Development of Weighted/Corrected Consensus Forecasts for TC Track and Intensity Using the GPCE Technique

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Background

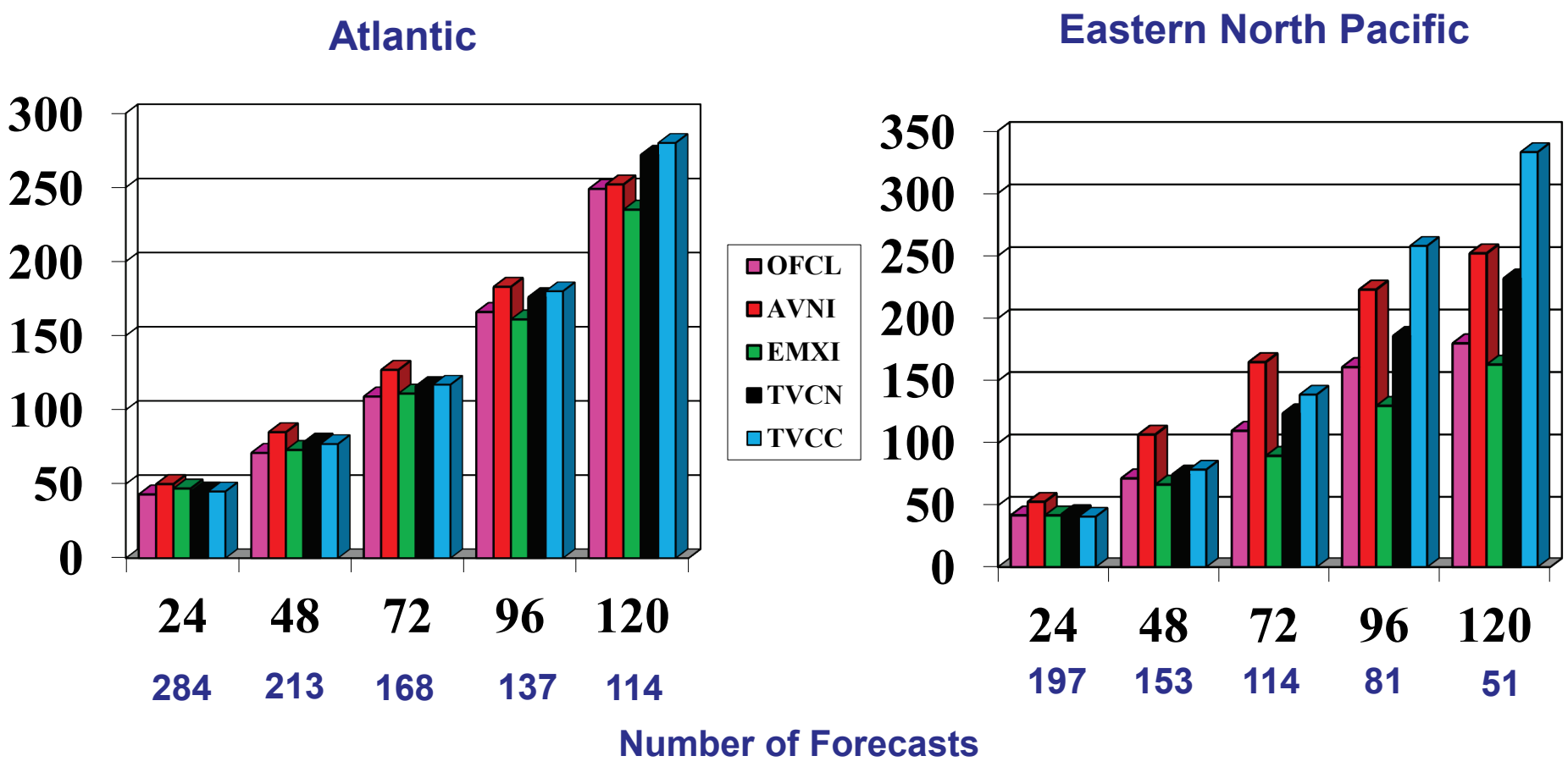
Review of the current Corrected Consensus (TVCC)

- Just as for GPCE, predictors of east-west and north-south forecast error of the consensus models must be quantities that are available prior to the time when official forecasts must be issued.
- Consensus model spread is defined to be the average distance of the member forecasts from the consensus forecast.
- The GPCE predictors are used and are consensus model spread; initial and forecast TC intensity; initial TC location and forecast displacement of TC location (latitude and longitude); TC speed of motion; and number of members available (for TVCN).

Review of the current Corrected Consensus (TVCC)

- Using stepwise linear regression and the aforementioned pool of predictors for previous seasons, regression models are found to predict east-west and north-south TC track forecast error for each combination of forecast length, consensus model, and basin.
- The means of the consensus east-west and north-south forecast errors for all forecast lengths for previous seasons are found for all to be used as possible bias correctors.
- For the Atlantic and eastern North Pacific basins, combinations of the statistical and bias correctors, depending on forecast length, are used to create the corrected consensus (TVCC) forecasts.

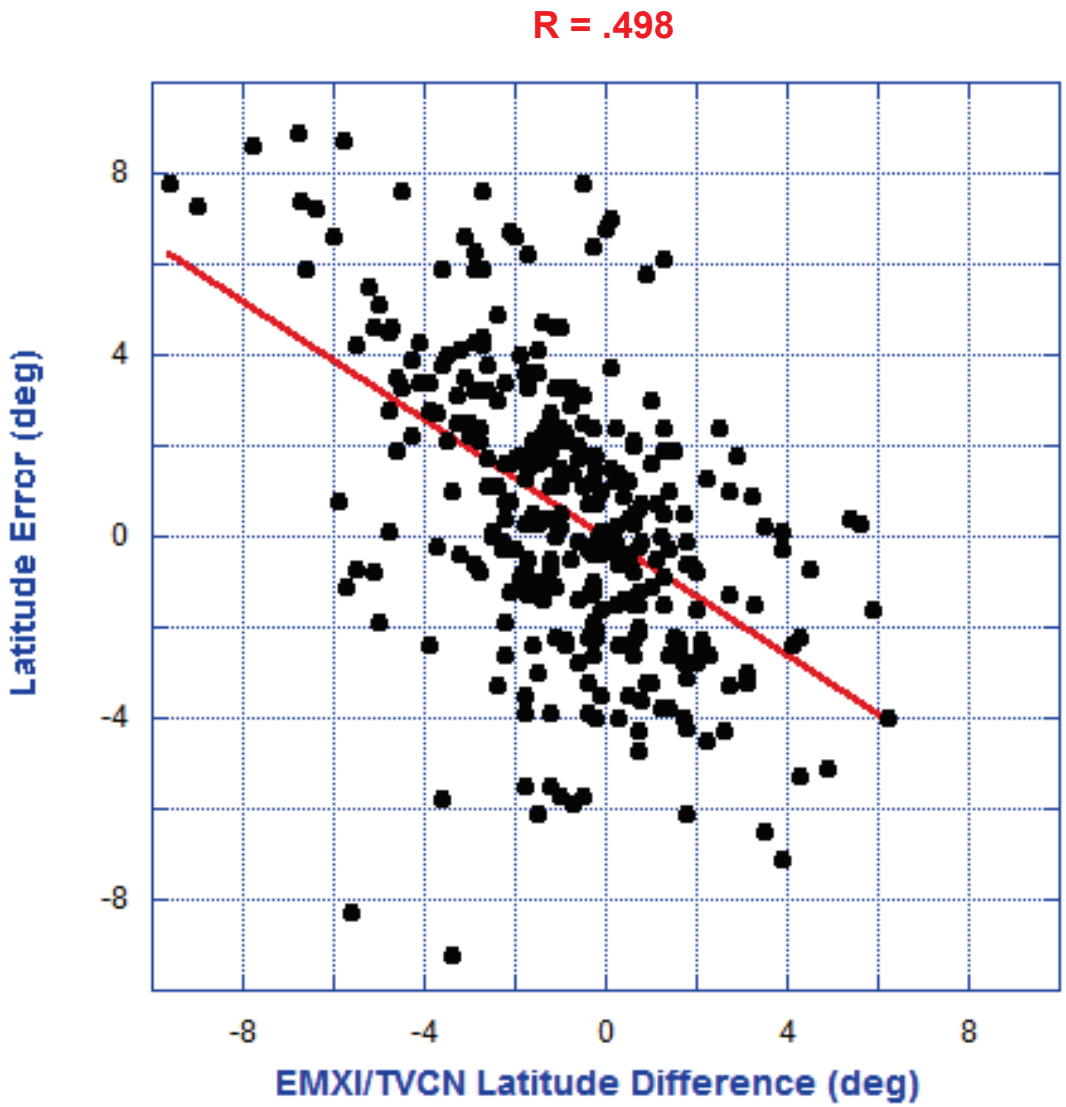
2011 TC Track Forecast Errors (nm)



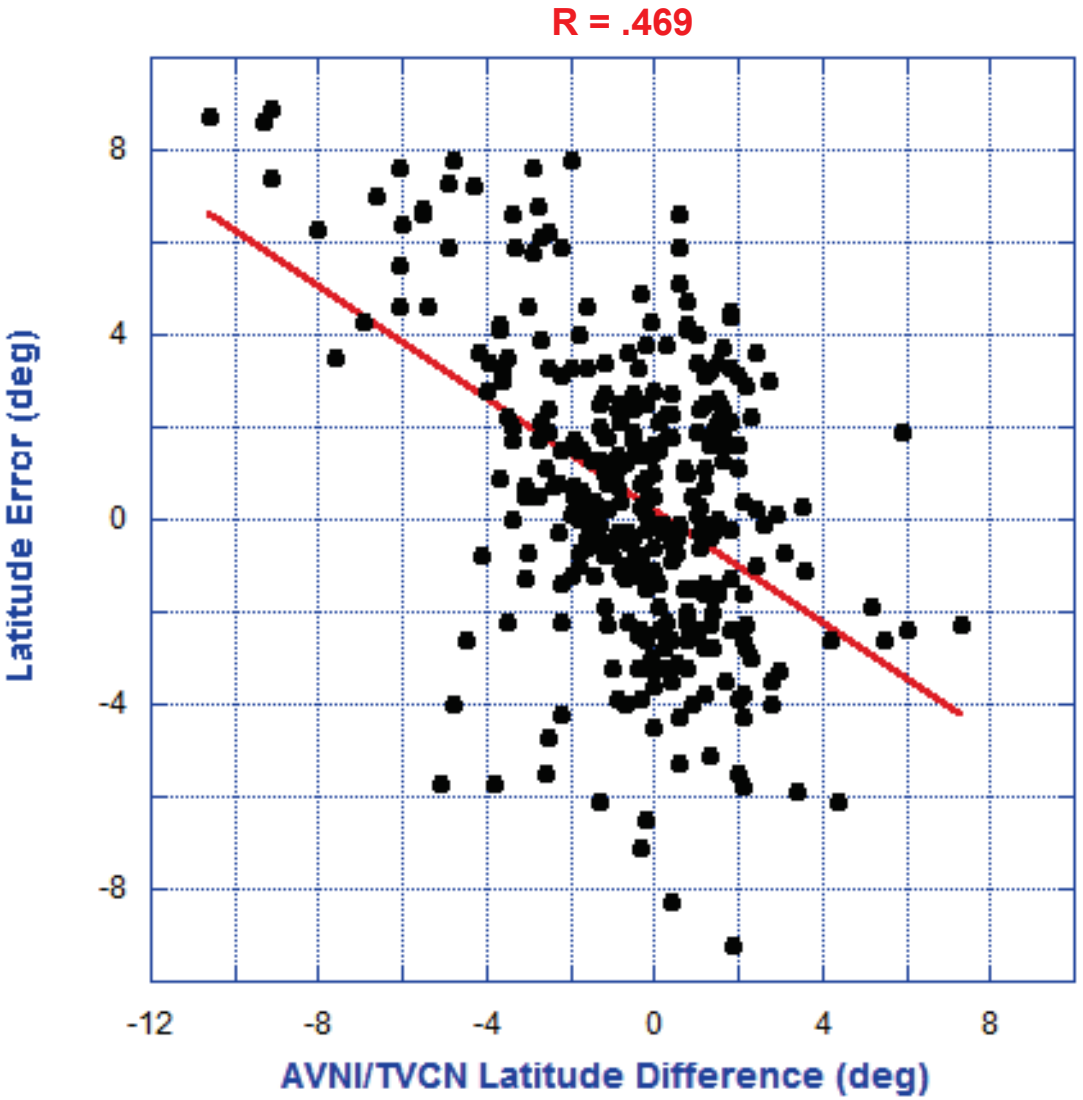
New Predictors for Corrected Consensus

- Using the GPCE predictors, we have found that the corrected consensus (TVCC) forecast performance is at best about the same as the consensus (TVCN) forecast performance and is often worse.
- The proposed new predictors are the differences in latitude and longitude between the TVCN member forecasts and the TVCN forecast.
- Using the new predictors, the same techniques were applied to estimate east-west and north-south correctors to be applied to the TVCN forecasts and create a new corrected consensus (CCON).

2008-2011 Atlantic
120-h TVCN Latitude Error

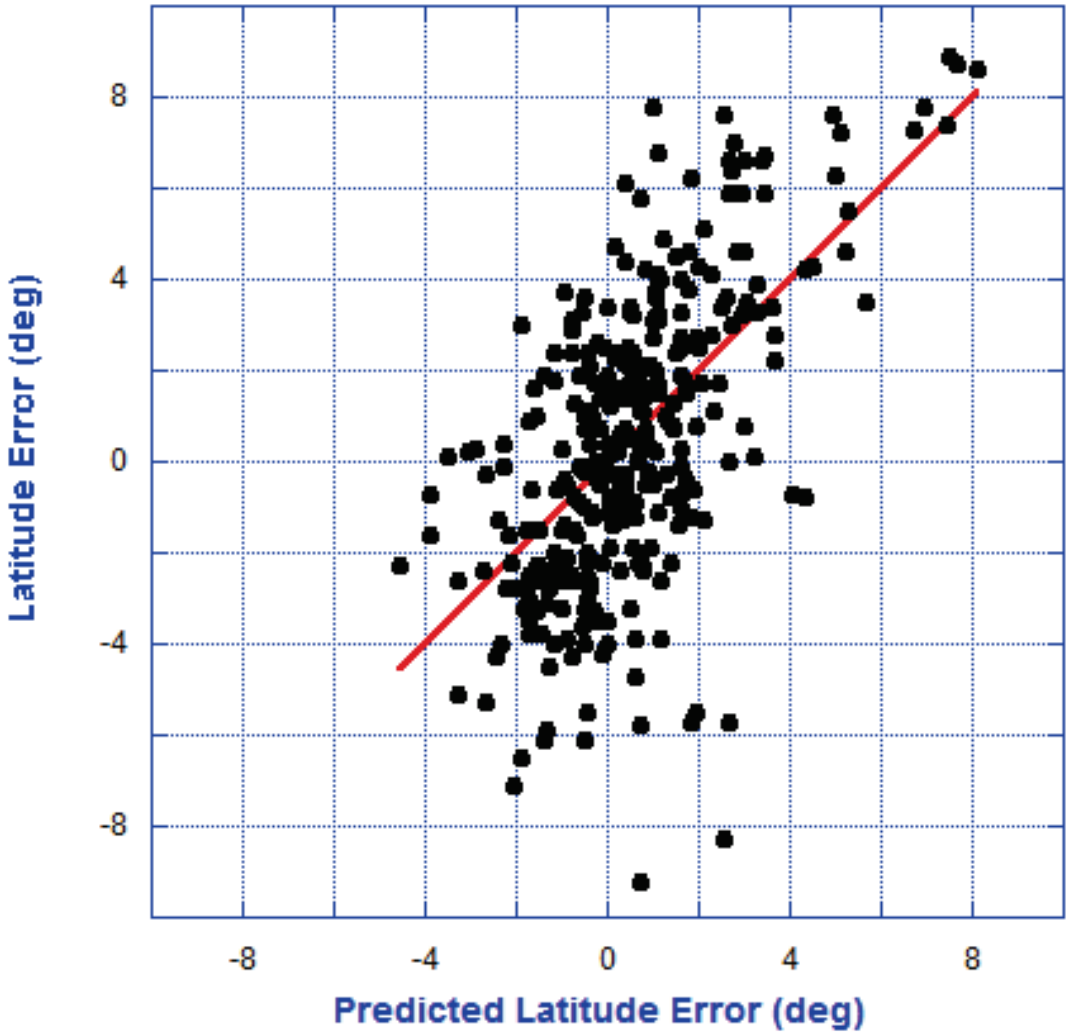


2008-2011 Atlantic
120-h TVCN Latitude Error

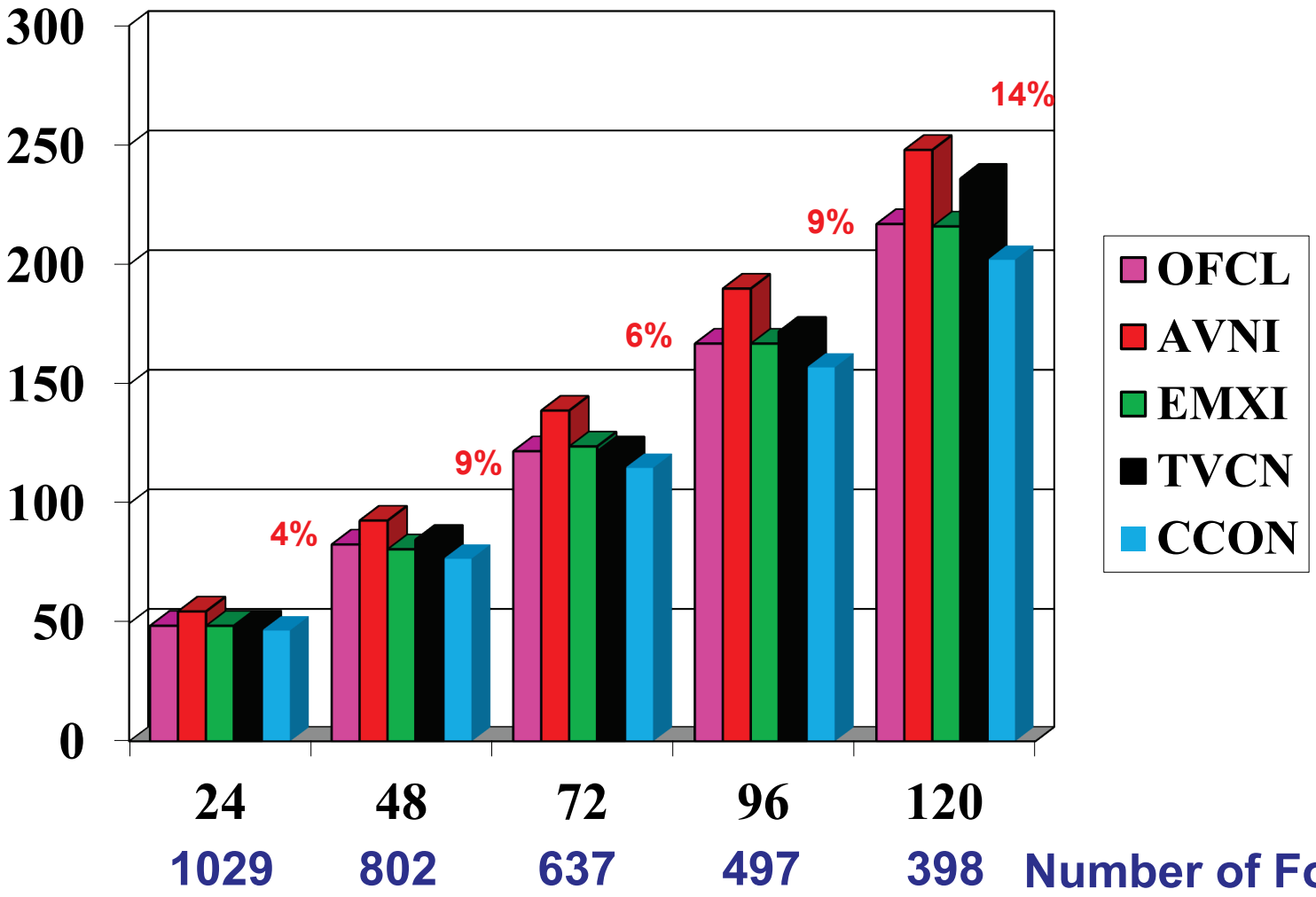


2008-2011 Atlantic
120-h TVCN Latitude Error

PE = 0.515 * ECLAT + 0.457 * AVLAT + 0.16 (R = .603)



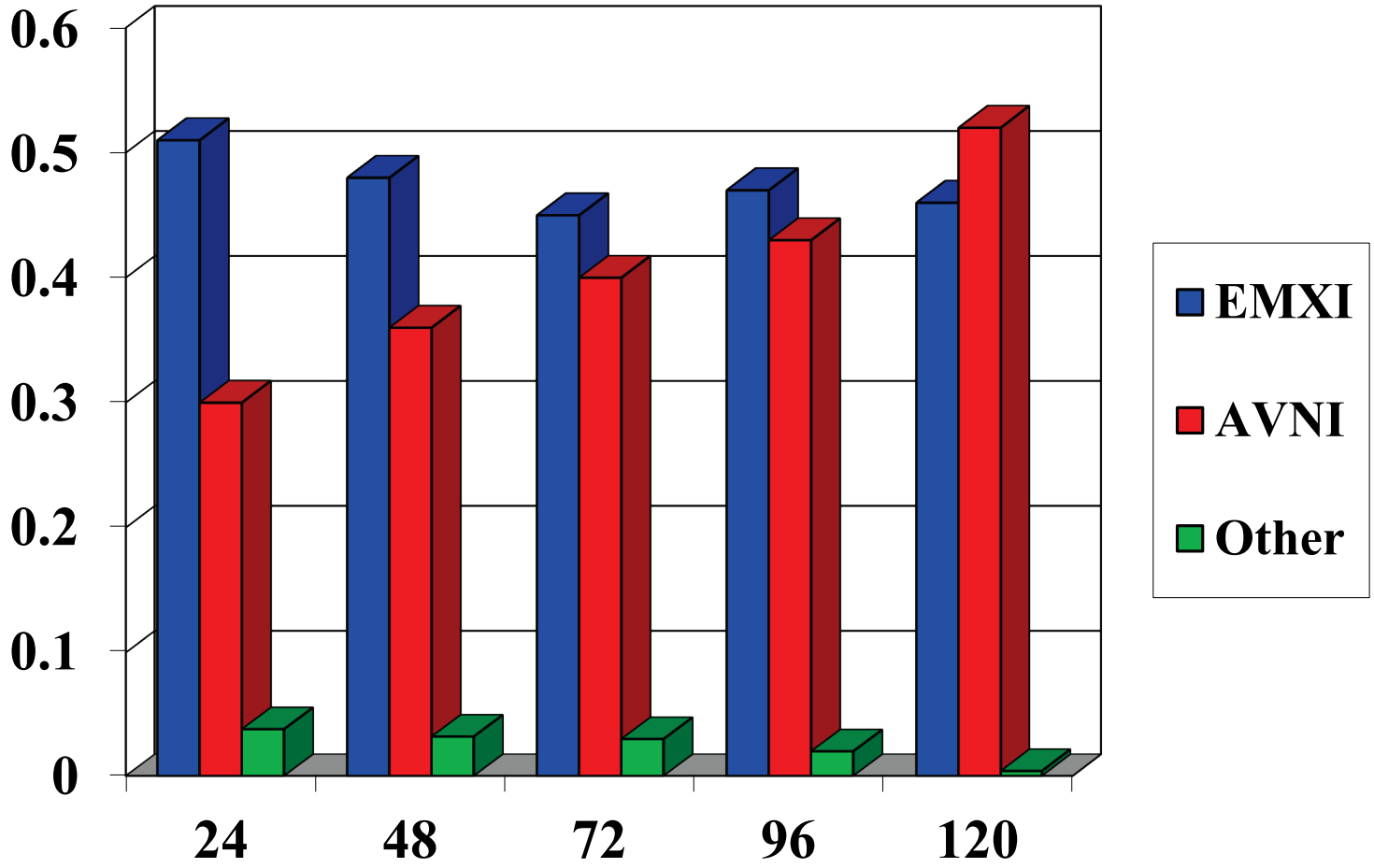
2008-2011 Atlantic (Dependent Data) TC Forecast Error (nm)



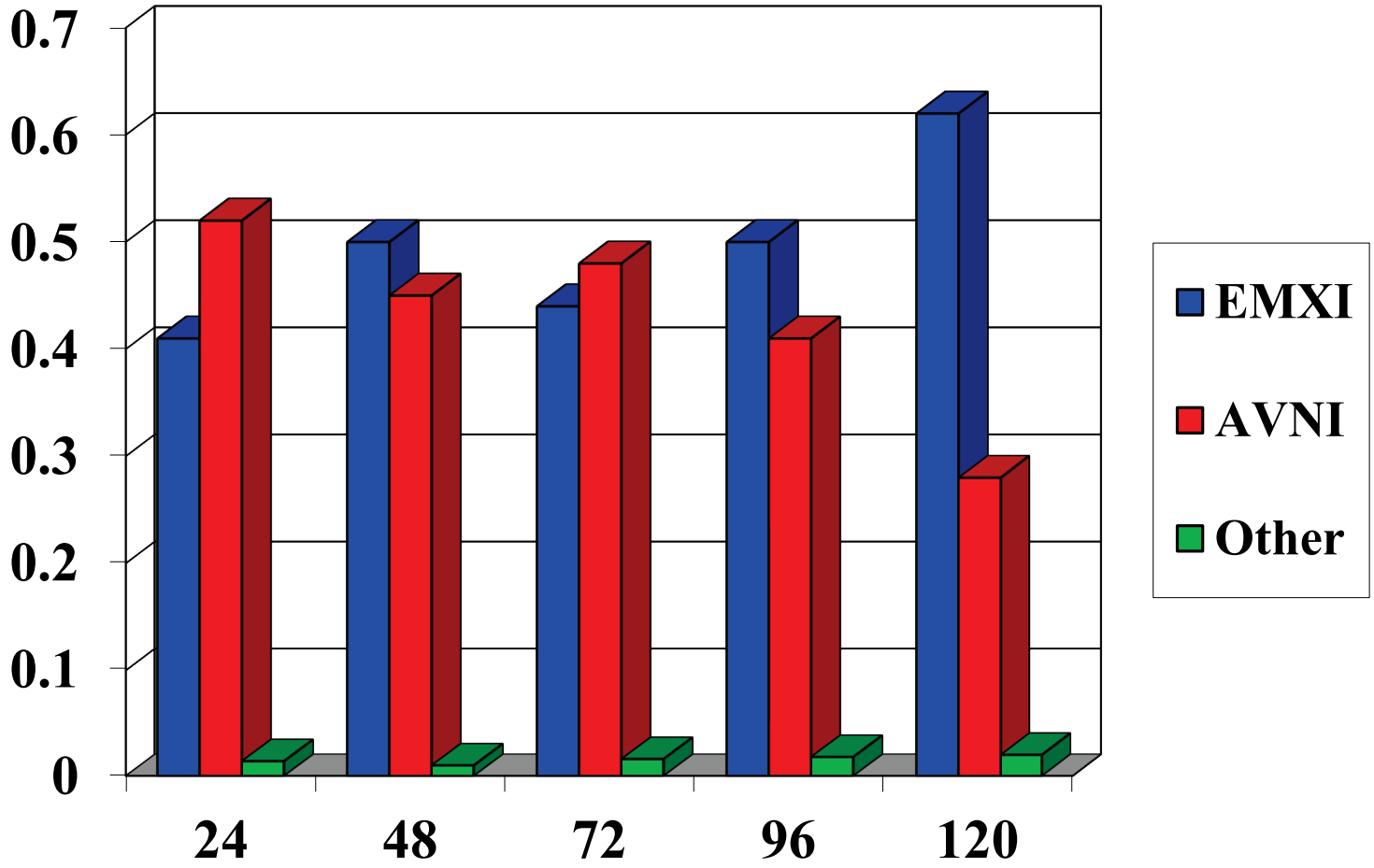
Corrected Consensus vs. Weighted Consensus

- Because the new predictors are linear combinations of the TVCN member forecasts, the corrected consensus forecasts can be shown to be equivalent to weighted consensus forecasts.
- Using the equations used to produce the east-west and north-south correctors, we can derive weights to be applied to the TVCN member forecasts of latitude and longitude and use them to created a weighted consensus.
- Thus, using the new correctors, we have an objective way to determine appropriate weights, based on past performance, to apply to each TVCN member forecast to produce a weighted consensus forecast (TVCW) that is equivalent to the corrected consensus forecast (CCON).

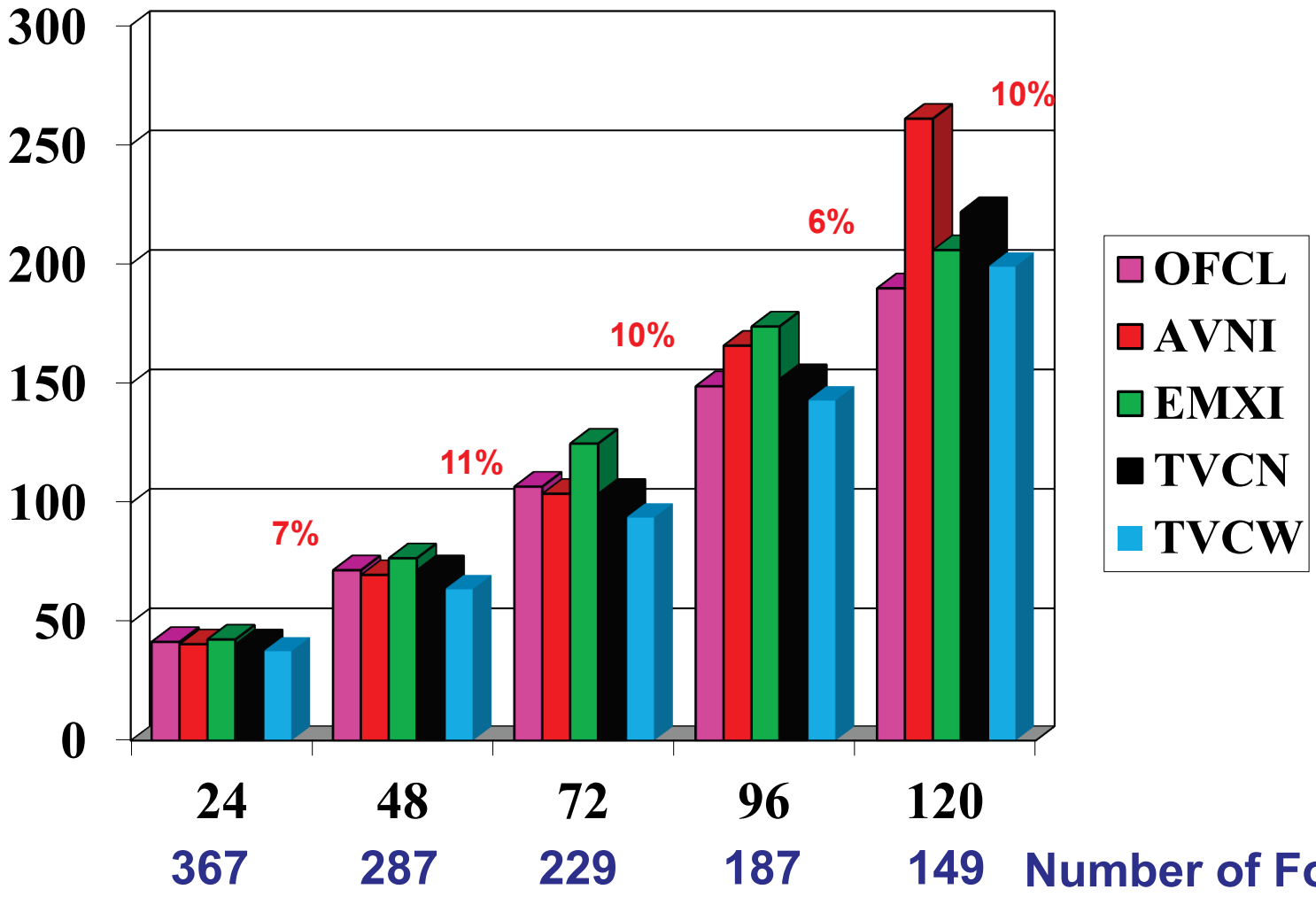
2008-2011 Atlantic Weighted Consensus Latitude Weights



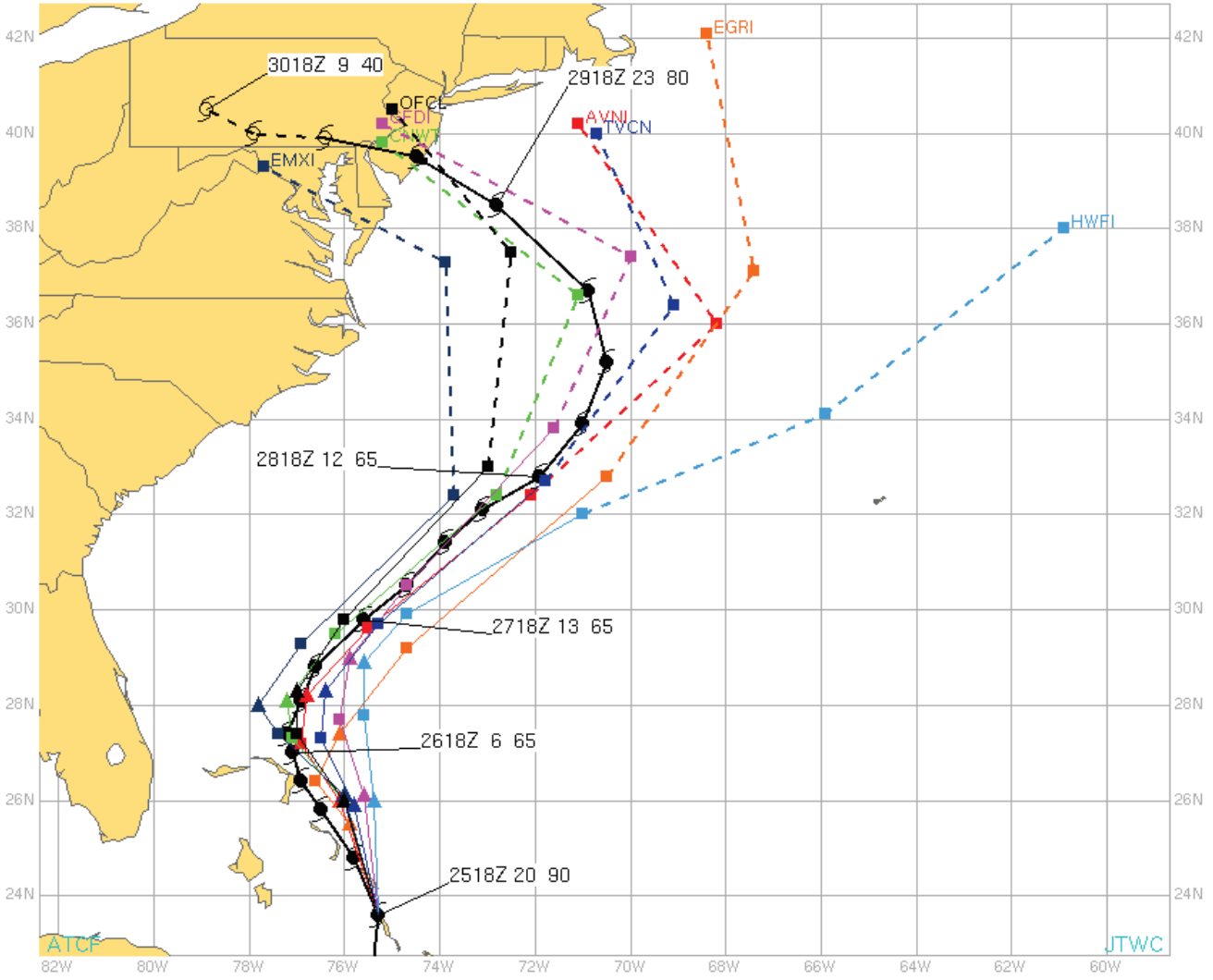
2008-2011 Atlantic Weighted Consensus Longitude Weights



2012 Atlantic (Independent Data)
TC Forecast Error (nm)



Hurricane Sandy Forecasts
18Z October 25, 2012



Summary

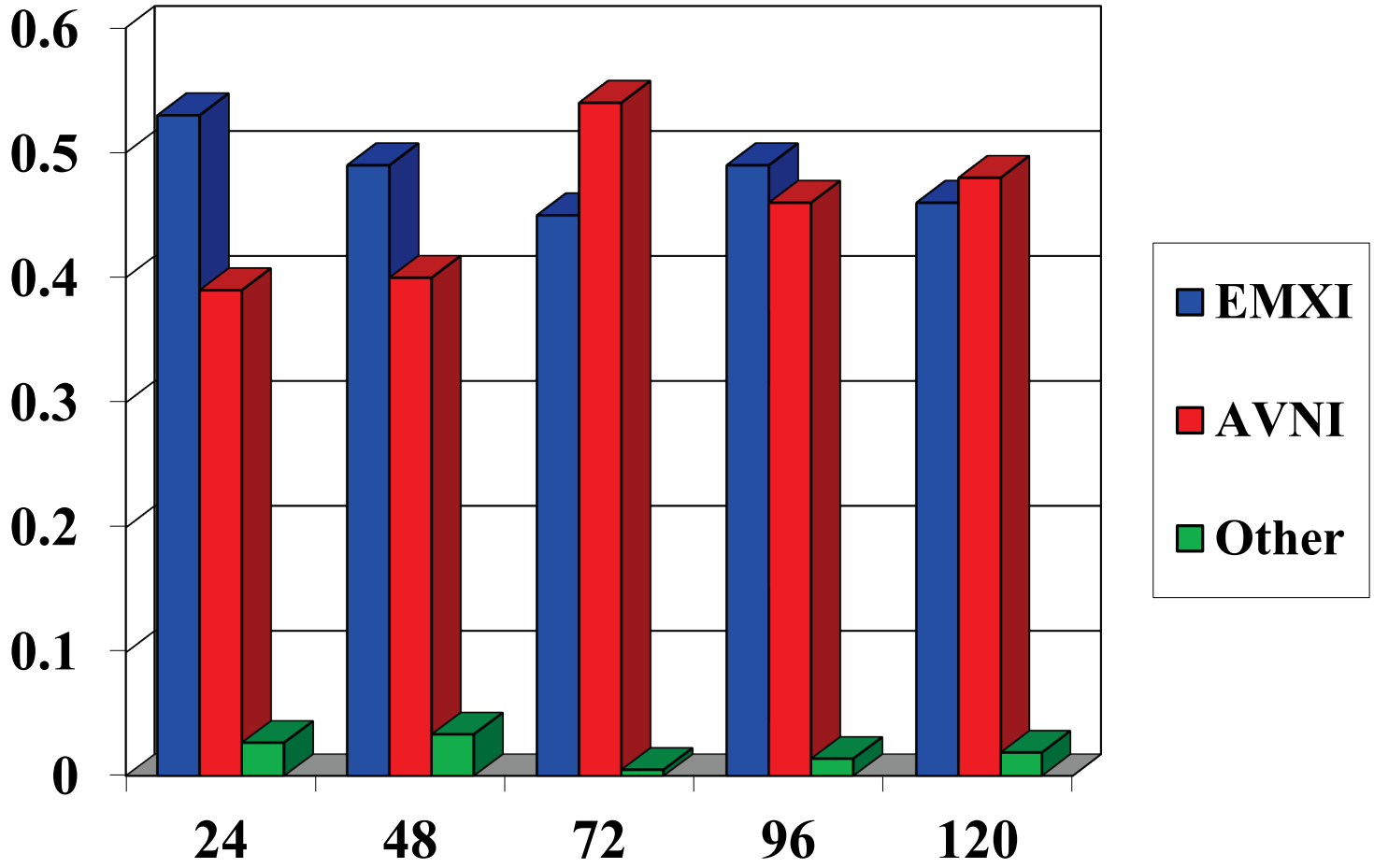
- The TC track forecast performance of the corrected consensus (TVCC) derived using the GPCE predictors has been at best about the same and often worse than the forecast performance of the consensus (TVCN).
- A new corrected consensus (CCON) has been derived applying the GPCE methodology to new predictors, the differences between the TVCN member latitude and longitude forecasts and the TVCN latitude and longitude forecasts. Using the 2008-2011 Atlantic seasons, the leading predictors for CCON were found to be the EMXI and AVNI latitude and longitude differences for all forecast lengths.
- Because the new predictors are linear combinations of the TVCN member forecasts, the corrected consensus forecasts can be shown to be equivalent to weighted consensus forecasts (TVCW). The weights to be applied to the EMXI and AVNI forecasts were found to be considerably greater than those to be applied to the other TVCN members. The EMXI and AVNI weights were found to vary with forecast length as well as with latitude and longitude.
- For the independent 2012 Atlantic season, the TVCW forecast improvements over TVCN were 7, 11, 10, 6, and 10 percent for the 24-h, 48-h, 72-h, 96-h, and 120-h forecasts, respectively.

Progress

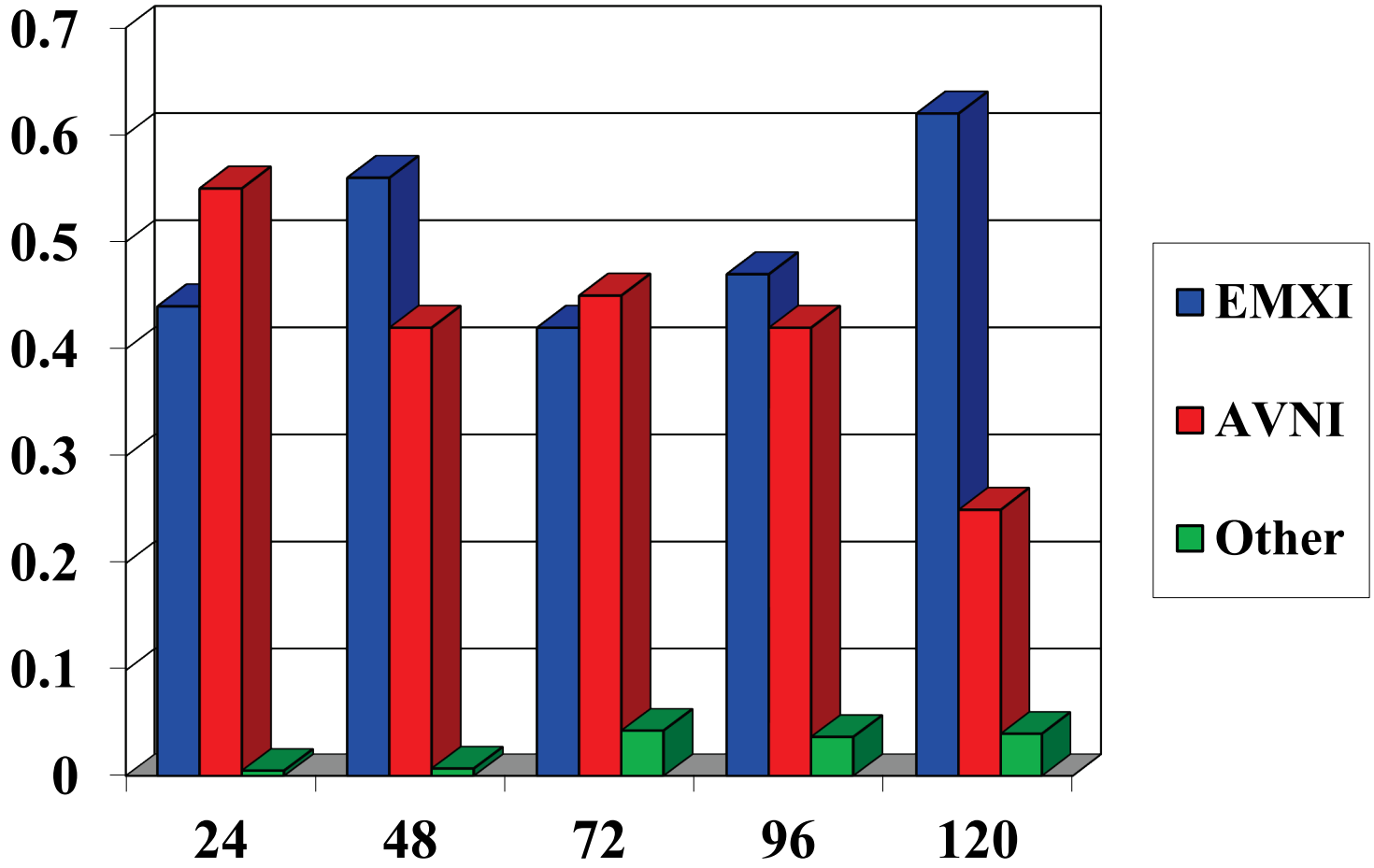
Derivation of Weighted Track Consensus and Corrected Intensity Consensus for each basin for the 2014 Season

TC Track

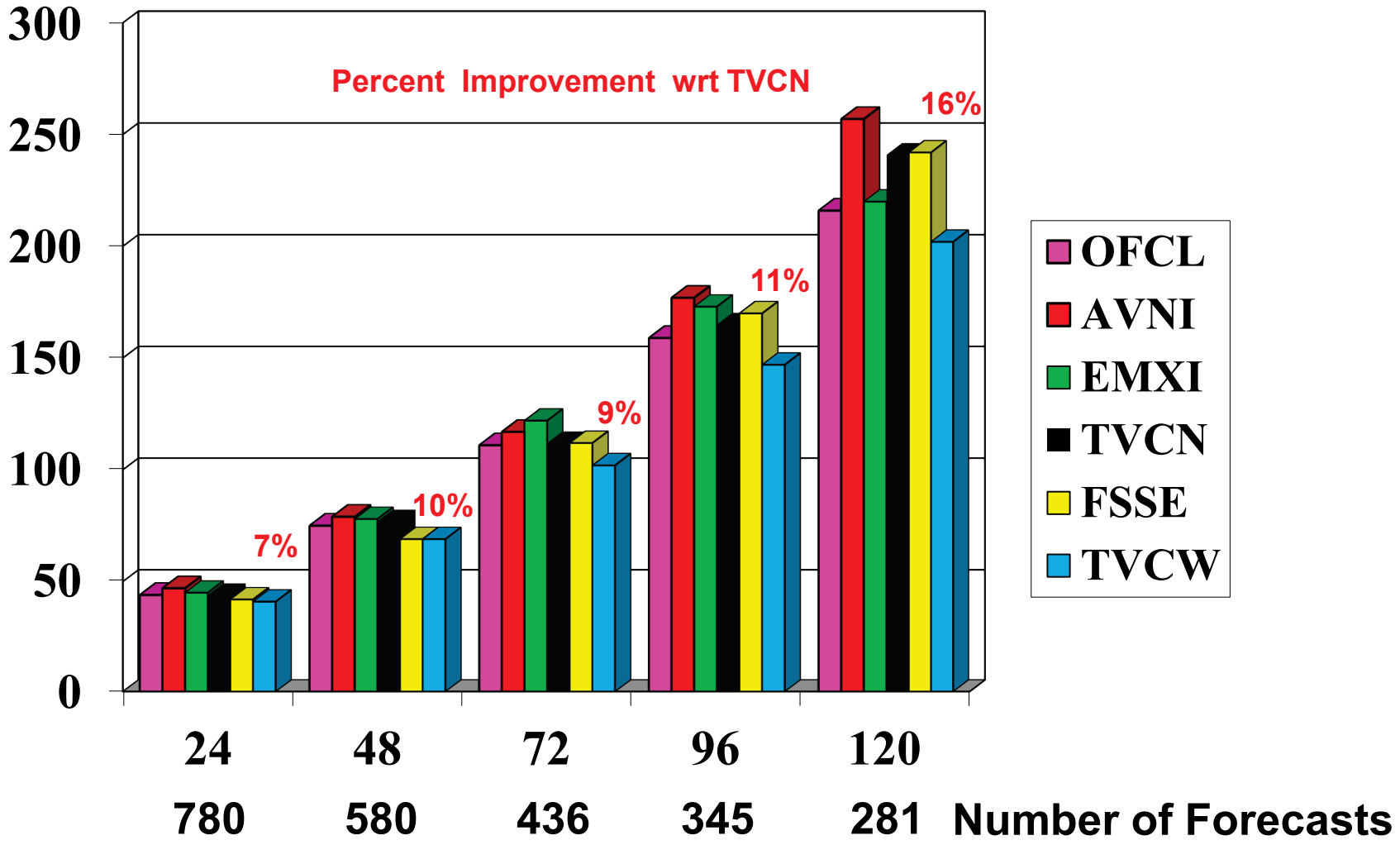
2011-2013 Atlantic Weighted Consensus Latitude Weights



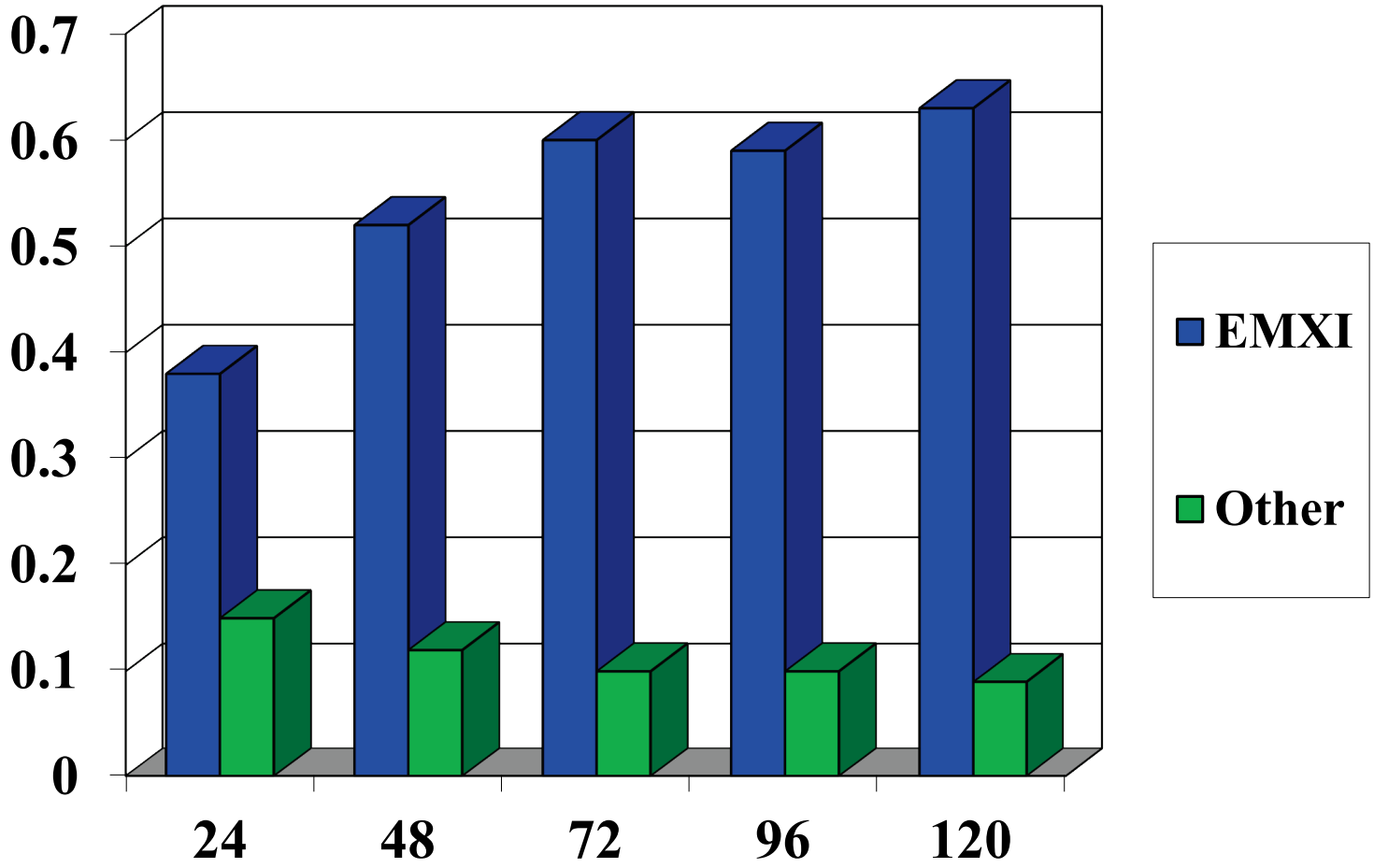
2011-2013 Atlantic Weighted Consensus Longitude Weights



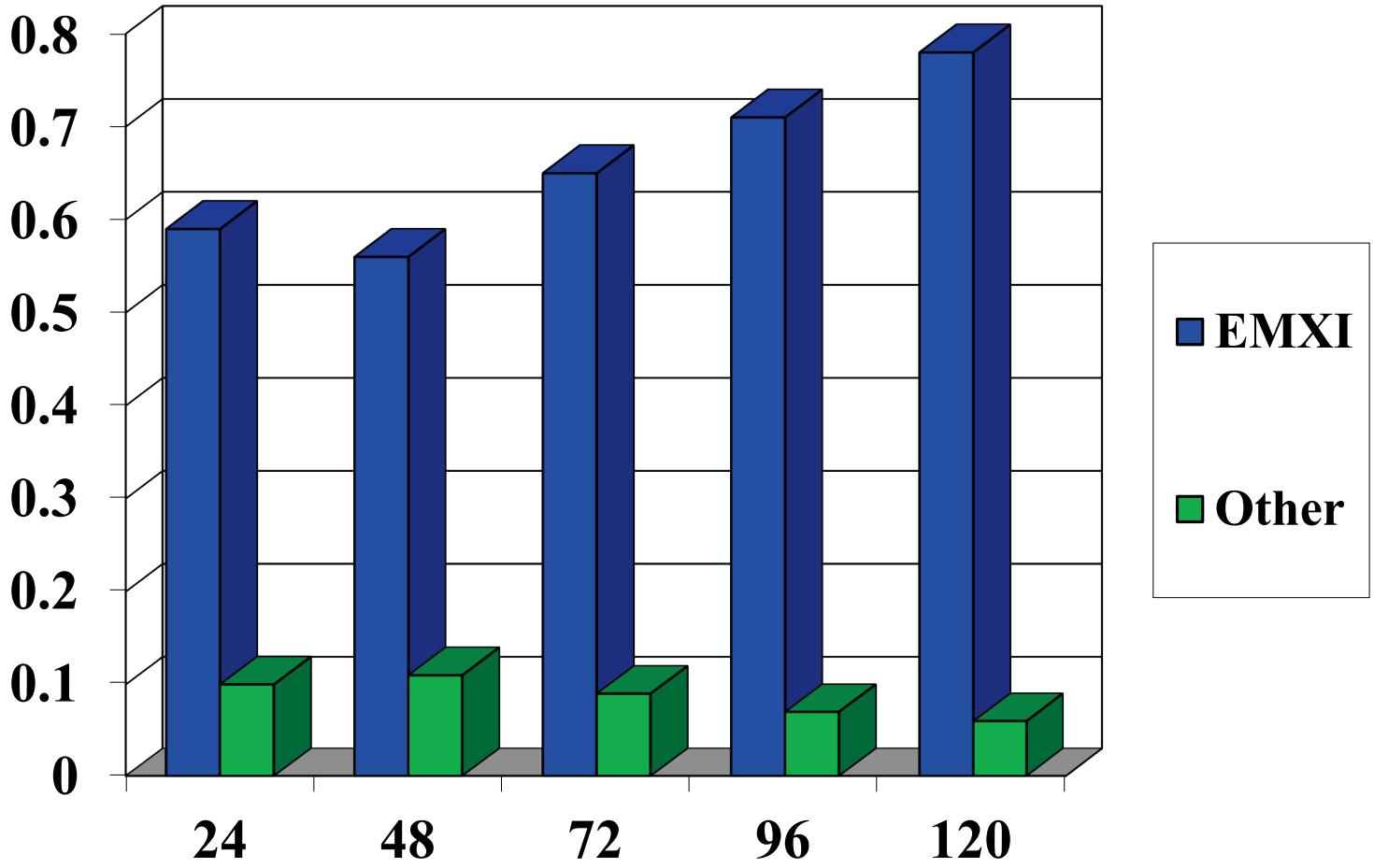
2011-2013 Atlantic (Dependent Data)
TC Forecast Error (nm)



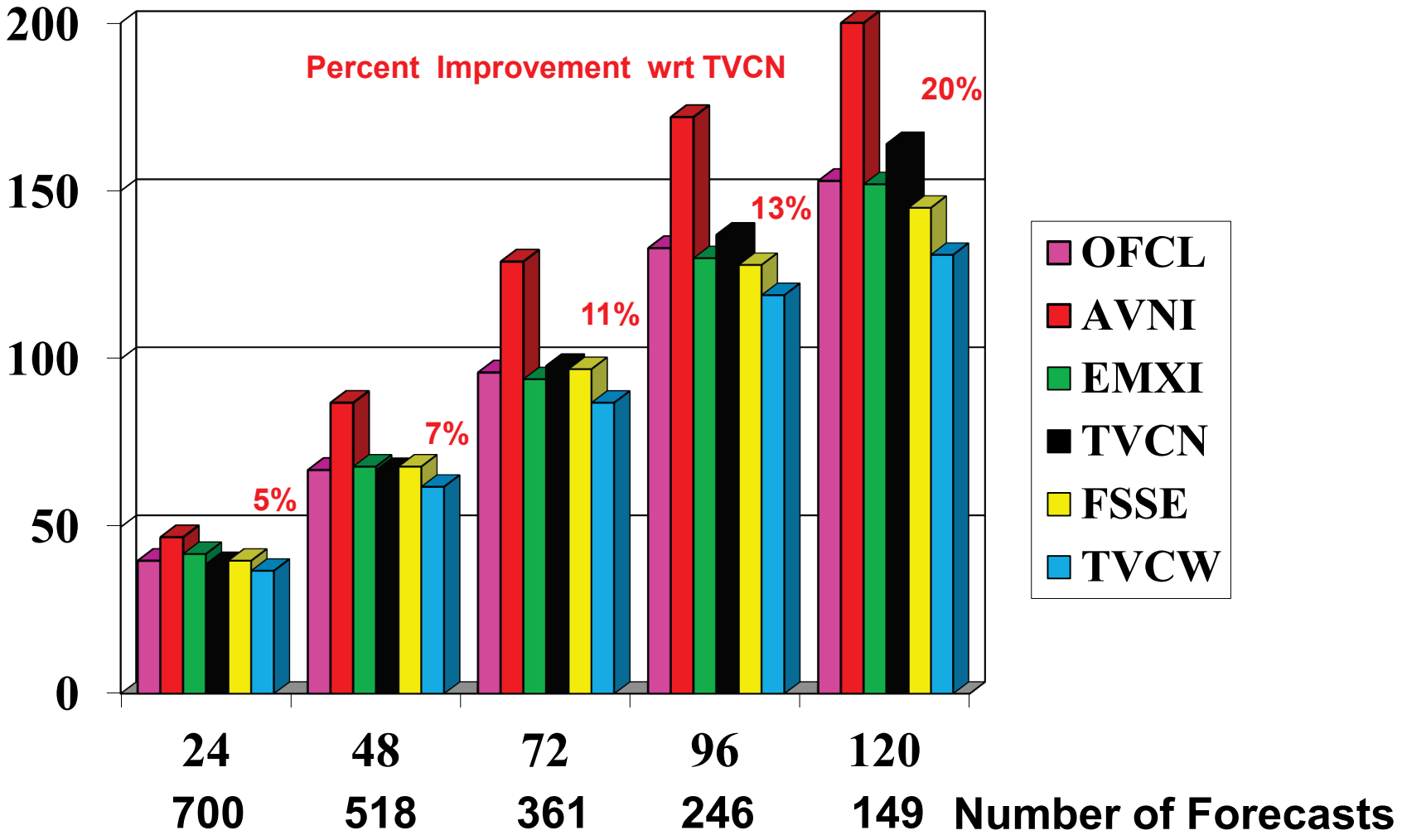
2011-2013 Eastern North Pacific Weighted Consensus Latitude Weights



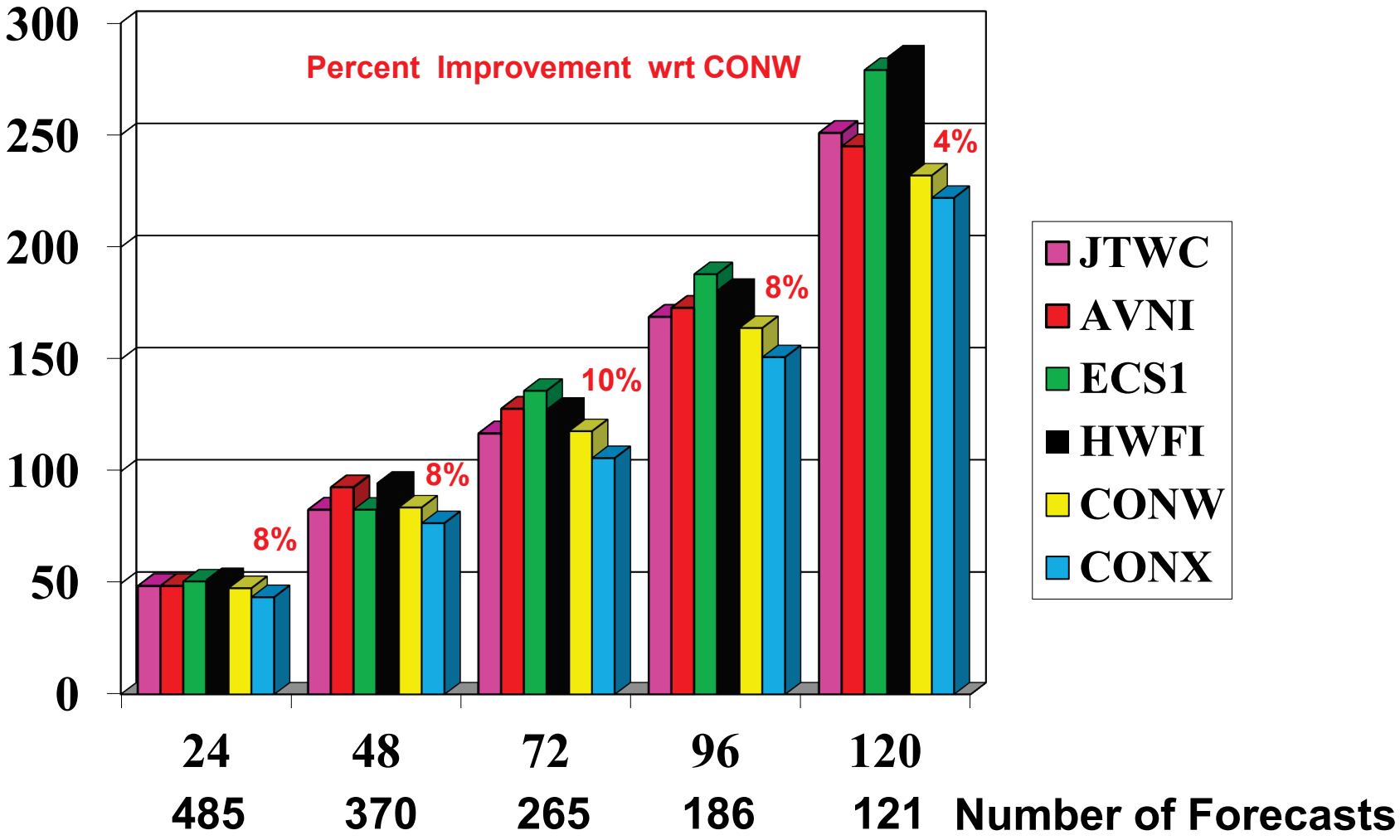
2011-2013 Eastern North Pacific Weighted Consensus Longitude Weights



2011-2013 Eastern North Pacific (Dependent Data) TC Forecast Error (nm)



2013 Western North Pacific (Dependent Data)
TC Forecast Error (nm)

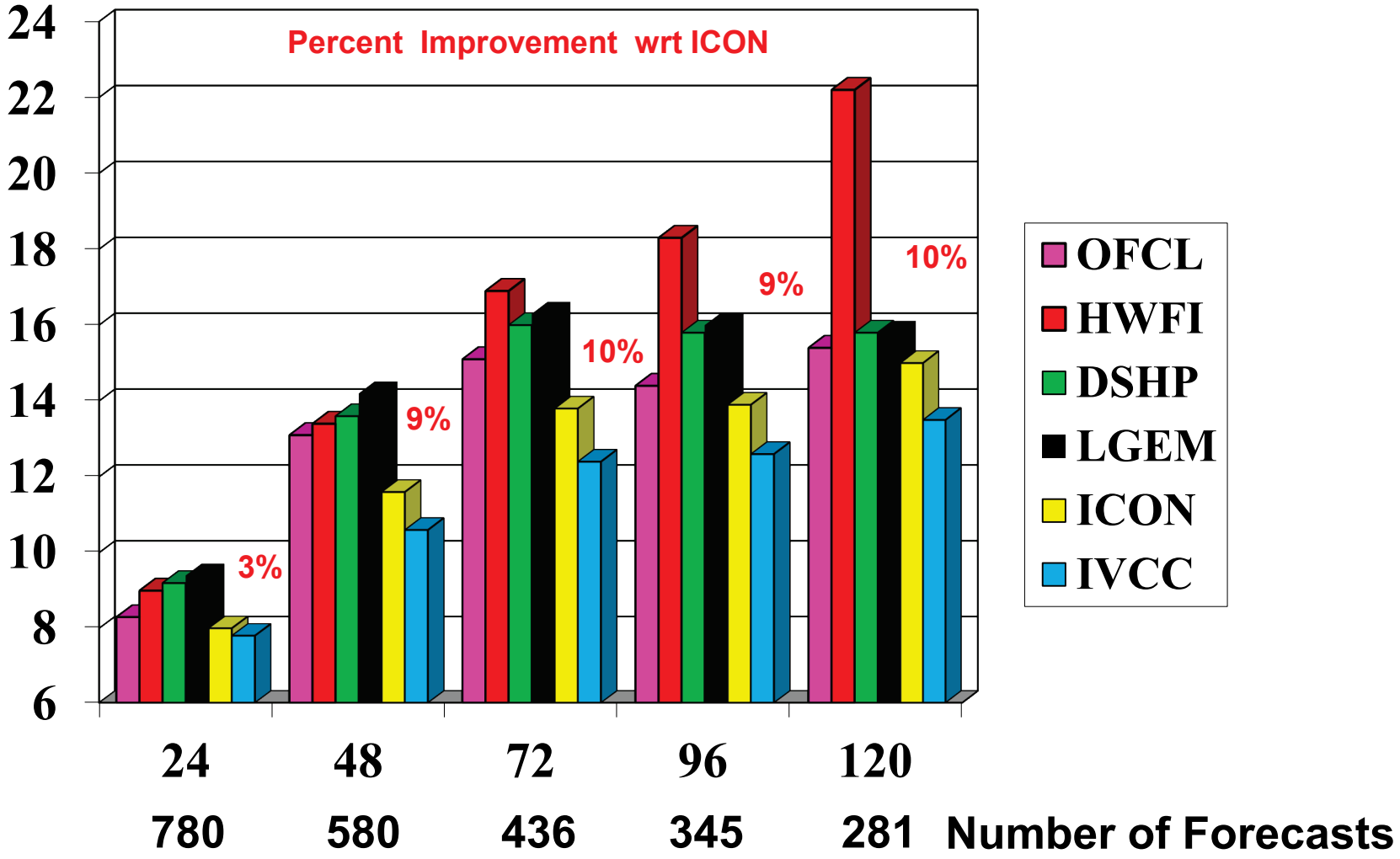


TC Intensity

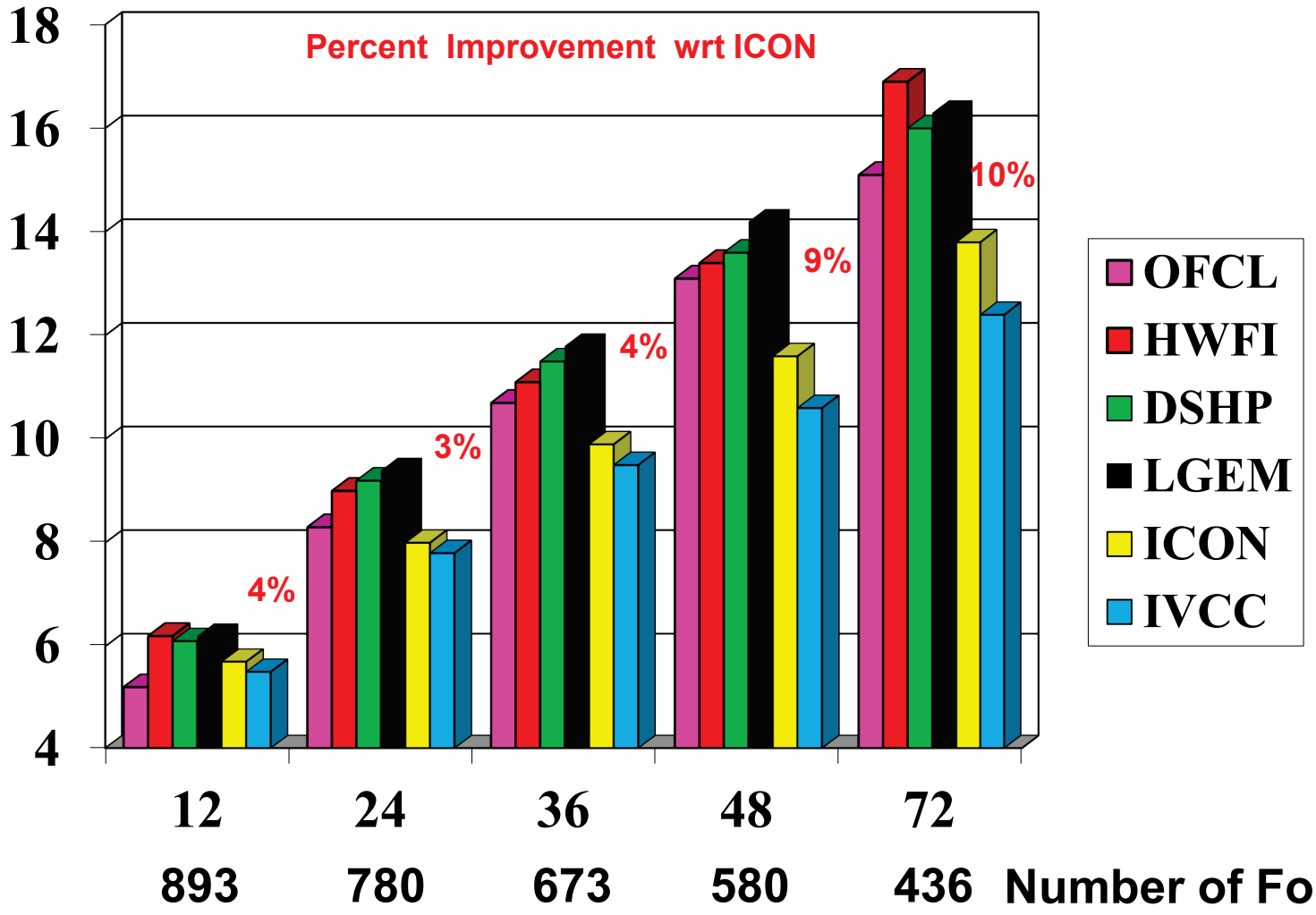
Corrected Consensus for Intensity

- The predictors for intensity are the differences in intensity between the consensus (ICON and S5YY) member forecasts and the consensus forecast, the initial intensity, the forecast intensity, and the forecast intensity change.
- Using these predictors, the same GPCE techniques were applied to estimate intensity correctors to be applied to the consensus forecasts and create a corrected consensus (IVCC or S5YC).
- For the 2011-2013 Atlantic seasons the predictor chosen for the 12-36 h forecasts was initial intensity while the predictor chosen for the 48-120 h forecasts was the forecast intensity. For the other basins a more complicated set of predictors was chosen.

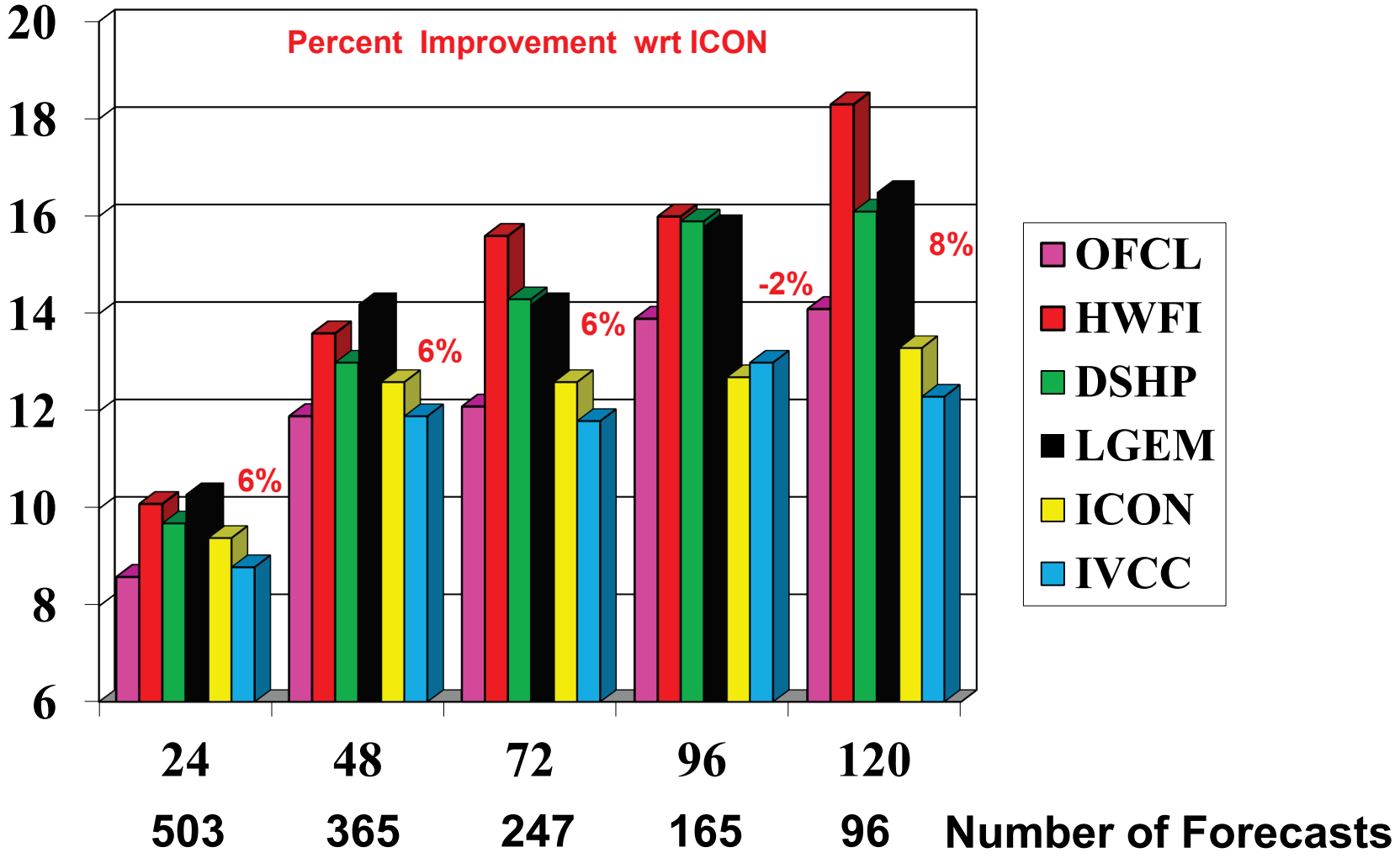
2011-2013 Atlantic (Dependent Data)
TC Intensity Forecast Error (kt)



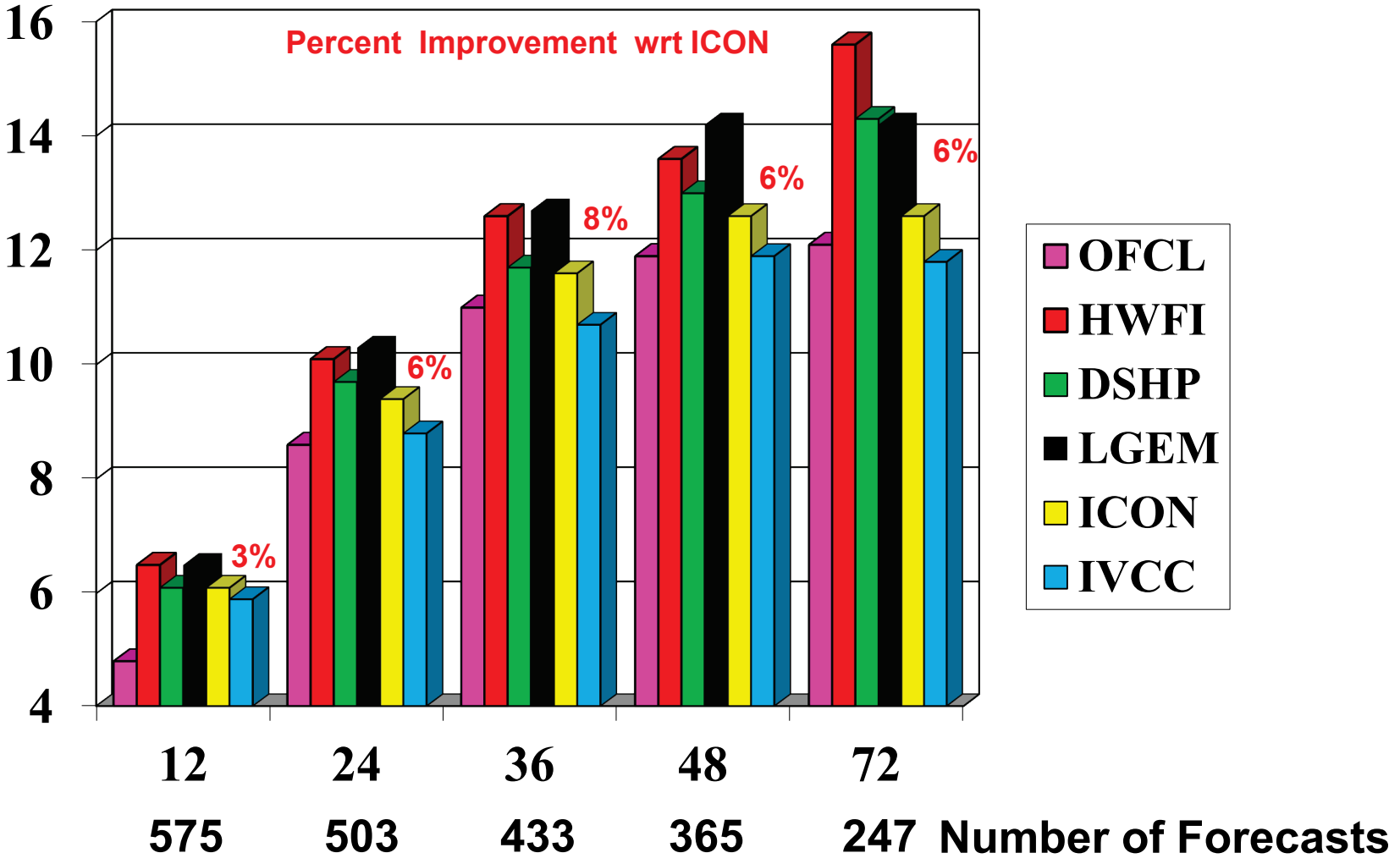
2011-2013 Atlantic (Dependent Data)
TC Intensity Forecast Error (kt)



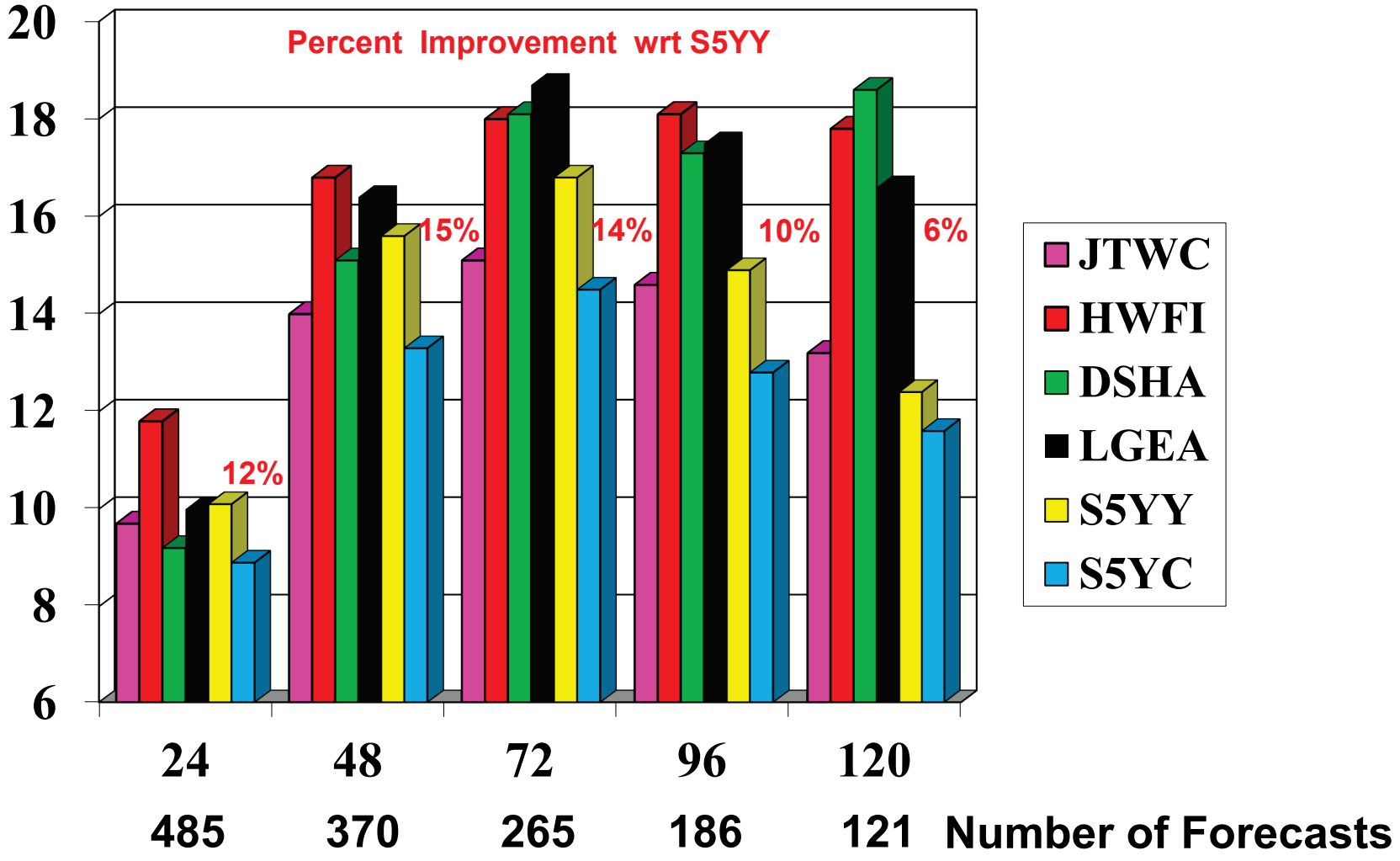
2012-2013 Eastern North Pacific (Dependent Data)
TC Intensity Forecast Error (kt)



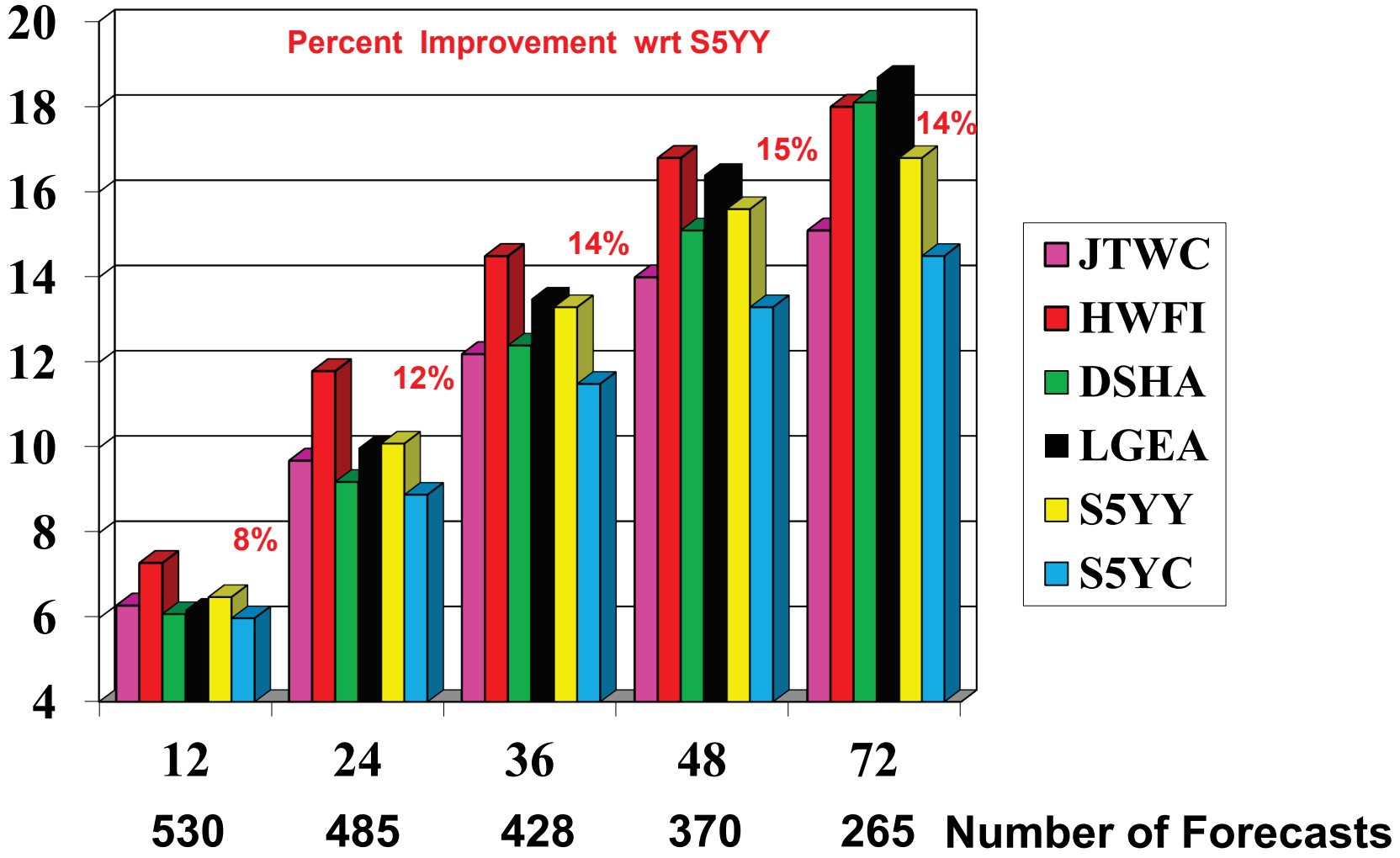
2012-2013 Eastern North Pacific (Dependent Data)
TC Intensity Forecast Error (kt)



2013 Western North Pacific (Dependent Data)
TC Intensity Forecast Error (kt)



2013 Western North Pacific (Dependent Data)
TC Intensity Forecast Error (kt)



Questions?