P1.56 National Hurricane Center Forecast Wind Radii Verification
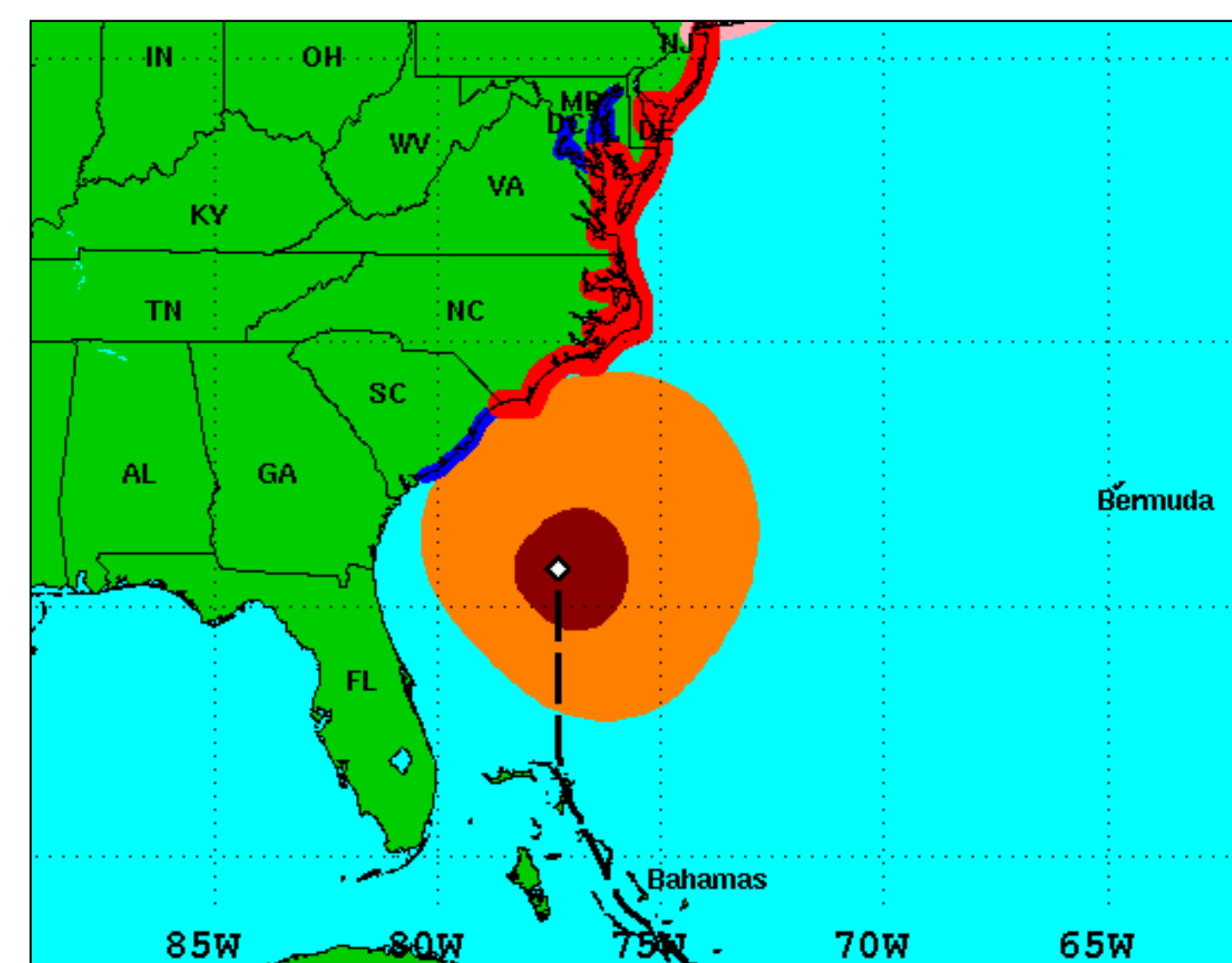
John P. Cangialosi and C.W. Landsea
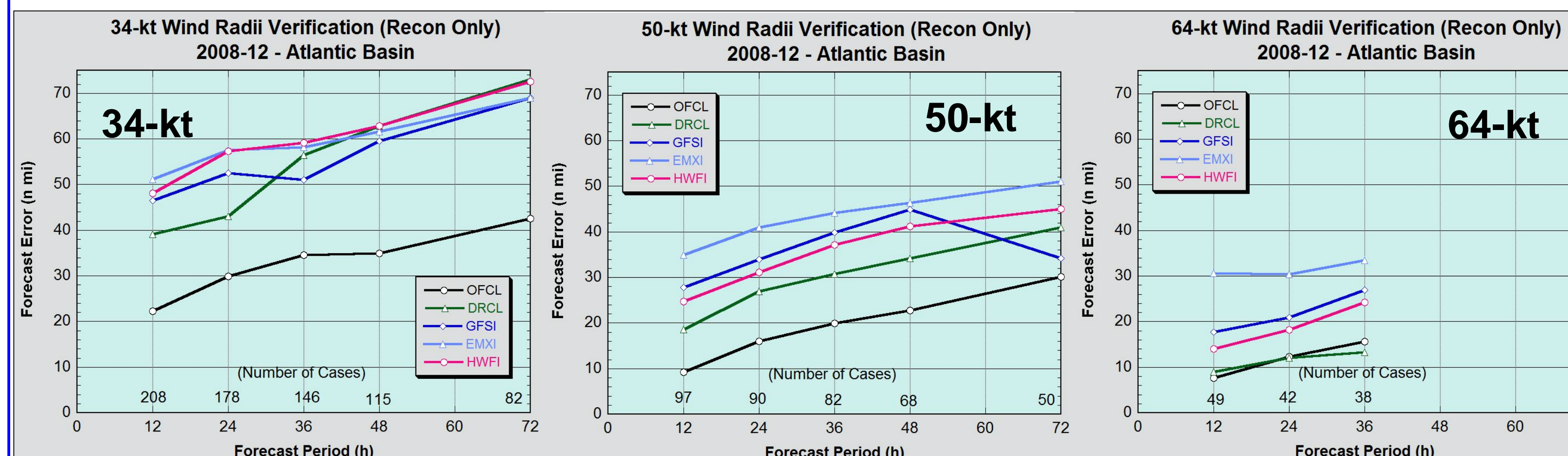### NOAA/NWS/NCEP/National Hurricane Center, Miami, FL

Motivation

- The National Hurricane Center (NHC) provides an analysis of and forecasts the 34-, 50- and 64-kt wind radii of tropical cyclones.

- How accurate are these forecasts?
- Are they skillful?
- Do the dynamical models have skill?
- Are there situations where the NHC and models are better?

Estimated surface wind field of Hurricane Irene at 1500 UTC 26 August 2011.
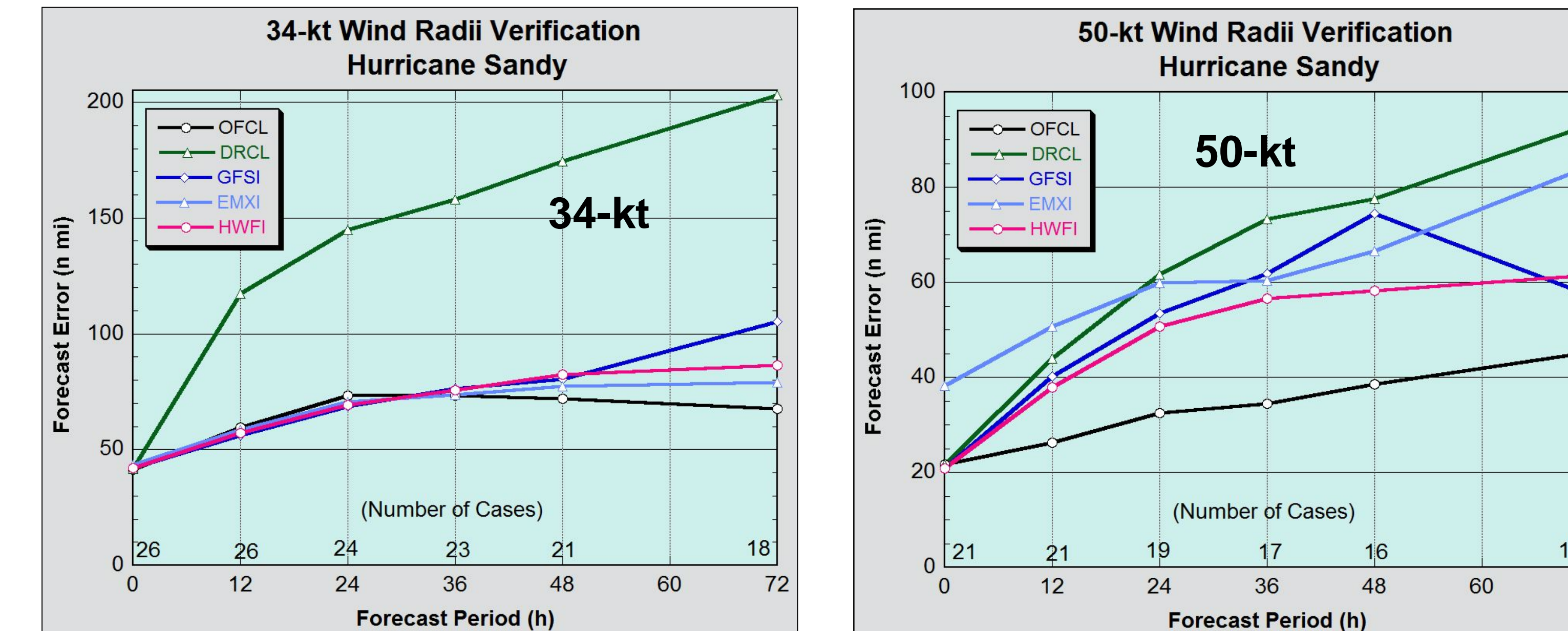
Methodology

To answer the questions above, four different datasets were used.

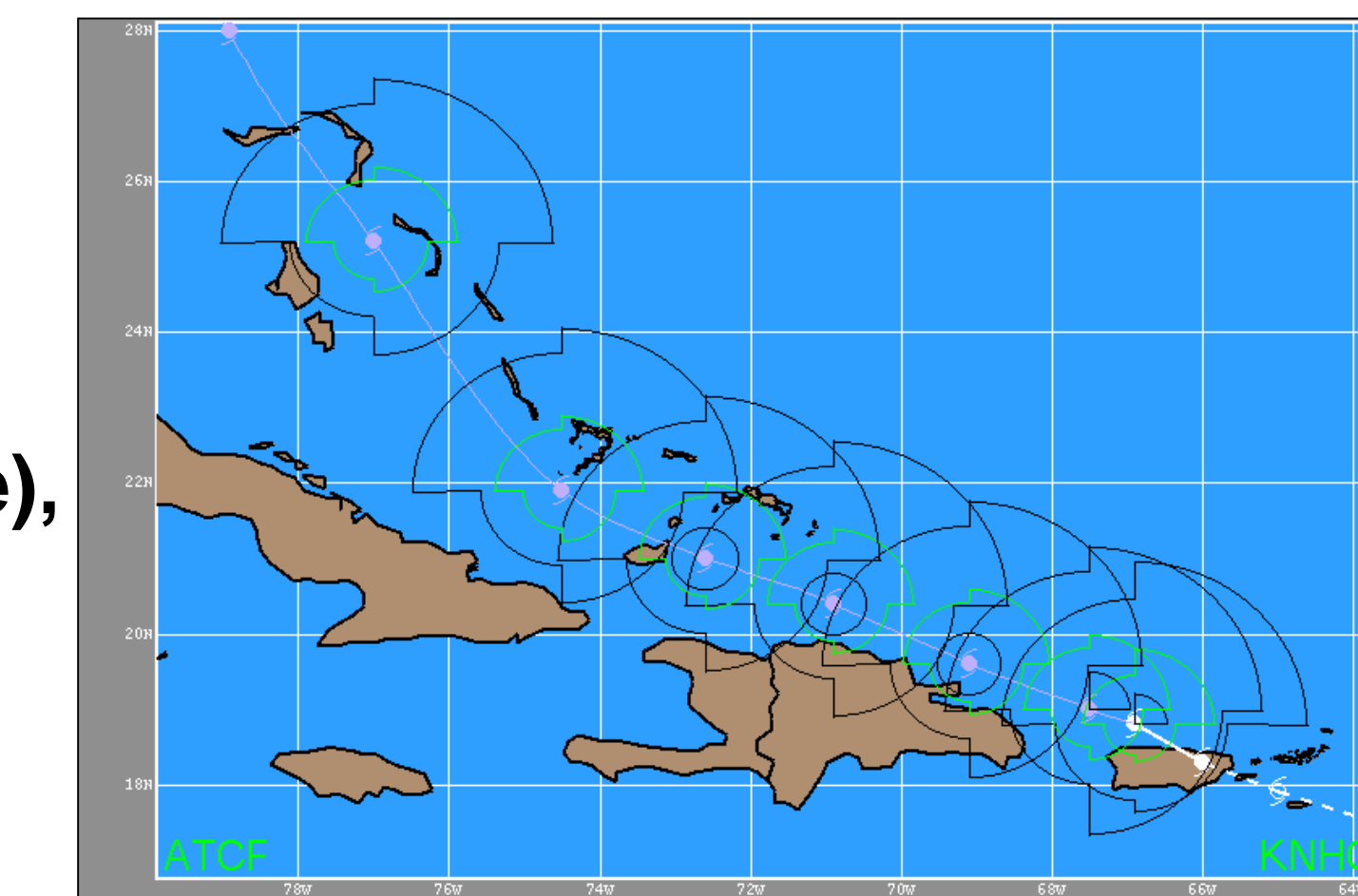| Sample Used	Reason for Testing
Reconnaissance TCs 2008-12	To obtain most accurate "ground truth" verification.
Entire 2011-12 sample	To obtain a very recent, sufficiently sized NHC and model verification.
TCs north of 30° N	To test if the NHC and model wind radii forecasts are more skillful at higher latitudes.
Hurricane Sandy (2012)	To study an atypical scenario.

The Reconnaissance Dataset

NHC Official Radii Forecasts (Reconnaissance Only) 2008-12 - Atlantic Basin

Error

NHC Official Radii Forecasts (Reconnaissance Only) 2008-12 - Atlantic Basin

Skill

34-kt error: 10-35 n mi
50-kt error : 8-25 n mi
64-kt error : 6-18 n mi

NHC forecasts are skillful, but the skill is lower for the 50- and 64-kt radii.

NHC Forecasts and the Models

Reconnaissance Dataset continued

34-kt Wind Radii Verification (Recon Only) 2008-12 - Atlantic Basin

50-kt Wind Radii Verification (Recon Only) 2008-12 - Atlantic Basin

64-kt Wind Radii Verification (Recon Only) 2008-12 - Atlantic Basin

NHC forecasts are considerably better than the dynamical model guidance and wind radii CLIPER model (DRCL), except for the hurricane wind radii where NHC is close to DRCL.

The 2011-2012 complete sample

Let's evaluate the skill of the models during 2011 and 2012.

34-kt Wind Radii Verification Atlantic Basin 2011-12

50-kt Wind Radii Verification Atlantic Basin 2011-12
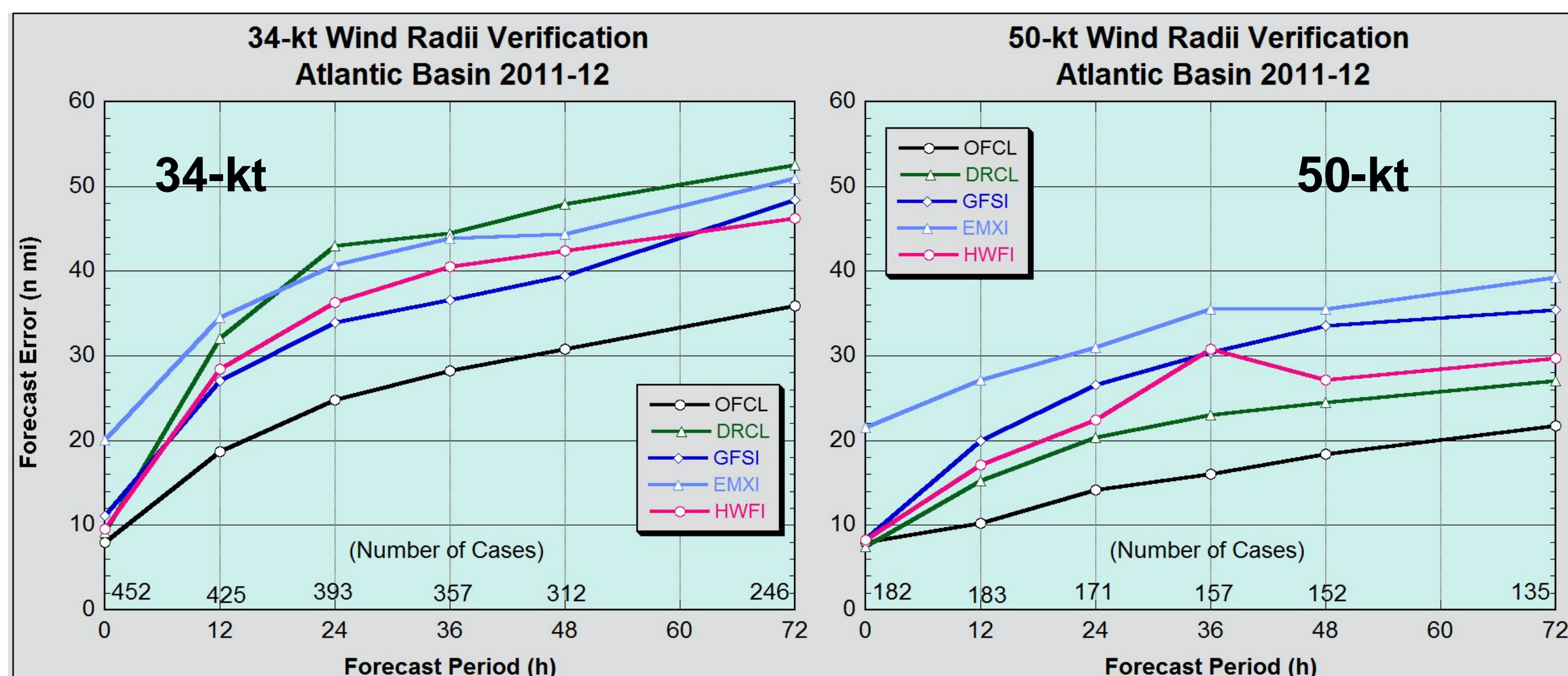
- Models have skill for 34-kt, but no skill for 50-kt radii.

- NHC better than the models.

Tropical Cyclones North of 30° N

Are the models better for TCs in the subtropics and mid-latitudes?

34-kt Wind Radii Verification 2008-12 - Atlantic Basin (TCs north of 30 N)

50-kt Wind Radii Verification 2008-12 - Atlantic Basin (TCs north of 30 N)

The models are skillful for this sample, but not nearly as much as the NHC forecasts.

Hurricane Sandy

34-kt Wind Radii Verification Hurricane Sandy

50-kt Wind Radii Verification Hurricane Sandy

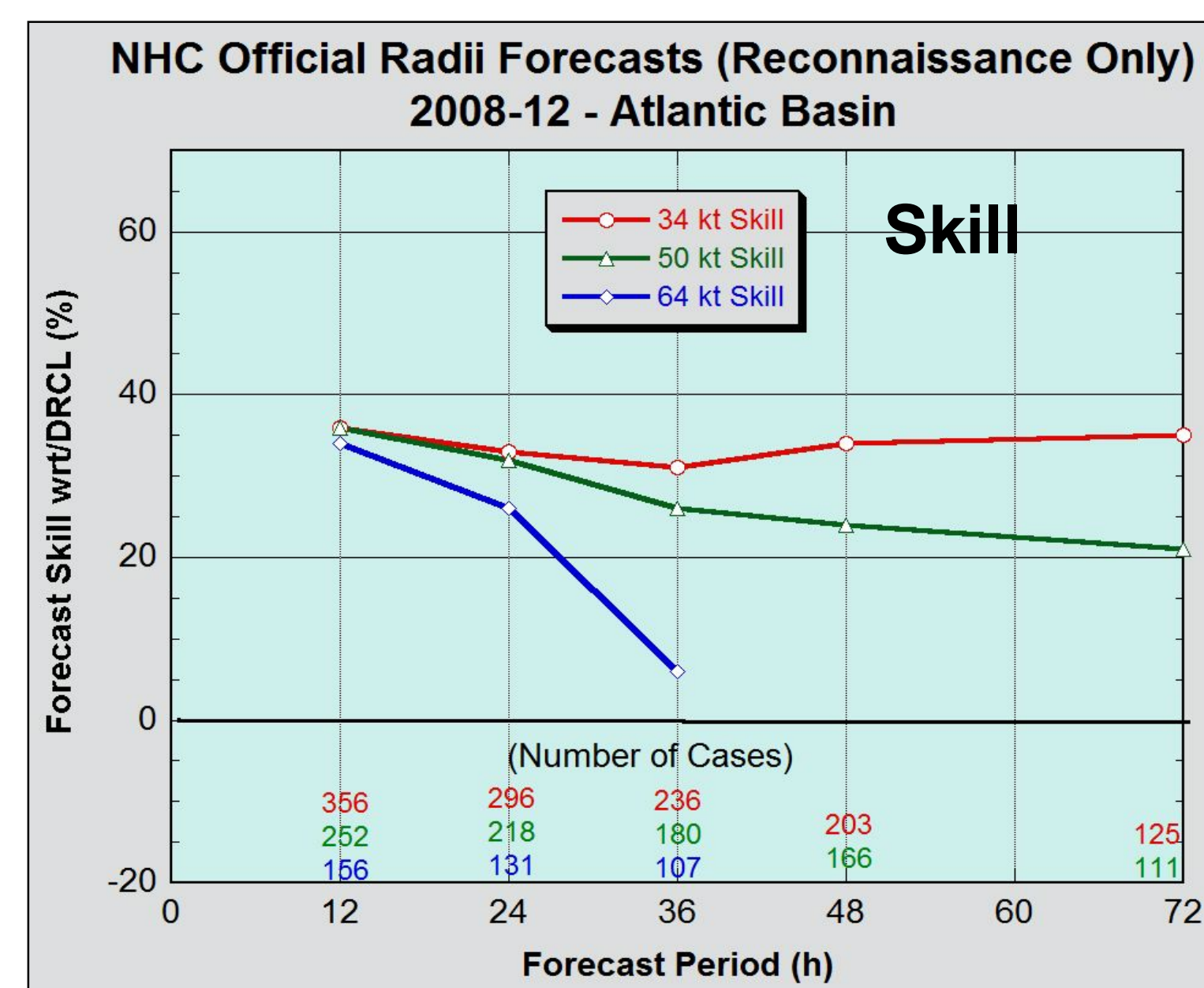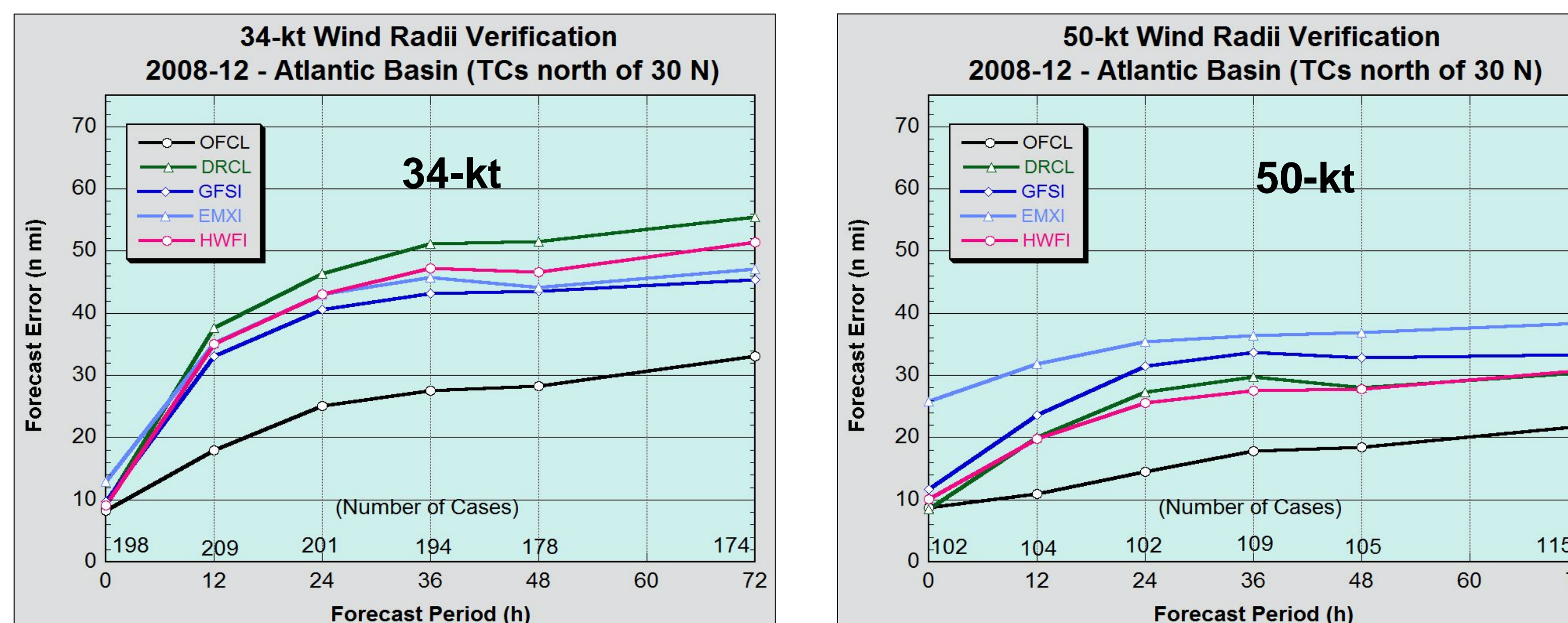NHC forecasts similar to the models for 34-kt; better than the models for 50-kt.

Summary

* For all samples, the NHC forecasts are far better than the models.

* The official forecasts have considerable skill (relative to climatology and persistence), especially for the 34- and 50-kt wind radii.

* The models, in general, are not skillful but have improved recently and perform better at higher latitudes.

Remaining questions

- Why are the official wind radii forecasts far superior to the various models?
- Are there other models that should be tested?
- Why does forecast skill drop off for the higher wind radii?
- Could this research assist emergency managers?

References

Blake, E. S., et al. (2013), Tropical Cyclone Report: Hurricane Sandy (AL182012). National Hurricane Center.

Cangialosi, J.P. and J.L. Franklin, 2013: 2012 National Hurricane Center Forecast Verification Report, National Hurricane Center.

Knaff, John A., Charles R. Sampson, Mark DeMaria, Timothy P. Marchok, James M. Gross, Colin J. McAdie, 2007: Statistical Tropical Cyclone Wind Radii Prediction Using Climatology and Persistence. *Wea. Forecasting*, 22, 781–791.

Kossin, J. P., J. A. Knaff, H. I. Berger, D. C. Herndon, T. A. Cram, C. S. Velden, R. J. Murnane, and J. D. Hawkins, 2007: Estimating hurricane wind structure in the absence of aircraft reconnaissance. Wea. Forecasting, 22, 89–101.