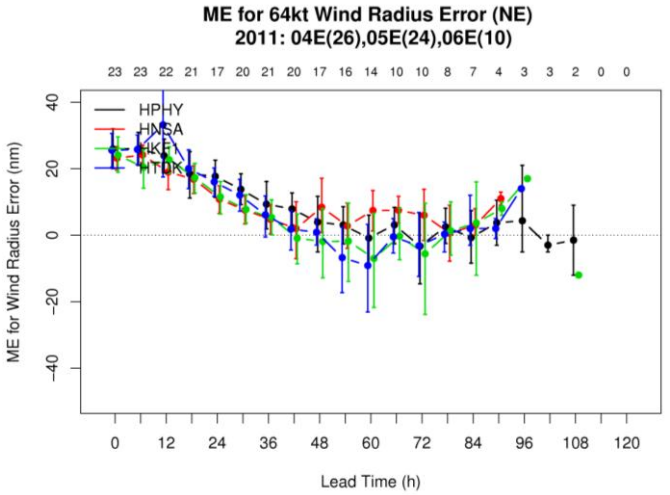

Figure 27b

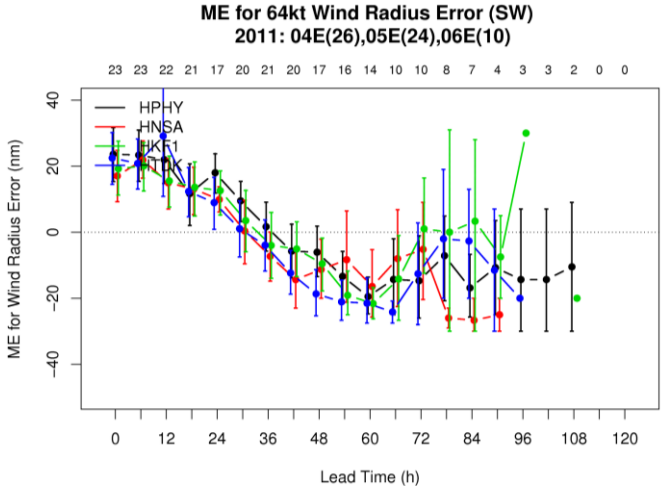

Figure 27c

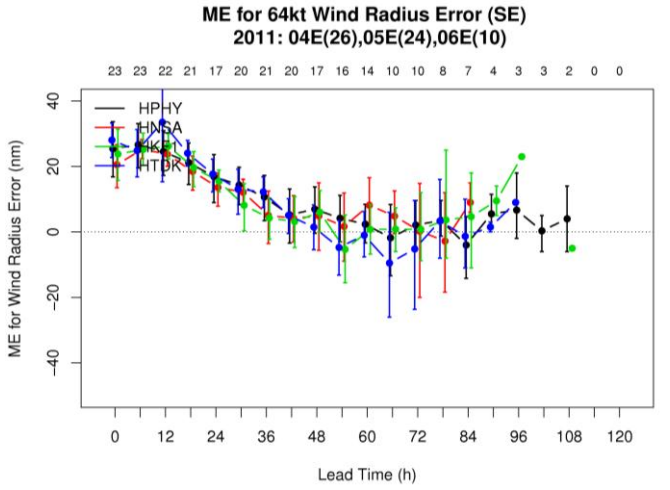

Figure 27d

Figure 27. Same as Fig. 17 except for 64-kt wind radii error in (a) NW (b) NE (c) SW and, (d) SE quadrant.

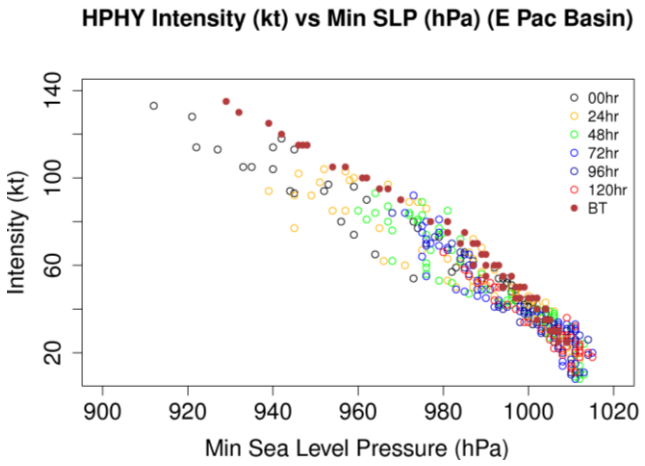

Figure 28a

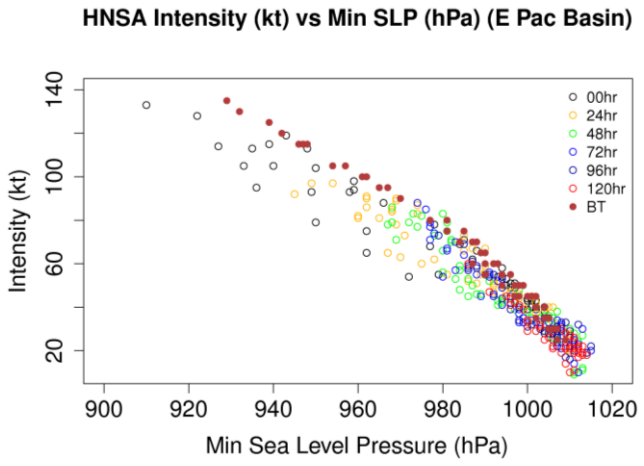

Figure 28b

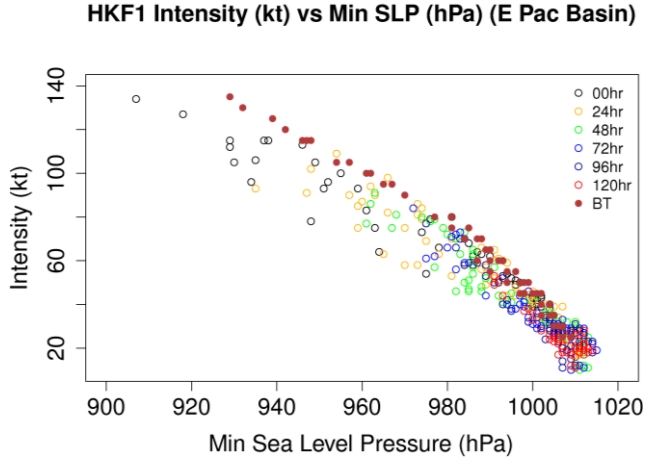

Figure 28c

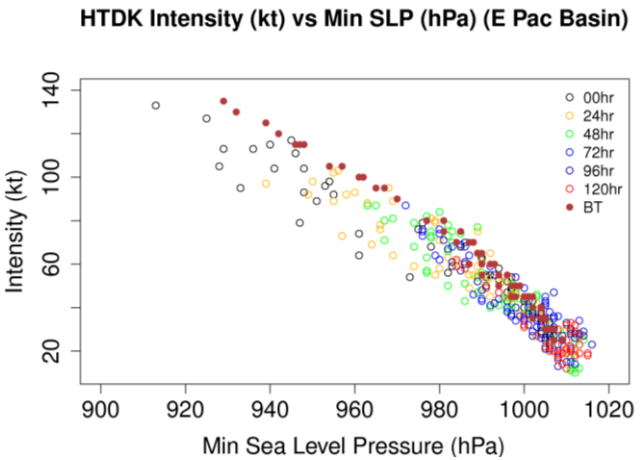

Figure 28d

Figure 28. Scatter plot of intensity (kt) versus MSLP (hPa) for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the rightmost corner of the plots. The Best track values are shown in brown filled circles.

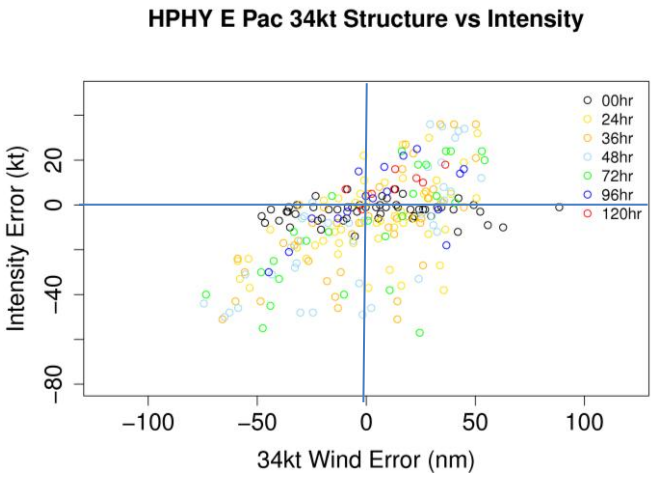

Figure 29a

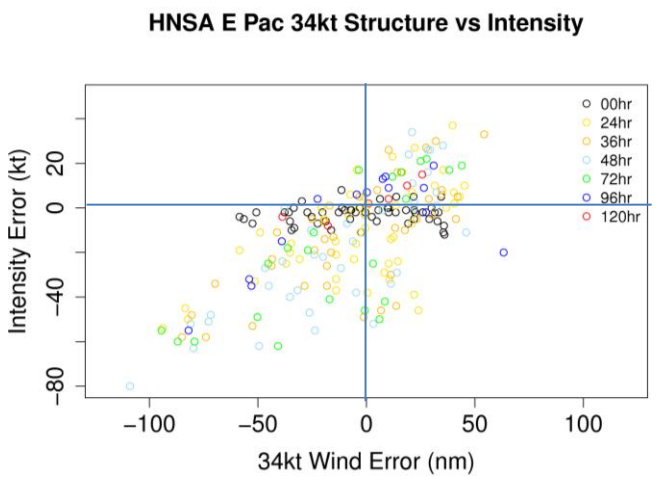

Figure 29b

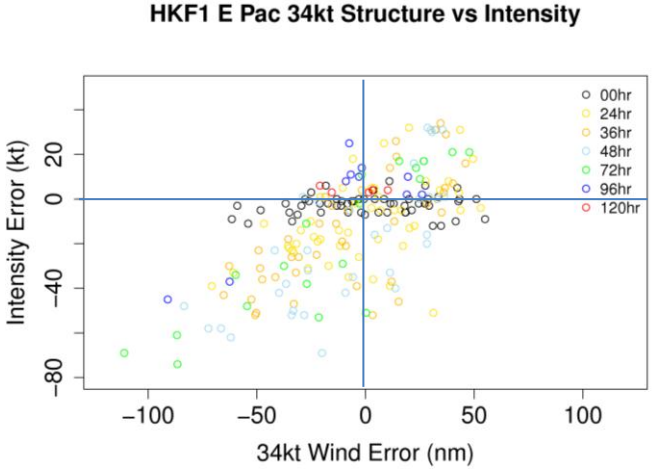

Figure 29c

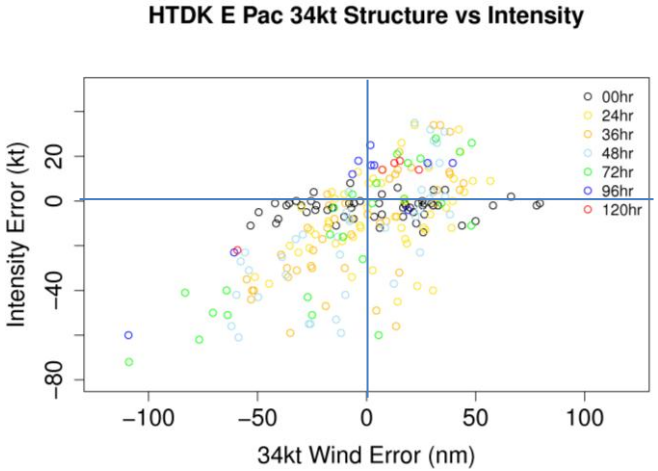

Figure 29d

Figure 29. Scatter plot of intensity error (kt) versus 34-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the top right corner of the plots.

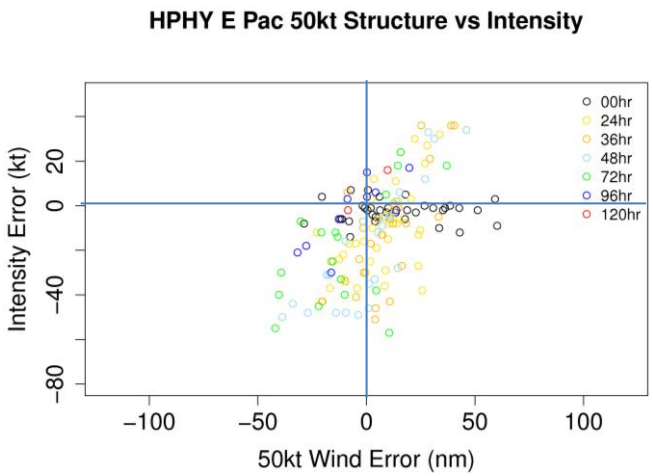

Figure 30a

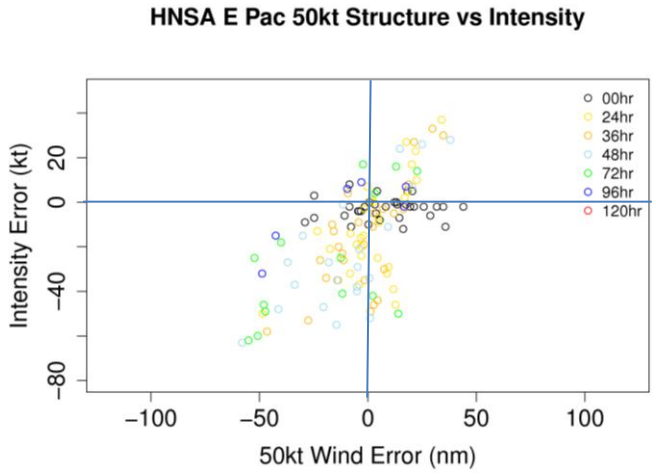

Figure 30b

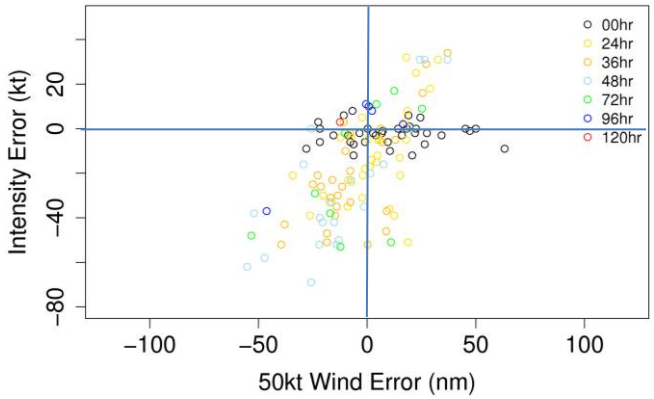

Figure 30c

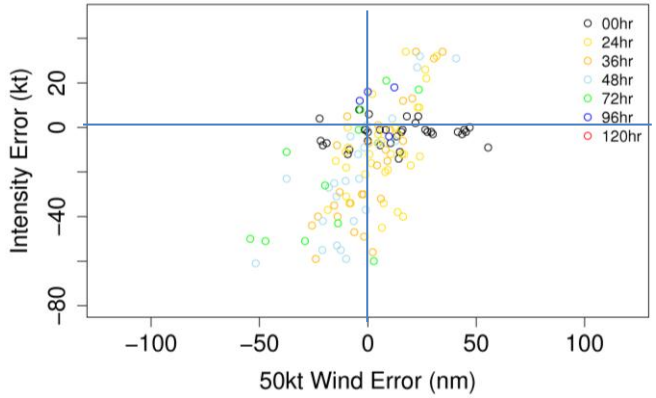

Figure 30d

Figure 30. Scatter plot of intensity error (kt) versus 50-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the top right corner of the plots.

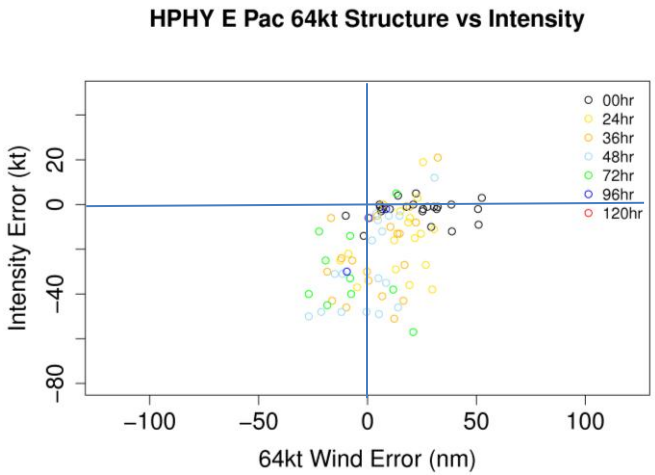

Figure 31a

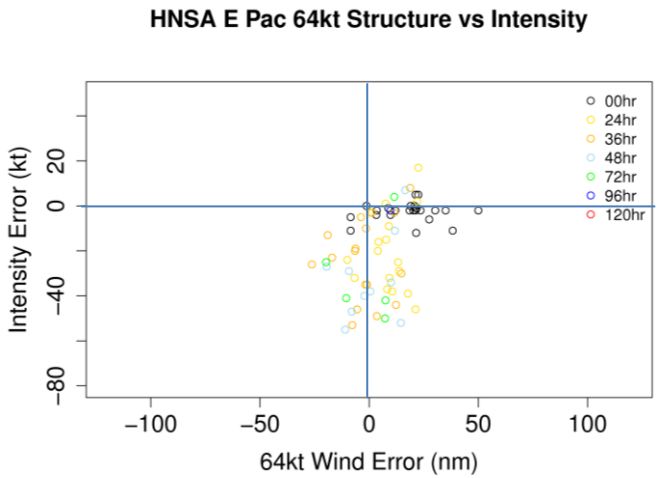

Figure 31b

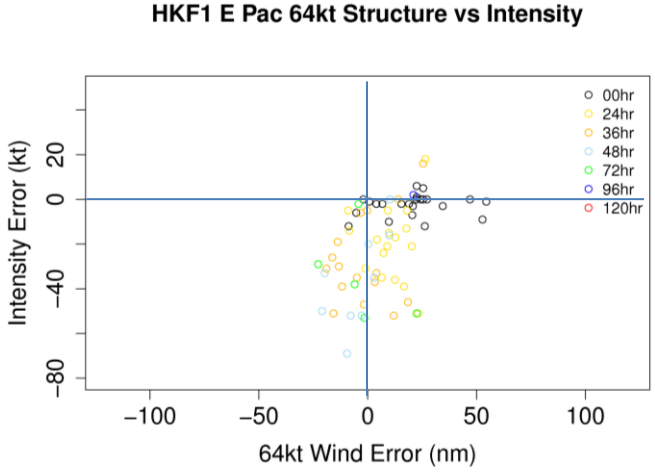

Figure 31c

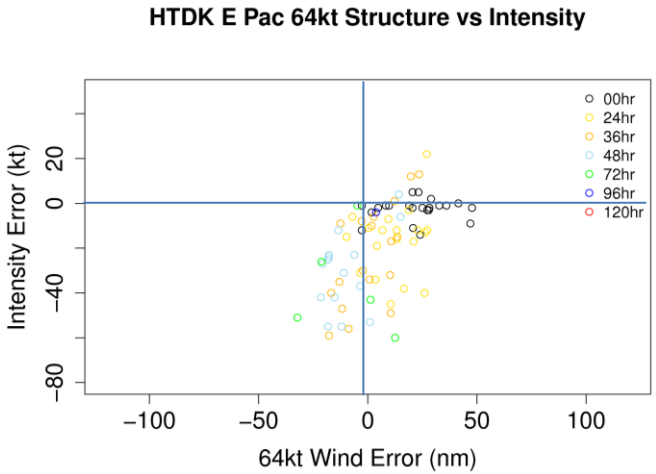

Figure 31d

Figure 31. Scatter plot of intensity error (kt) versus 50-kt wind radius mean error (nm) averaged over the NW, NE, SW and SE quadrants for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The lead times are shown in different colors and are provided in the corner of the plots.

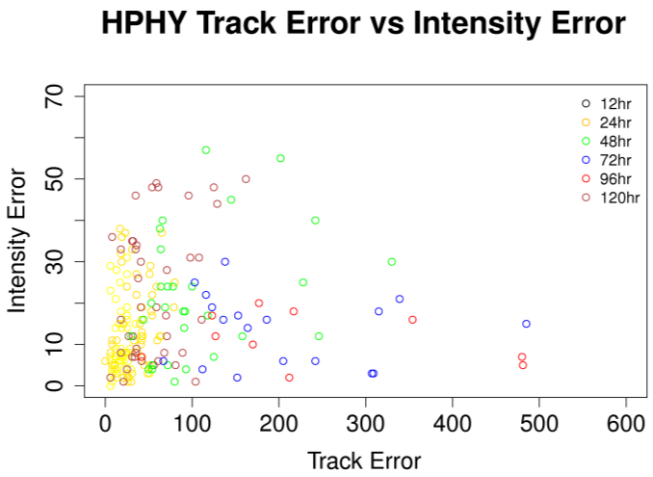

Figure 16a

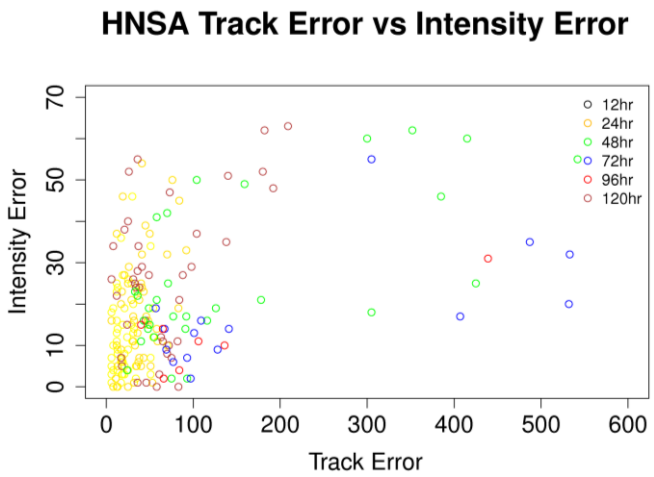

Figure 16b

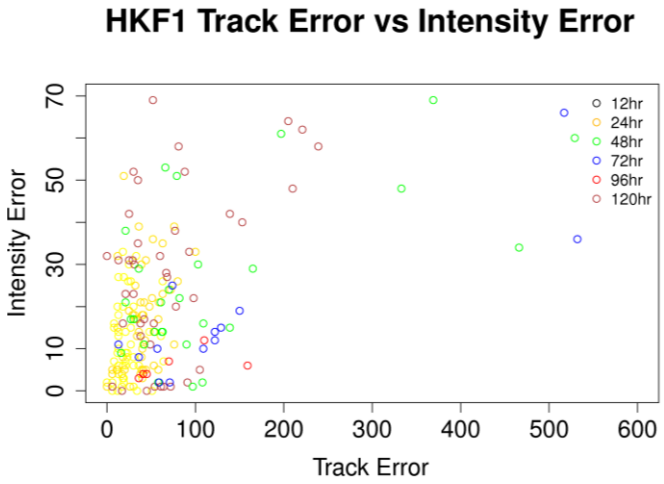

Figure 16c

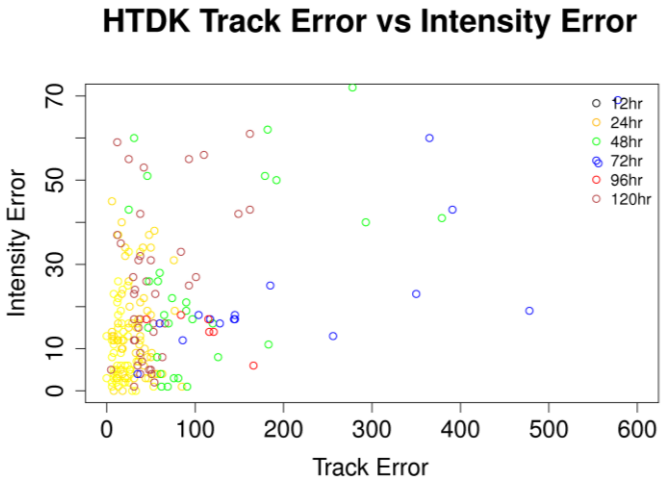

Figure 16d

Figure 32. Scatterplot of intensity (kt) versus track (nm) errors for (a) HPHY (b) HNSA (c) HKF1 and, (d) HTDK in the Atlantic basin. The forecast lead times are provided on the right side.

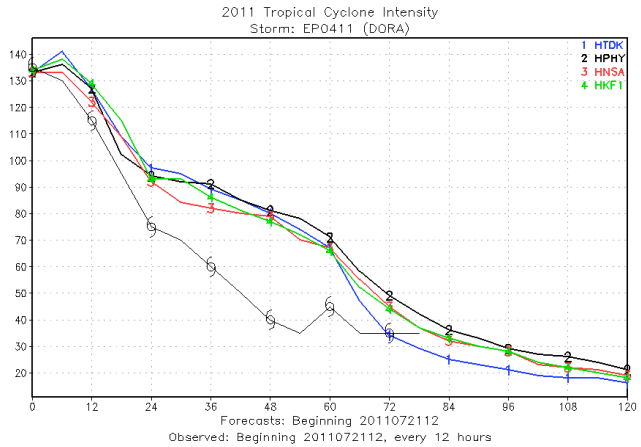

Figure 33a

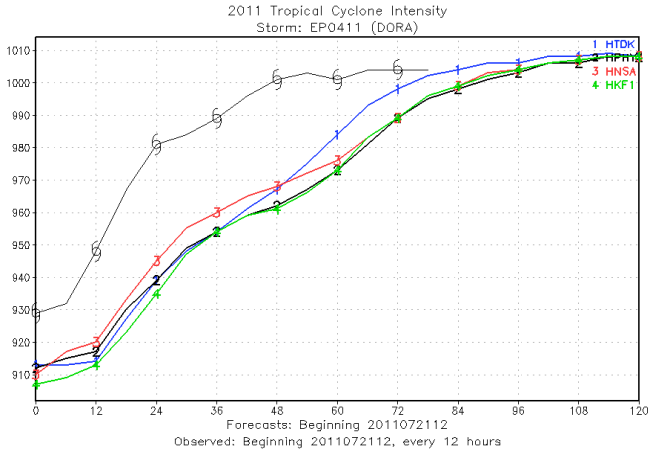

Figure 34b

Figure 33. (a) Intensity and, (b) MSLP forecast for Dora for HPHY initialized 12Z July 21 2011. The black line with hurricane symbols is the best track, and forecasts are shown for the HPHY (black), HNSA (red), HKF1 (green) and HTDK (blue) configurations.