

2003 GFDL HURRICANE PREDICTION SYSTEM



Morris Bender, Timothy Marchok (GFDL)

**Robert Tuleya, Hua-Lu Pan, Alexandr
Falkovich (NCEP)**

Isaac Ginis, Biju Thomas (URI)

CHANGES TO BE IMPLEMENTED IN 2003

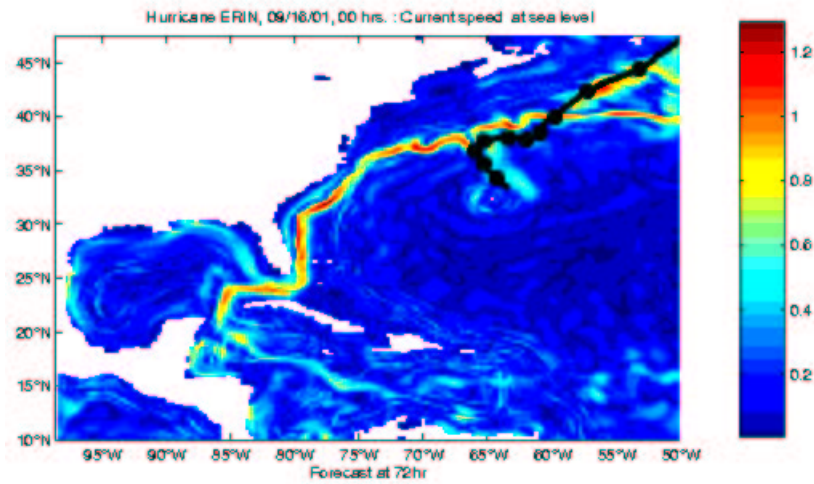
- Run from T254, 64 level GFS
- Ocean Coupling over entire Ocean Domain, Gulf Stream Assimilation
- Increase of Vertical Levels from 18 to 42
- Simplified Arakawa-Schubert Cumulus Parameterization (SAS)
- GFS Boundary Layer Scheme (Replaces M&Y)
- More Accurate Pressure Gradient Computation

CHANGES TO BE IMPLEMENTED IN 2003 (cont'd)

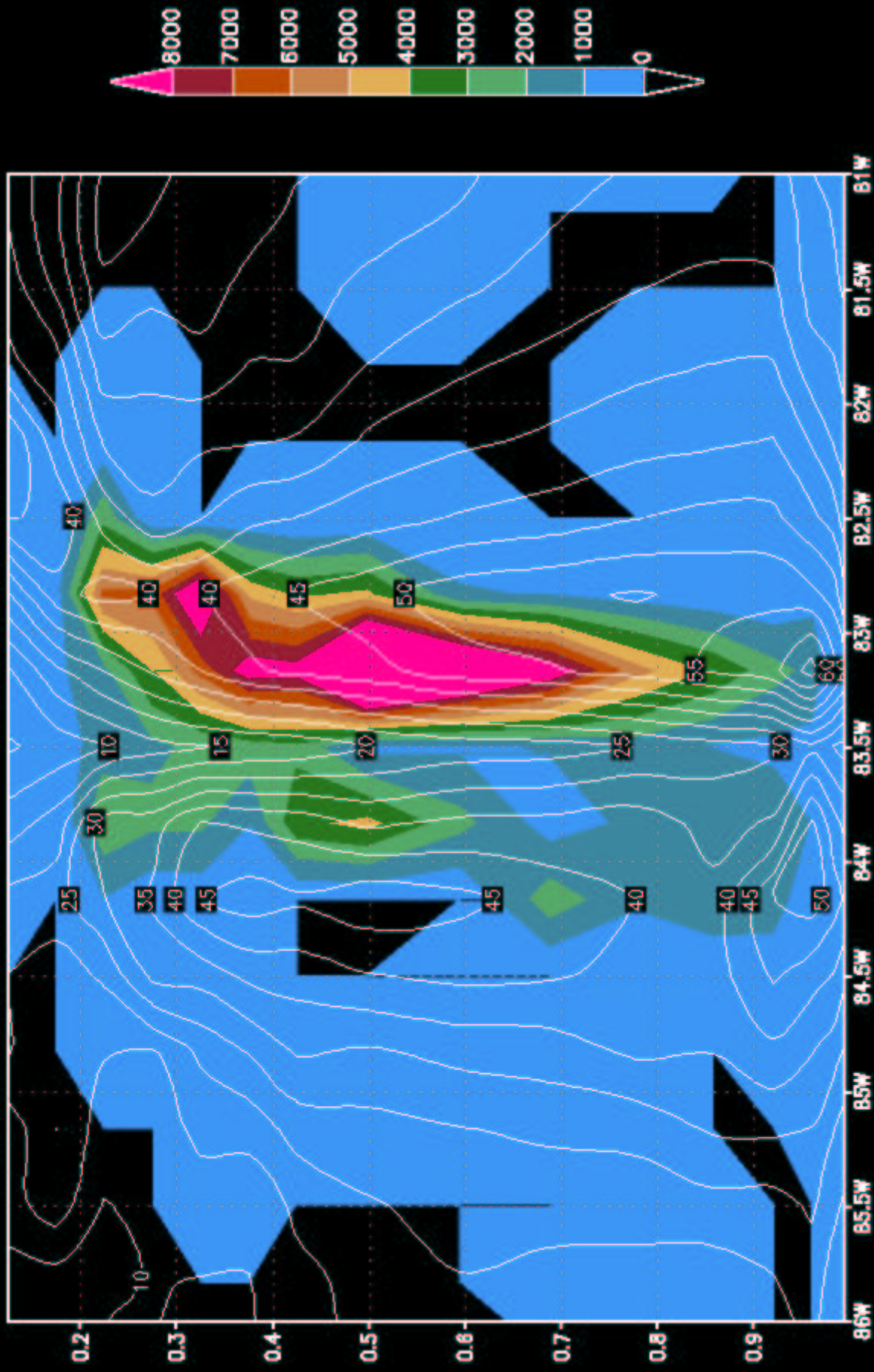
- Improved Mass Initialization
(Reduces Noise over Mountains)
- Improved Interpolation of Winds over mountains
- Improved Vortex removal algorithm in Initialization
- More consistent target wind in initialization
- Bug fix in computation of environmental field

Example of Improved Gulf Stream Structure with New Ocean Initialization

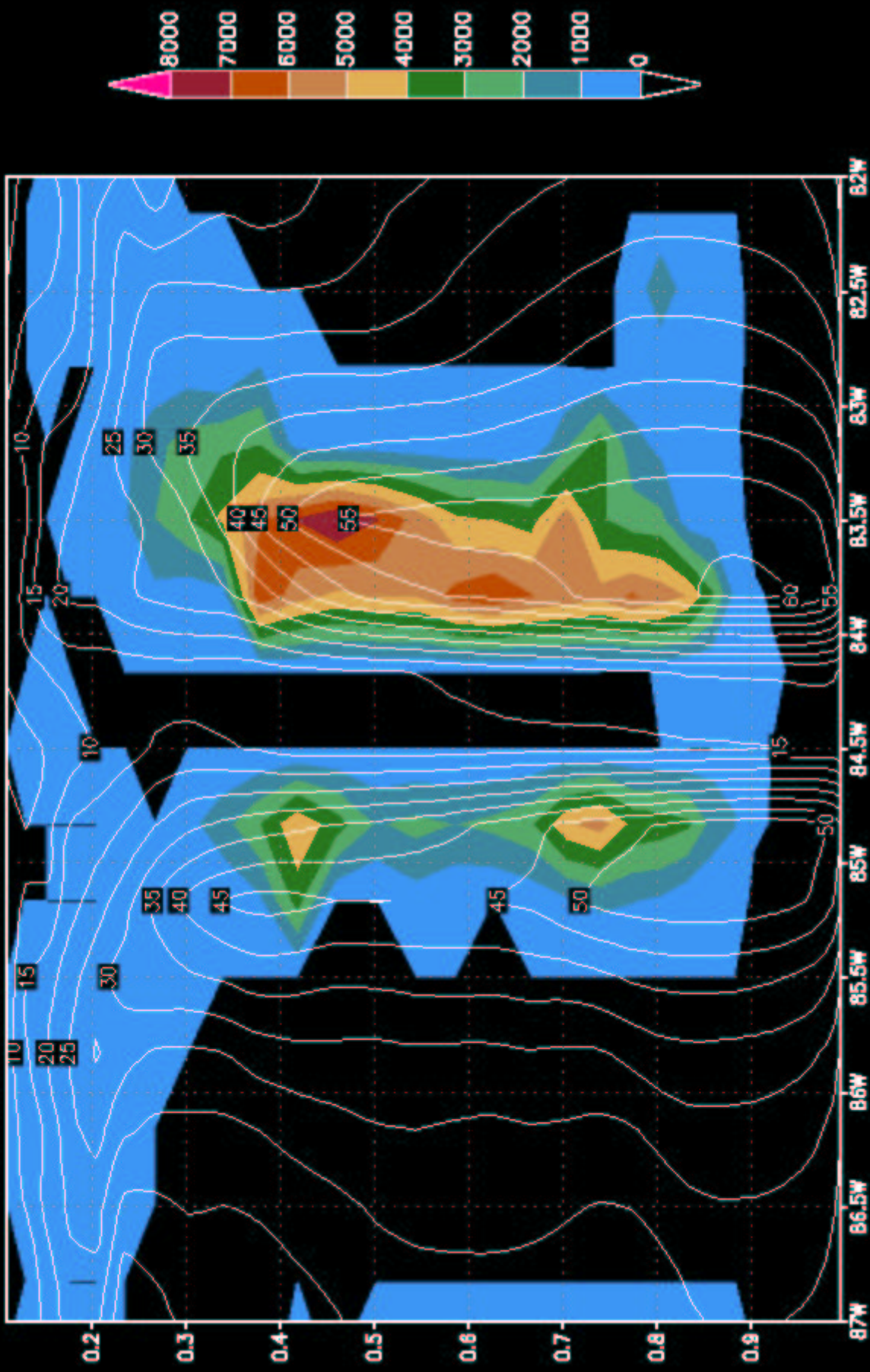
Hurricane Erin Initial Time: *0000 UTC 16 September*



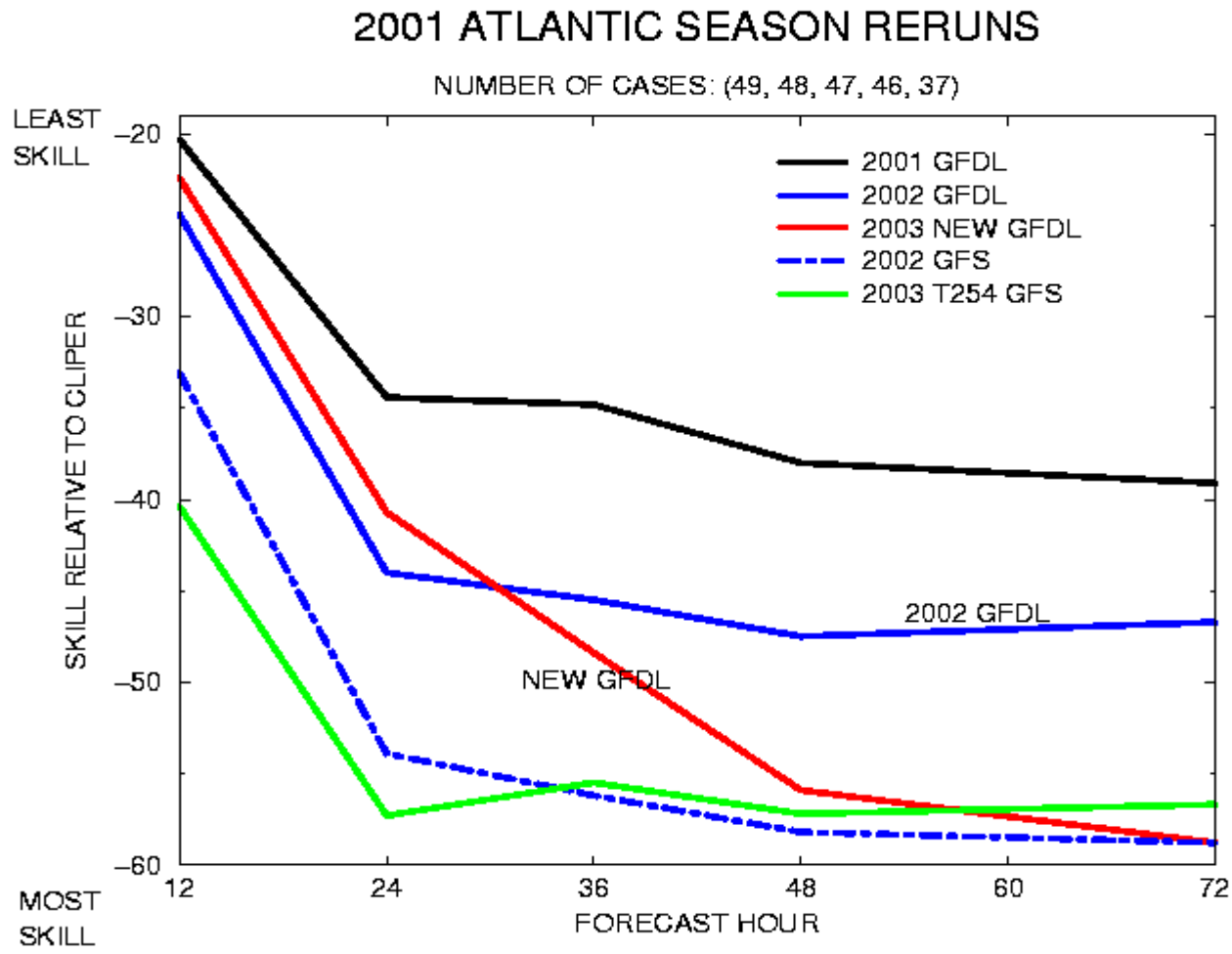
Hurricane Isidore (at 23.2° N) with Kurihara Convection
Total Heating (shaded) and Wind Speed (contours, ms^{-1})
Initial: 2002091912 Valid: 2002092100 (36h)



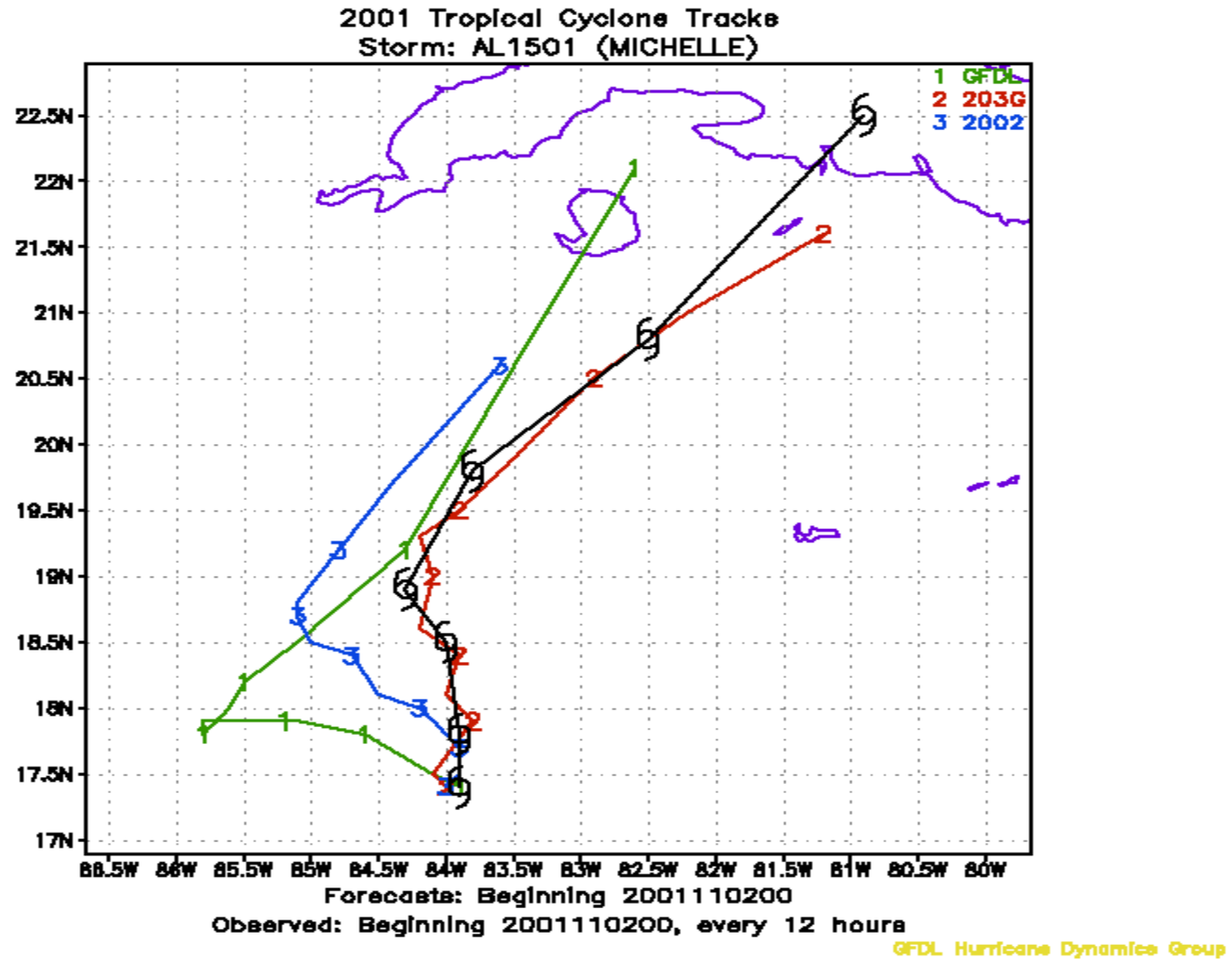
Hurricane Isidore (at 23.5° N) with Simplified AS
Total Heating (shaded) and Wind Speed (contours, ms^{-1})
Initial: 2002091912 Valid: 2002092100 (36h)



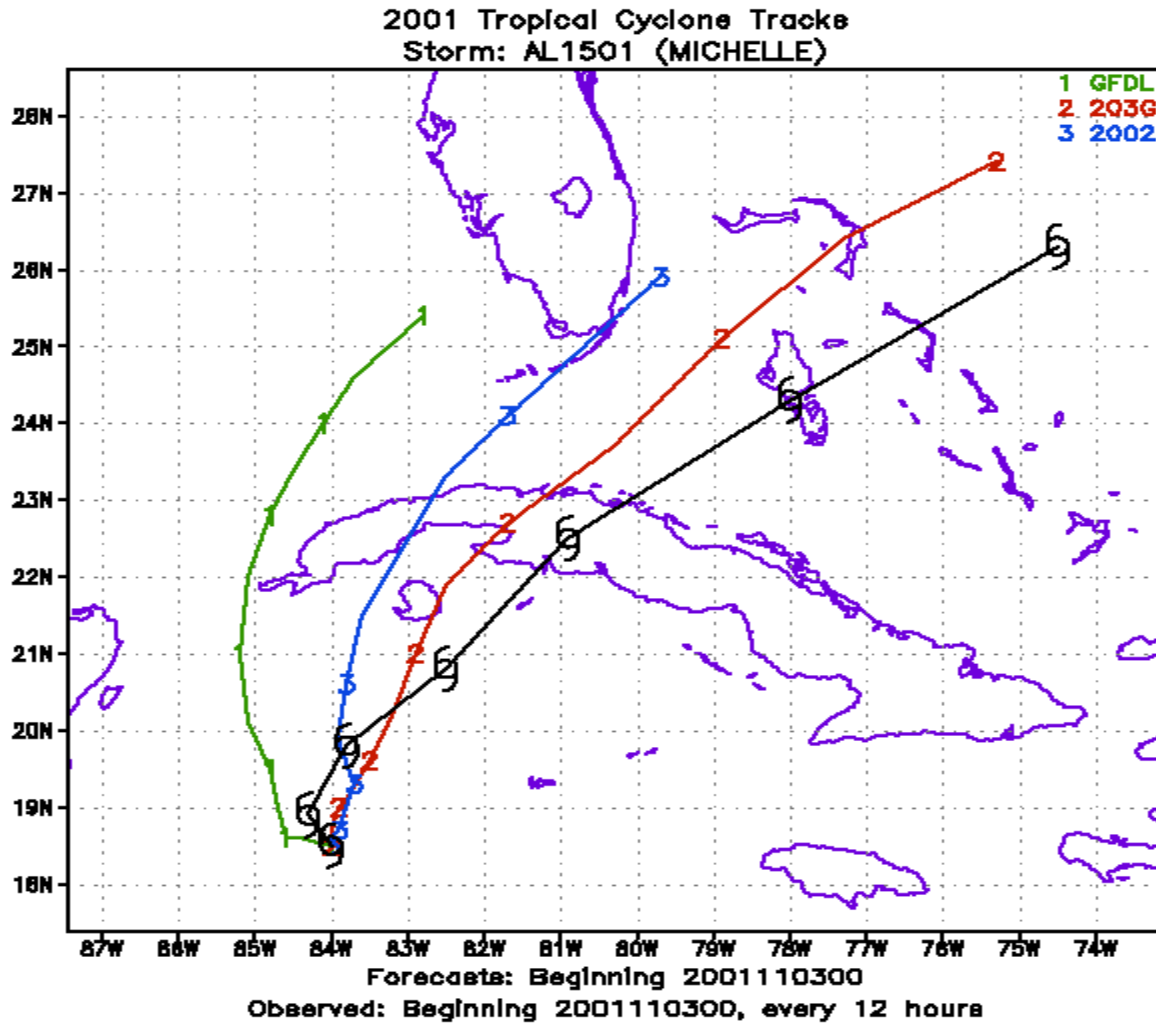
Track Verifications for 2001 Season Reruns



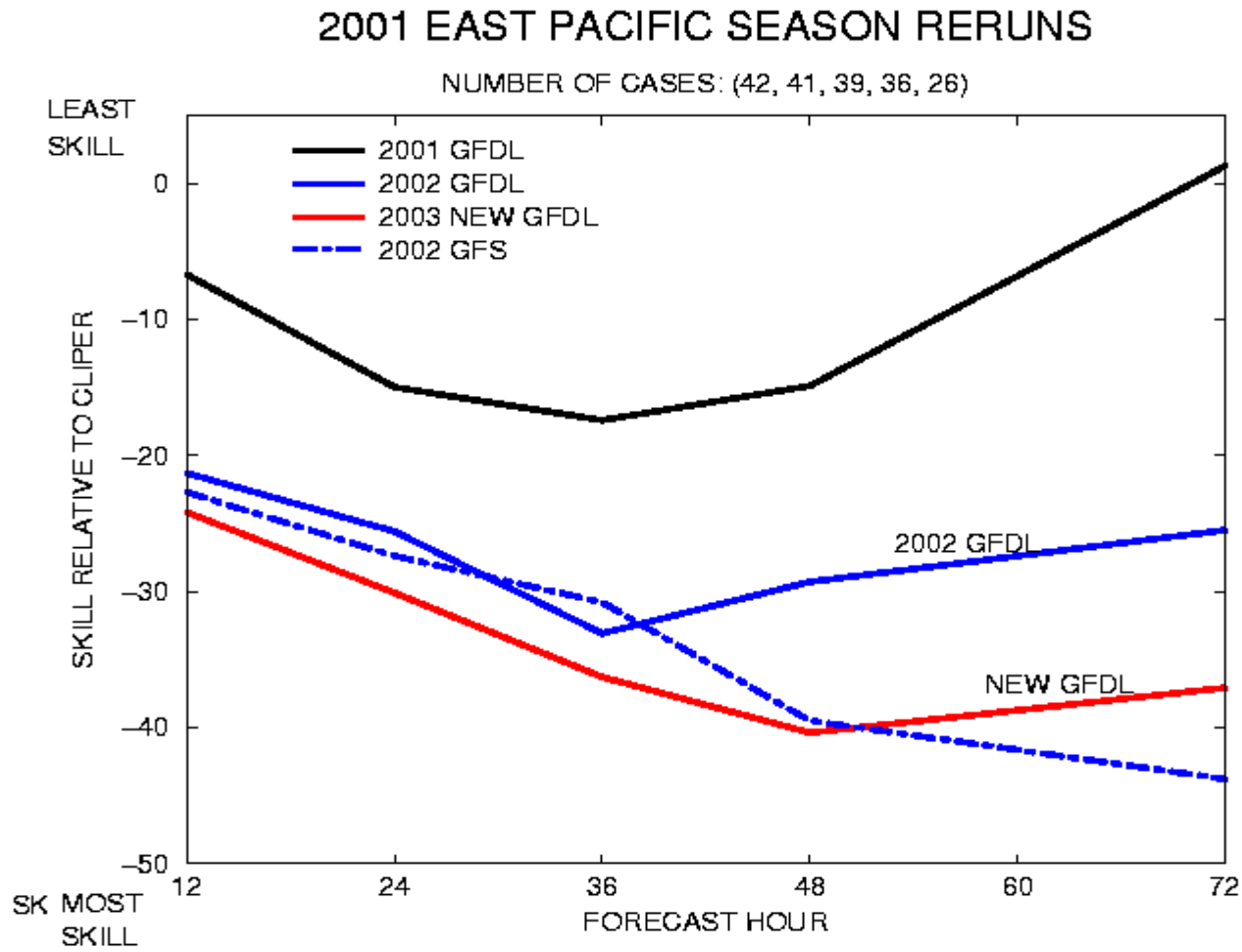
Track Forecasts of Hurricane Michelle from 2001, 2002 and 2003 GFDL Forecast Systems



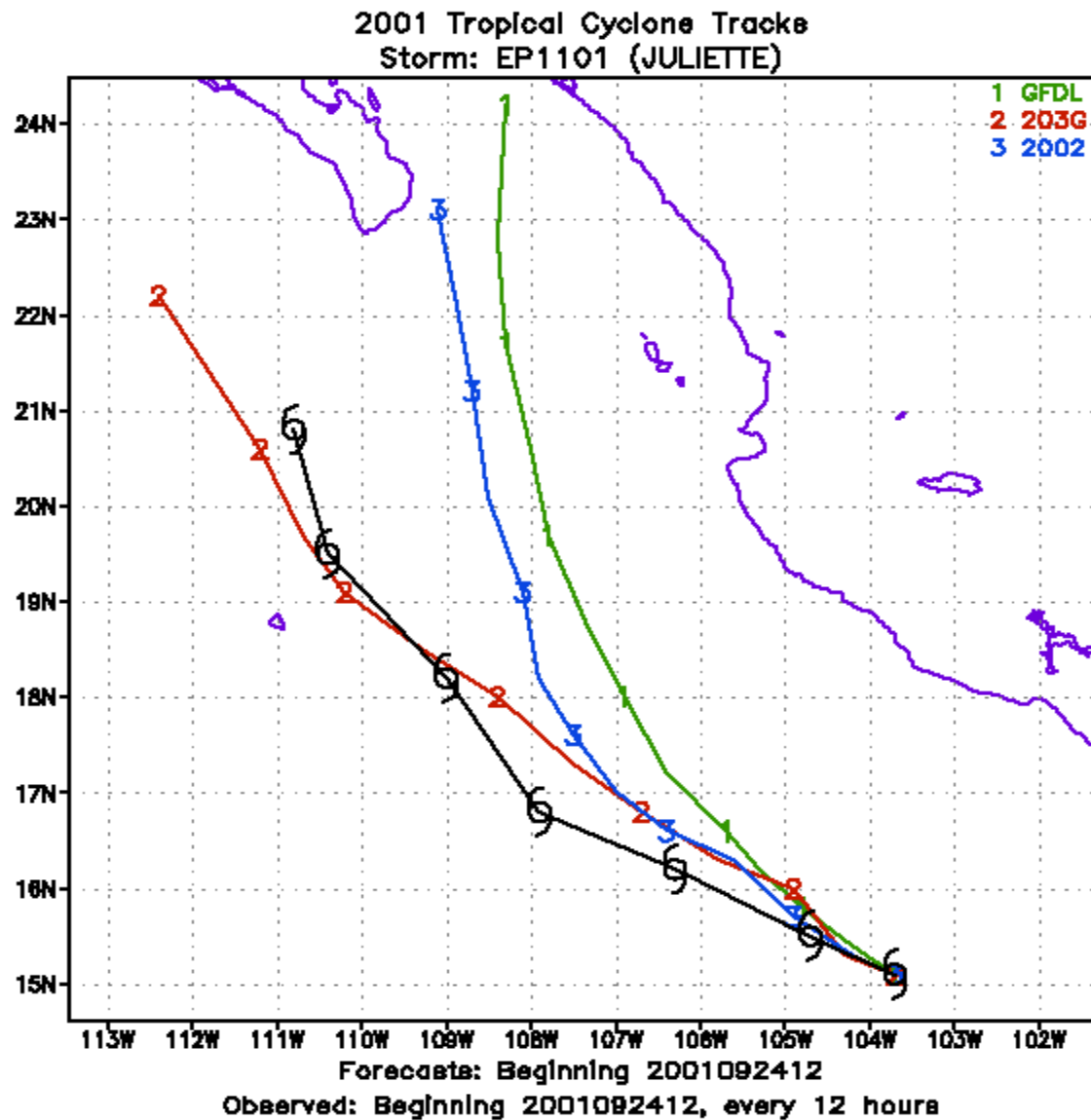
Track Forecasts for Hurricane Michelle from 2001, 2002 and 2003 GFDL Forecast Systems



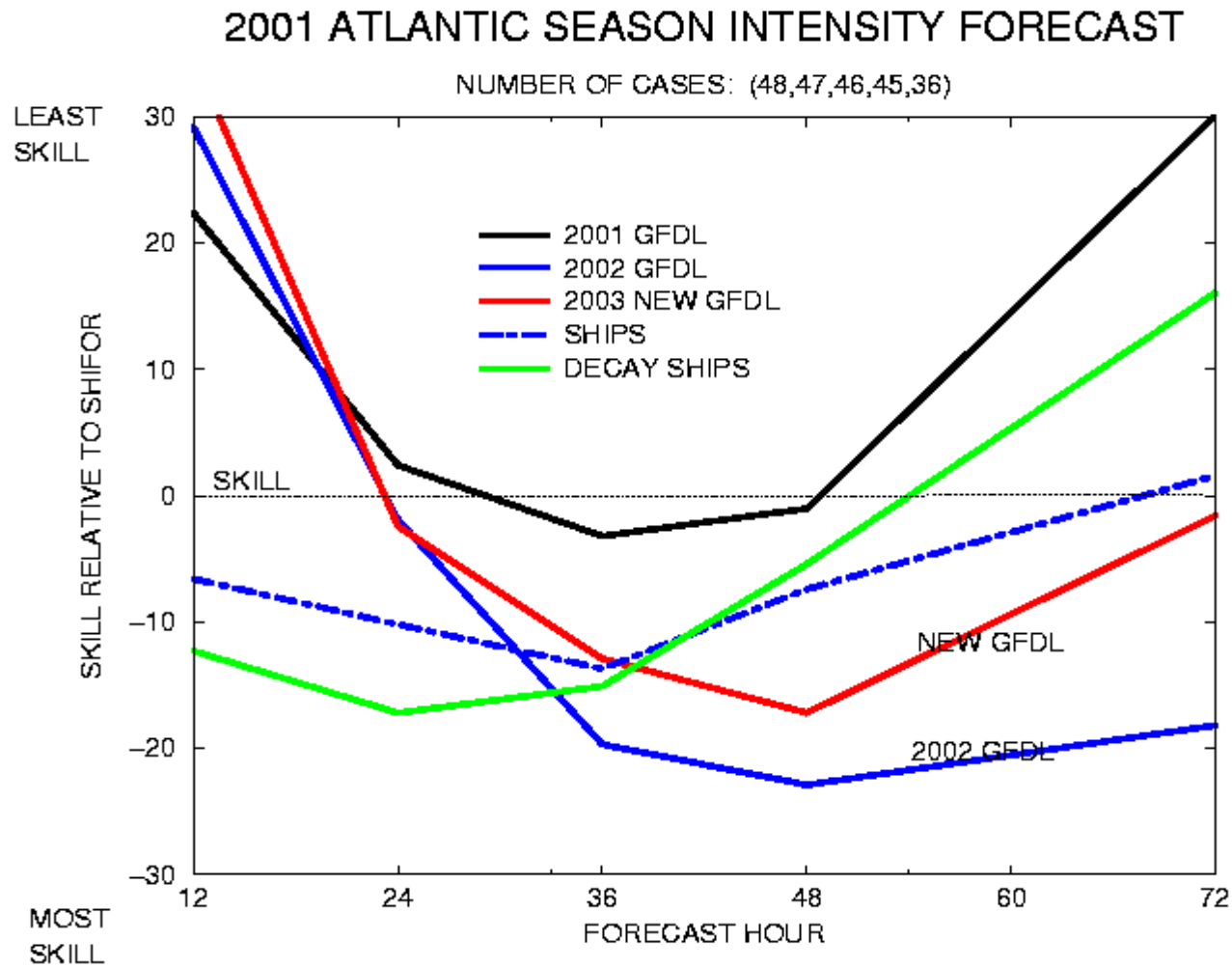
Track Verifications for 2001 Season Reruns



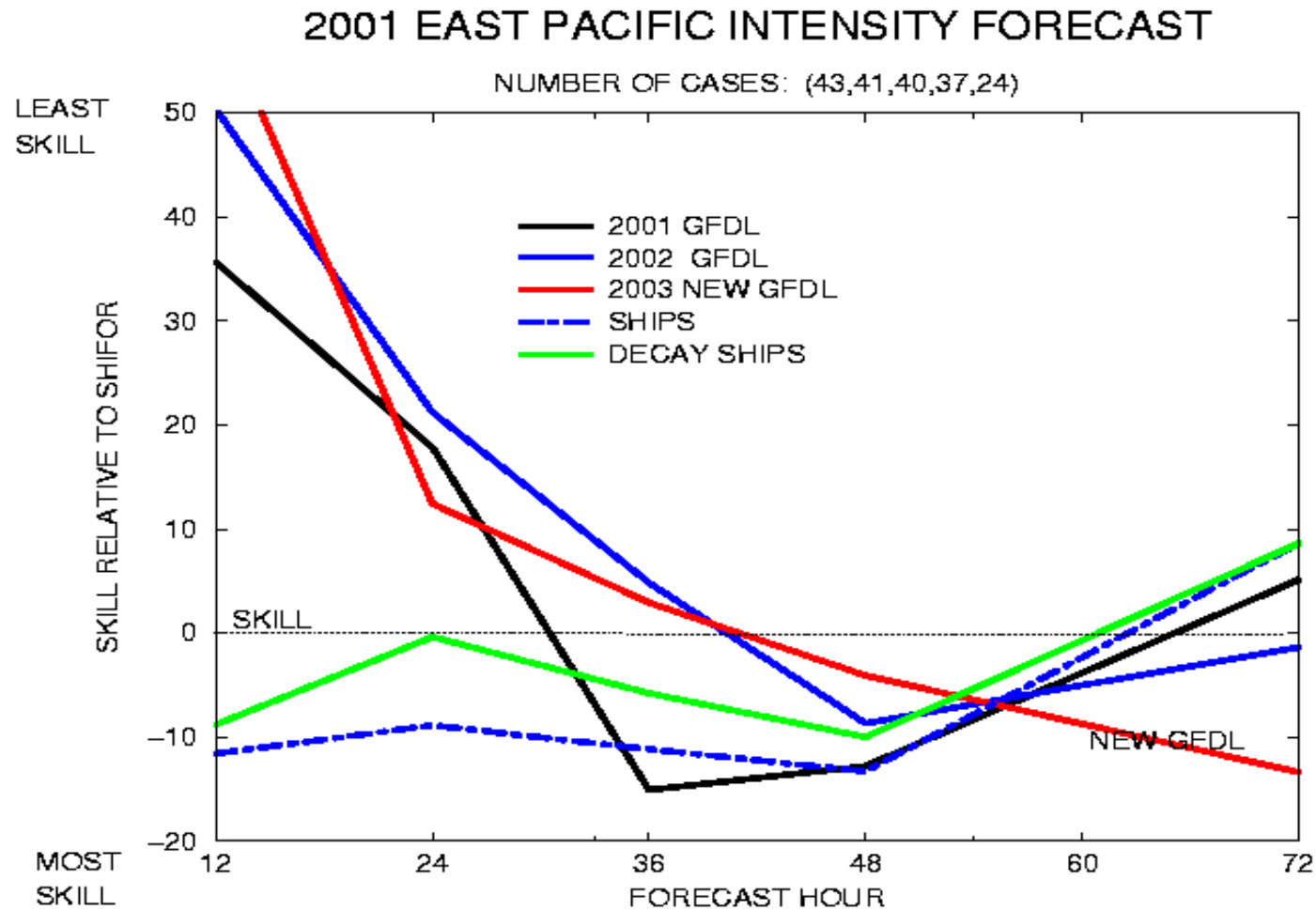
Example of Reduced North Bias



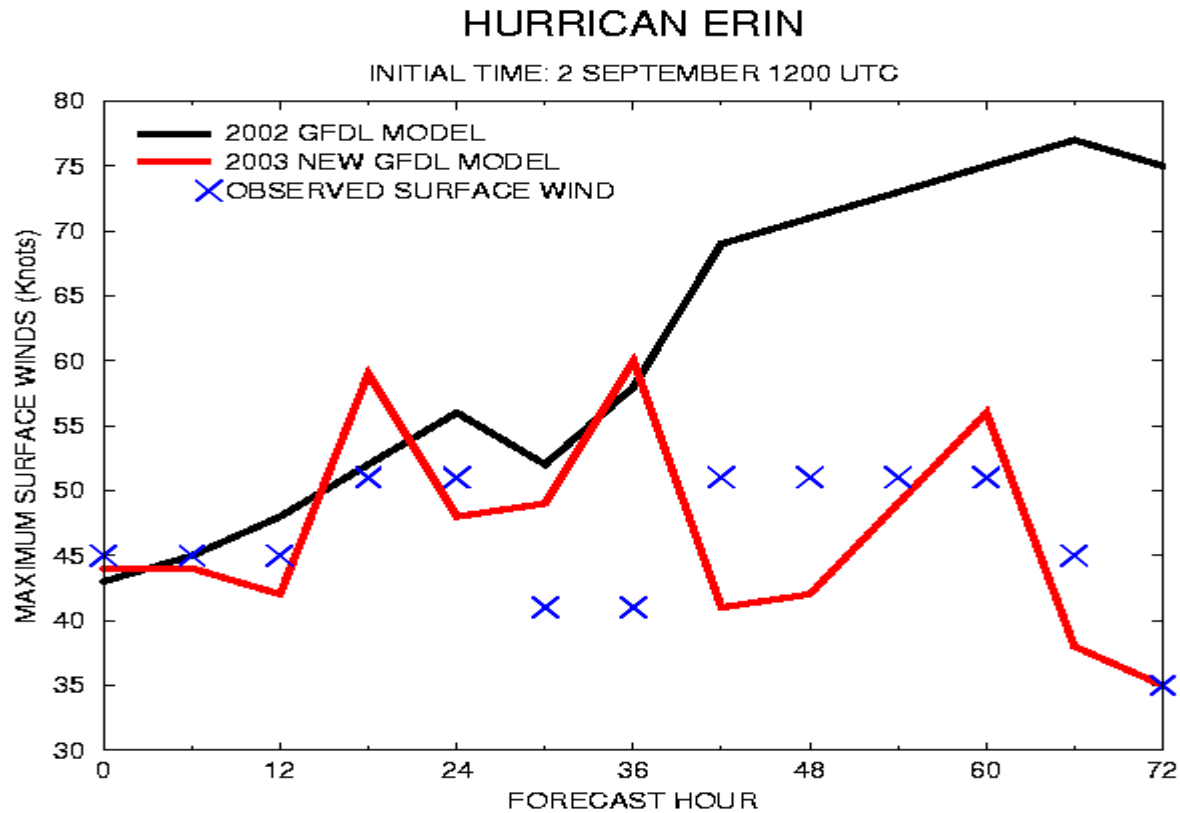
Intensity Verifications for 2001 Season Reruns



Intensity Verifications for 2001 Season Reruns

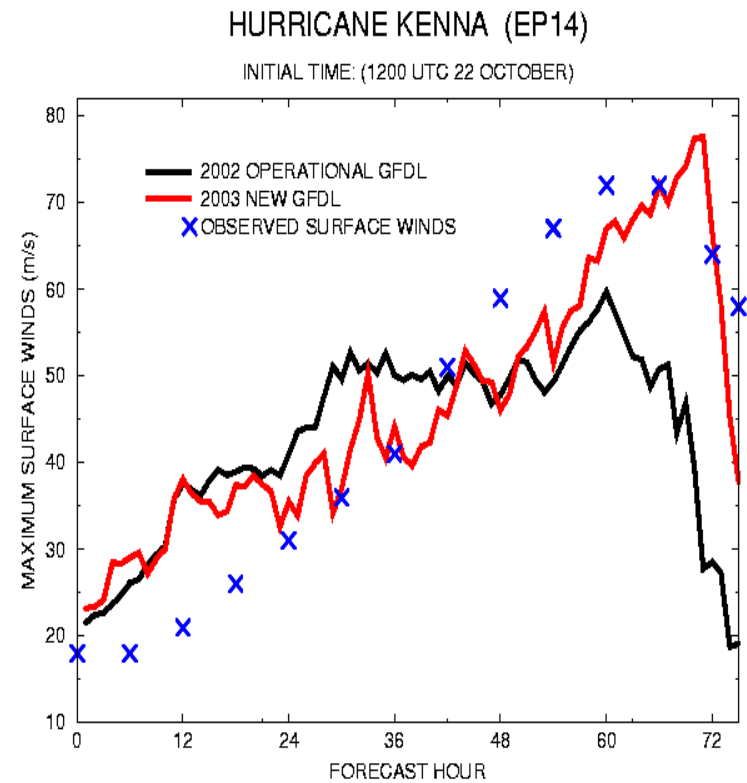
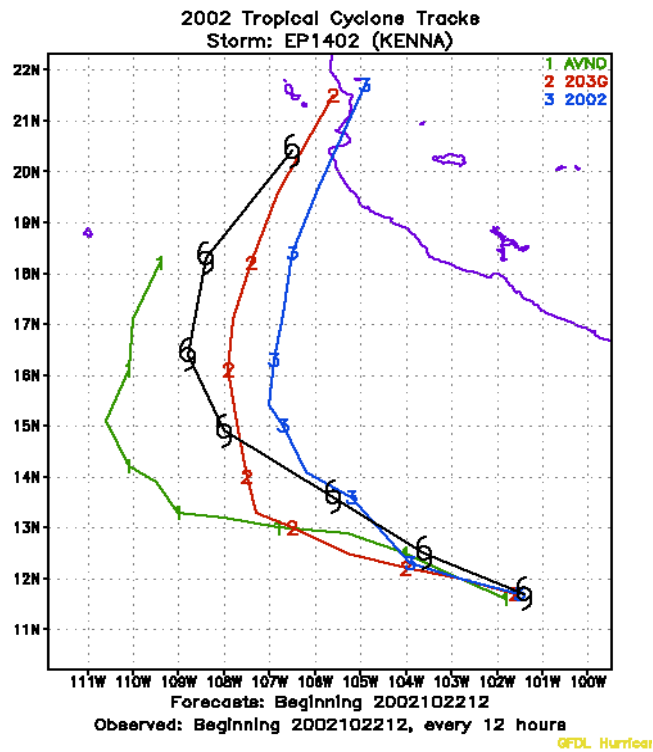


Forecast of Low-Level Winds from 2002 and 2003 Prediction System (Hurricane Erin)

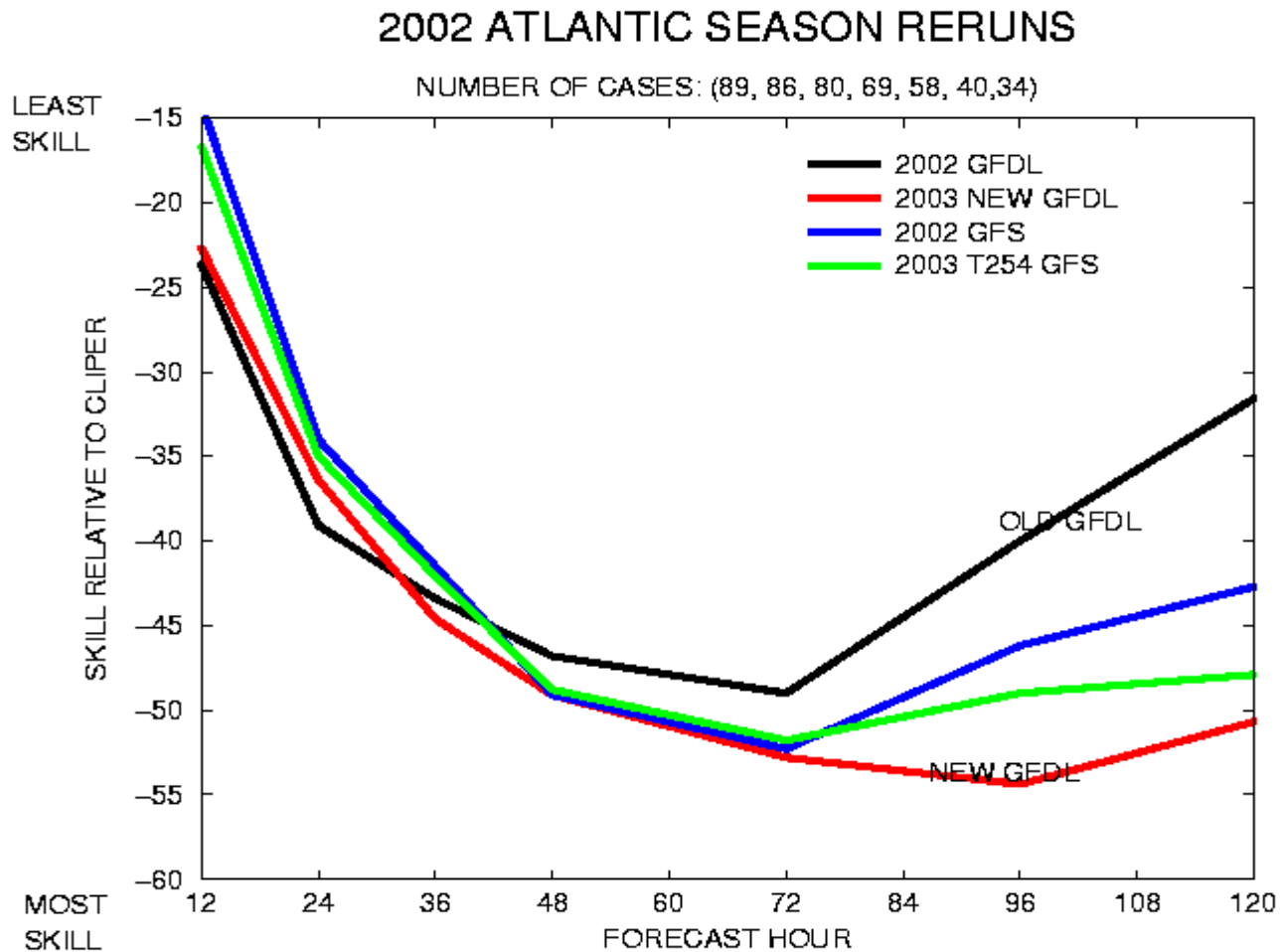


Forecast of Low-Level Wind and Track from 2002 and 2003 Prediction System

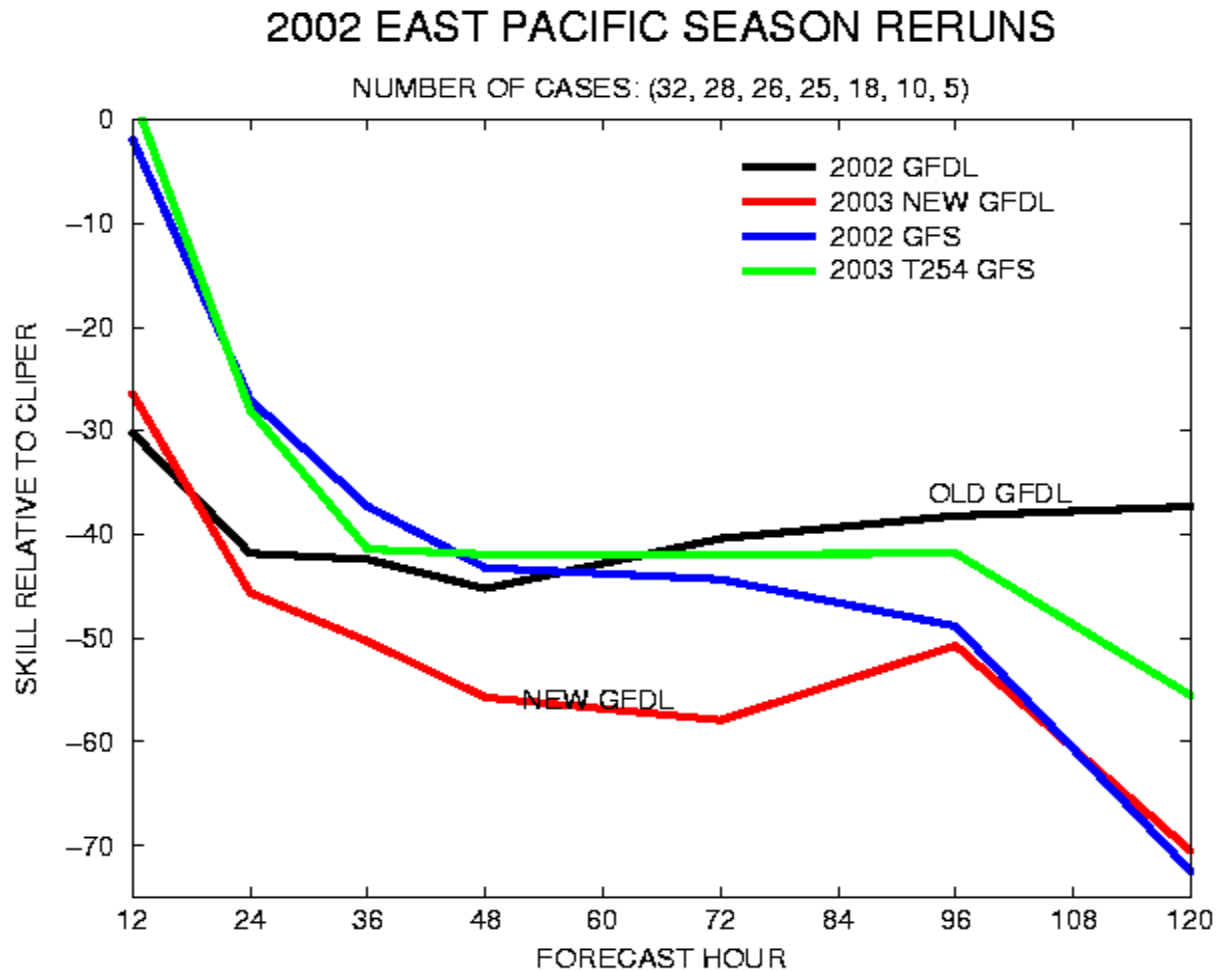
Hurricane Kenna Initial Time: *1200 UTC, 22 October*



Track Verifications for 2002 Season Reruns

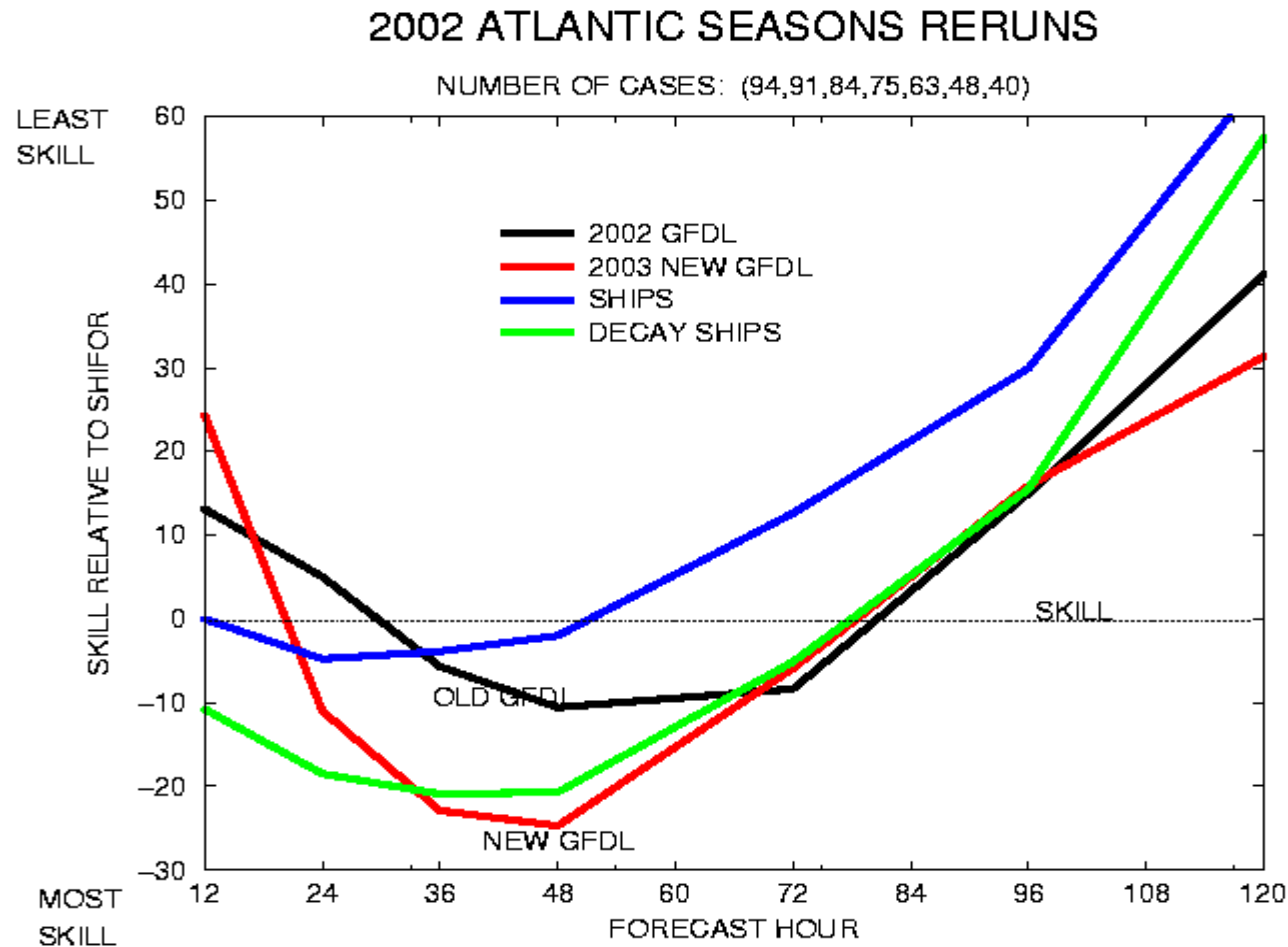


Track Verifications for 2002 Season Reruns



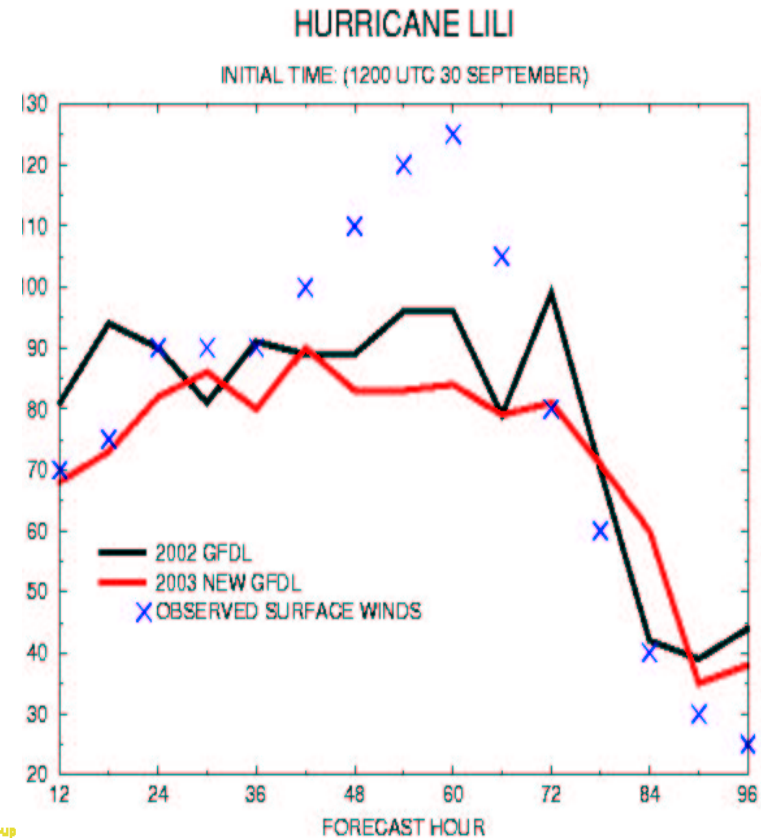
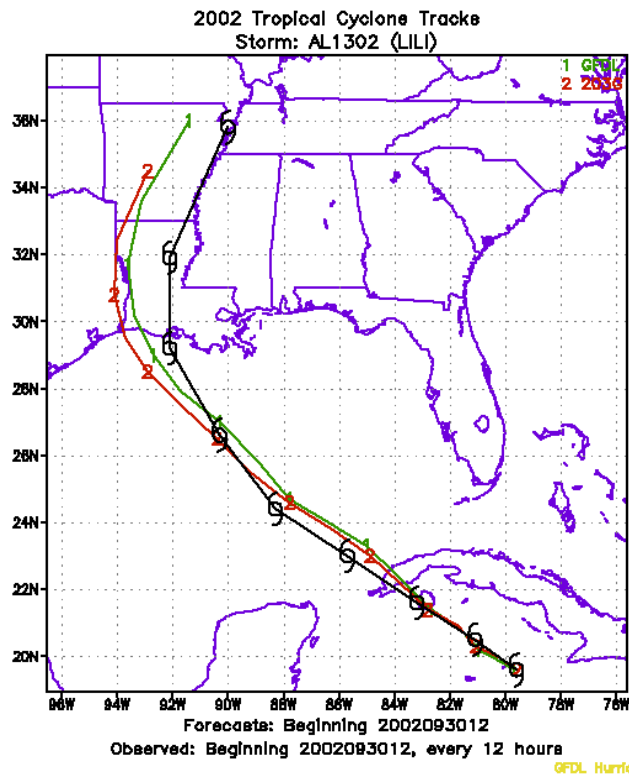
Intensity Verifications for 2002 Season

Reruns



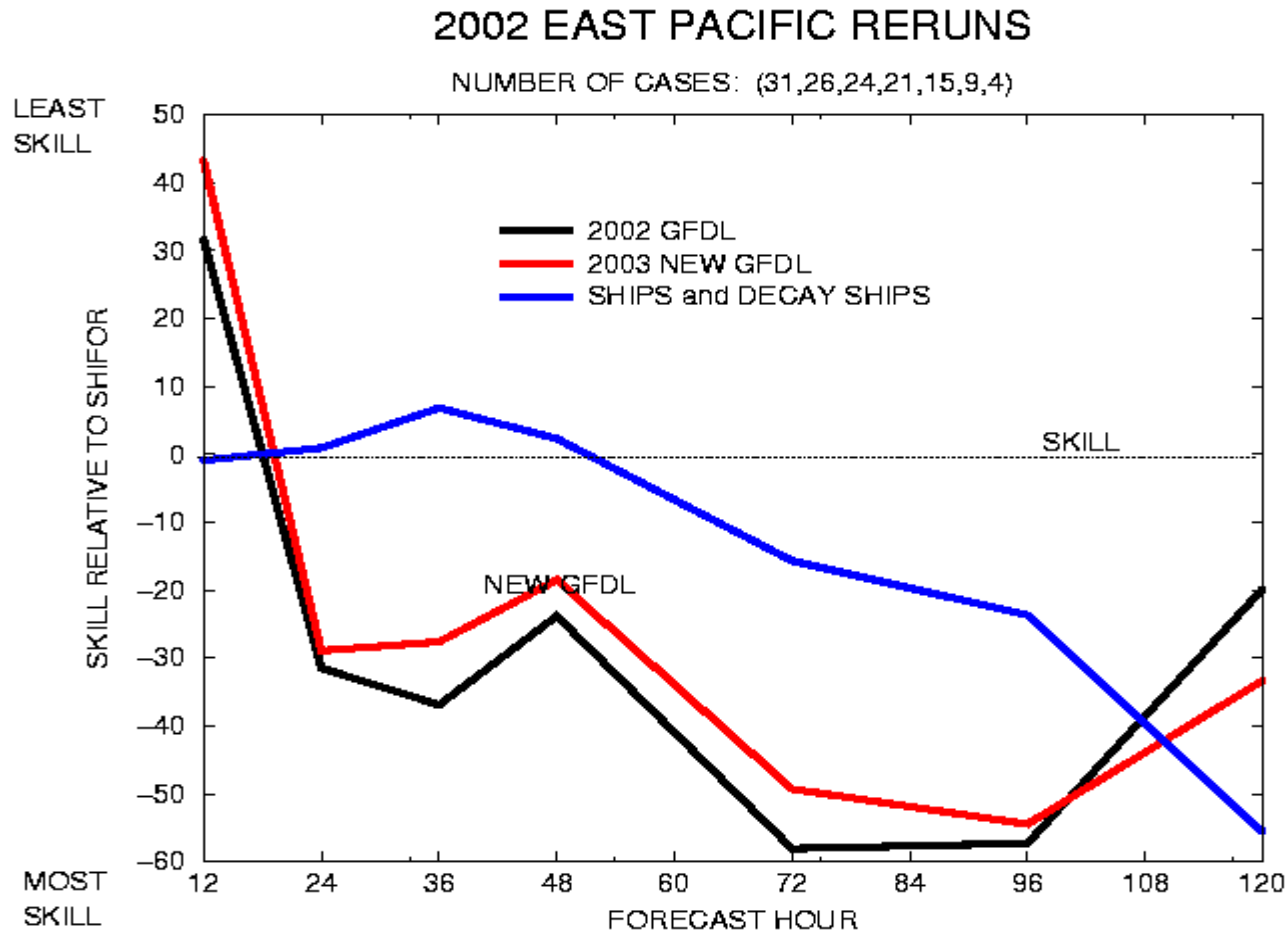
Forecast of Low-Level Wind and Track from 2002 and 2003 Prediction System

Hurricane Lili Initial Time: 1200 UTC, 30 September



Intensity Verifications for 2002 Season

Reruns



SUMMARY

1. For 2001 the track error was reduced about 15% for the 2-3 day period in both the Atlantic and East Pacific.
2. For 2002 in the Atlantic the track improvements were in the later times (3-5 days) ranging from 8% at day 3 to nearly 35% at 4-5 days.
3. In the East Pacific the track error was reduced in both seasons primarily due to elimination of the severe north bias near the Mexican coast.
4. The new GFDL model has lead to significantly improved track forecasts for cases in the 2001 and 2002 Hurricane Season.
5. Some improved skill in intensity prediction was noted in the 1-2 day period although the model's large positive intensity bias was greatly reduced particularly in the Atlantic.
6. The new model may tend to under-predict the intensity of depressions and weak tropical storms except under highly favorable conditions.