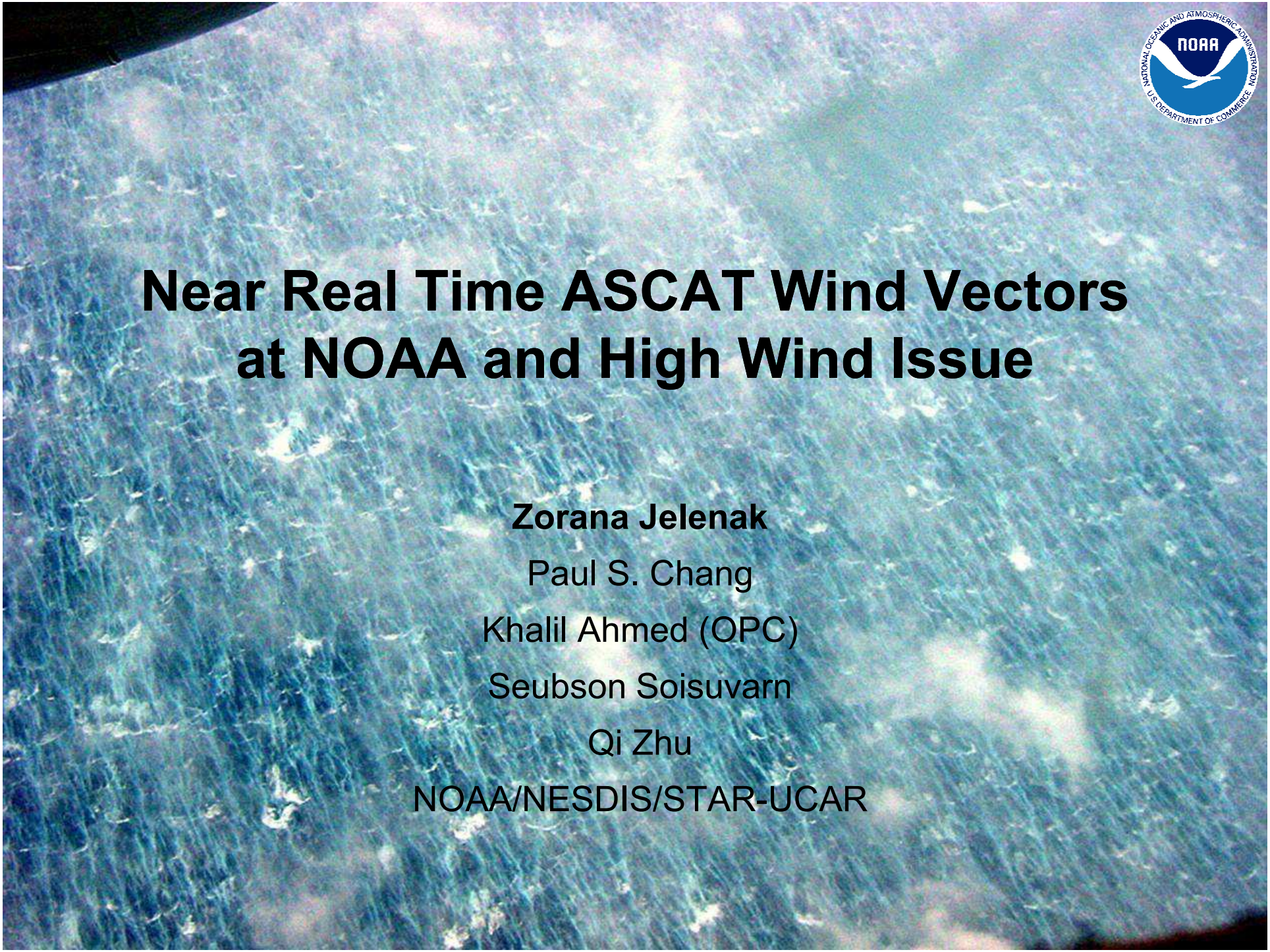


# Near Real Time ASCAT Wind Vectors at NOAA and High Wind Issue

**Zorana Jelenak**

Paul S. Chang

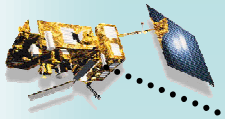
Khalil Ahmed (OPC)

Seubson Soisuvarn

Qi Zhu

NOAA/NESDIS/STAR-UCAR

# ASCAT Wind Processing Implemented at NOAA



Feb 2007

Input $\sigma^0$ values

EUMETSAT

Pre-processing $\sigma_0$ correction

Inversion using CMOD5.5 GMF

Quality Control

Input NWP collocation (NOAA's GFS)

Ambiguity Removal

KNMI

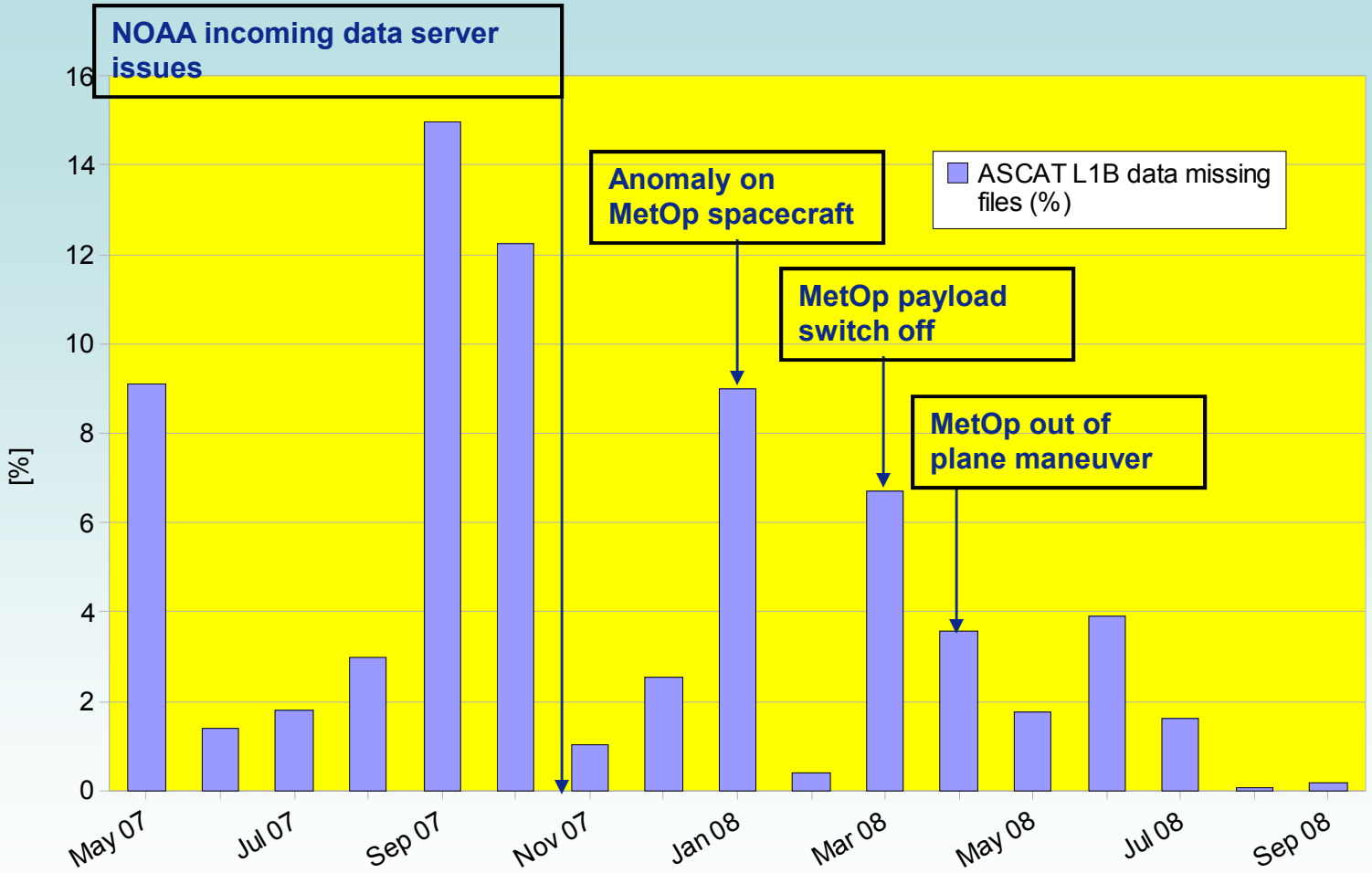
25 and 12.5km products available in NRT

**Output Wind Vector**

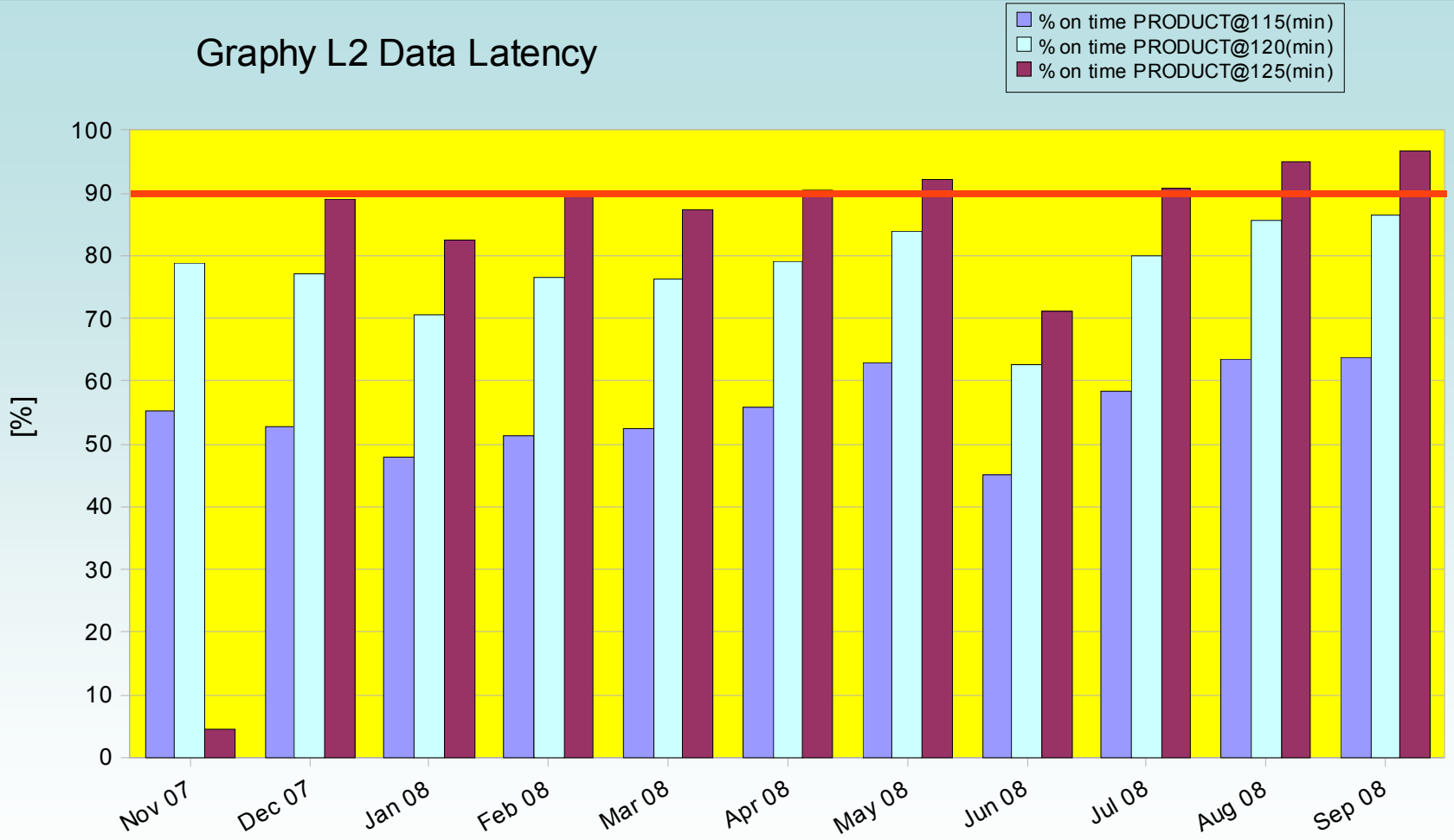
Operational Users

Research & Validation

# % of Missing ASCAT L1B Files in NOAA Operations

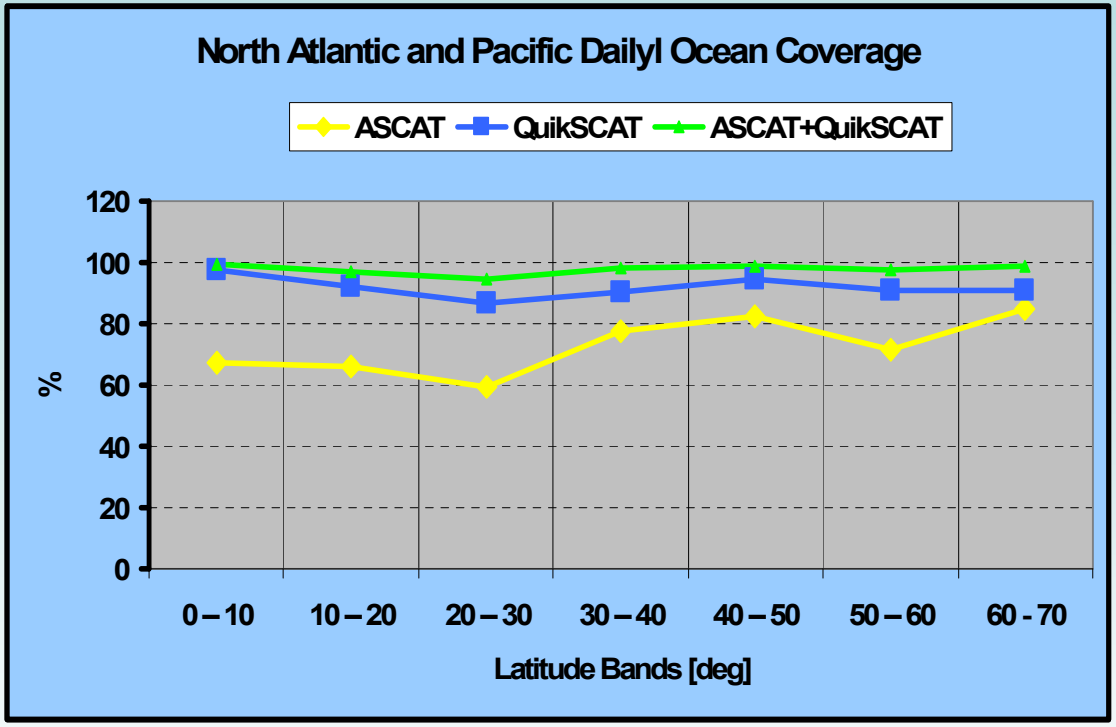


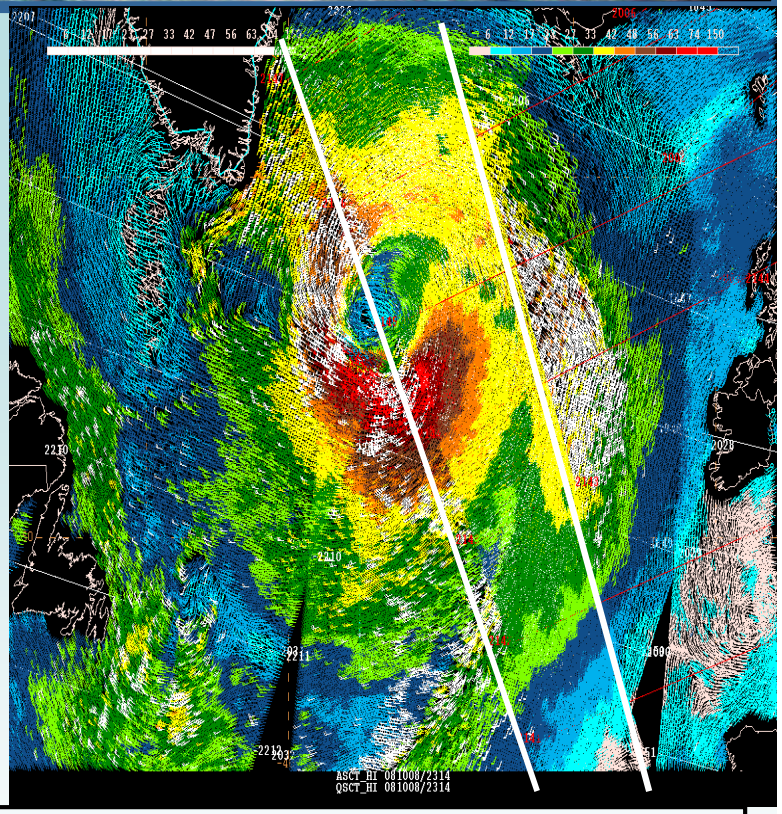
# % of On-time QuikSCAT Product Generation (End to End)



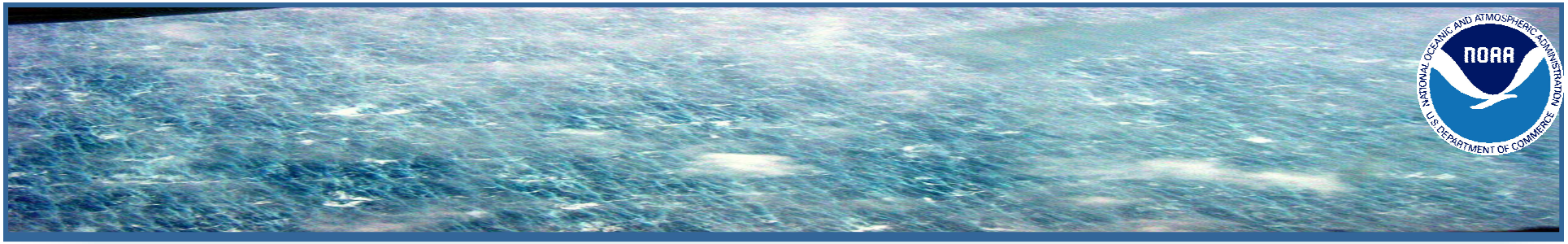

**90% of ASCAT wind products produced and available to users within 125 minutes**

# ASCAT Winds in NOAA Operations



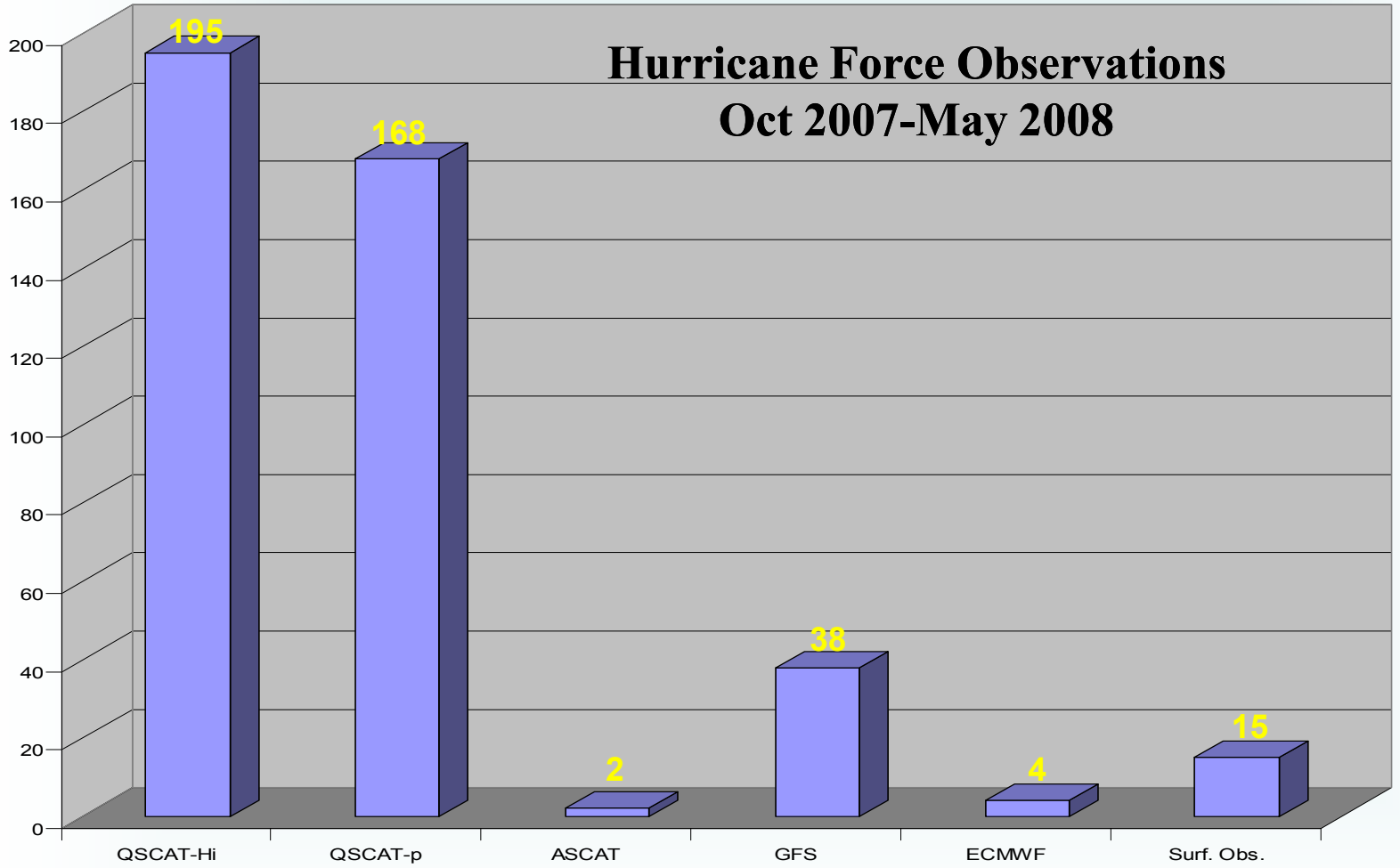




- *ASCAT provides a new, additional source of OSVW data in the large and mostly data void ocean regions within OPC and TPC's areas of responsibility (AOR)*
- *Extremely useful in rainy regions when QuikSCAT retrievals are questionable*
- *In low to moderate wind speed regimes two scatterometers have very comparable utility for marine forecasting and warning products*
- *High winds – not many of them – large difference between QuikSCAT and ASCAT*



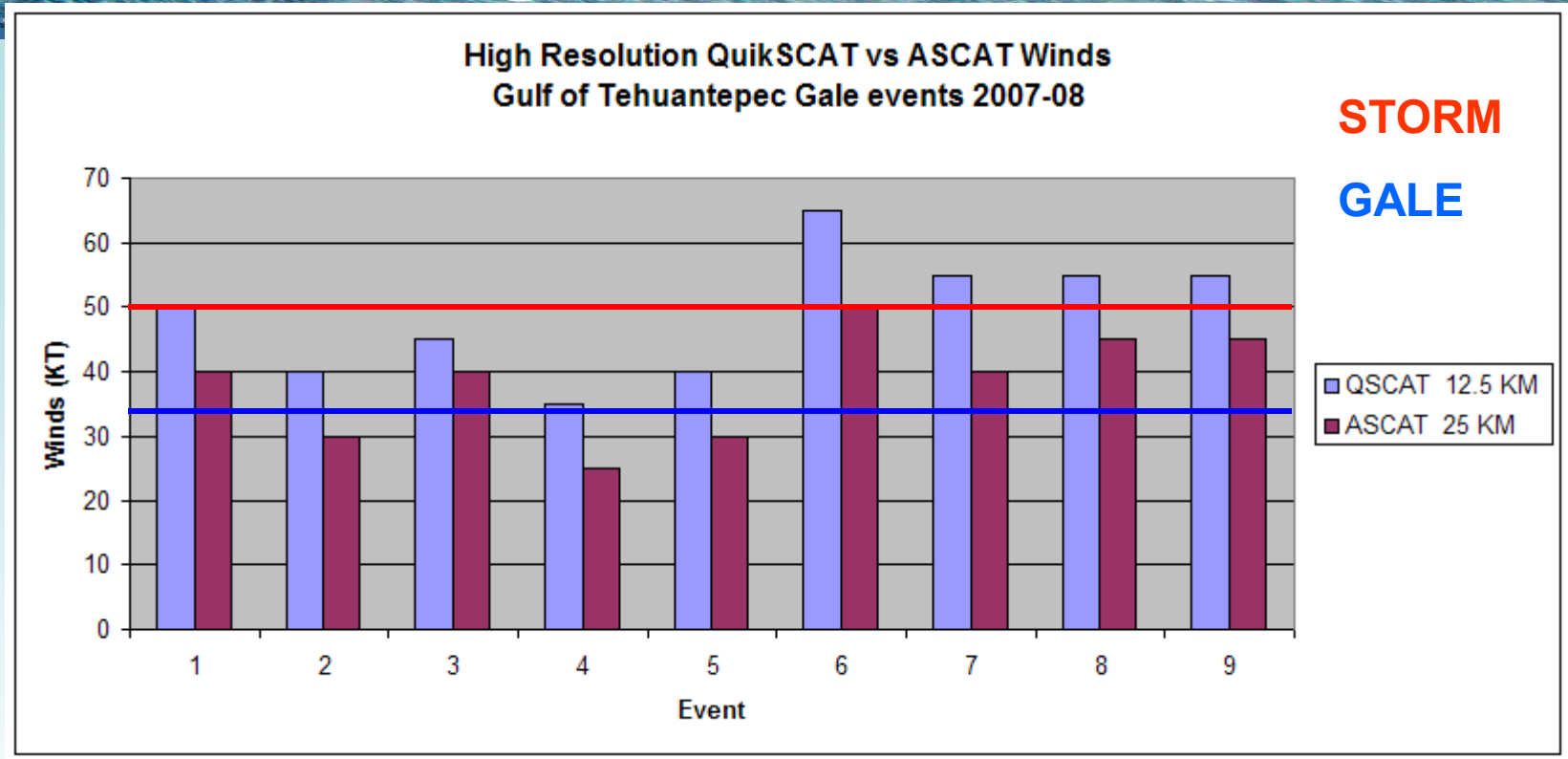
# High Wind Issue

# Utility of ASCAT in HF warnings




Khalil Ahmad NWS/OPC

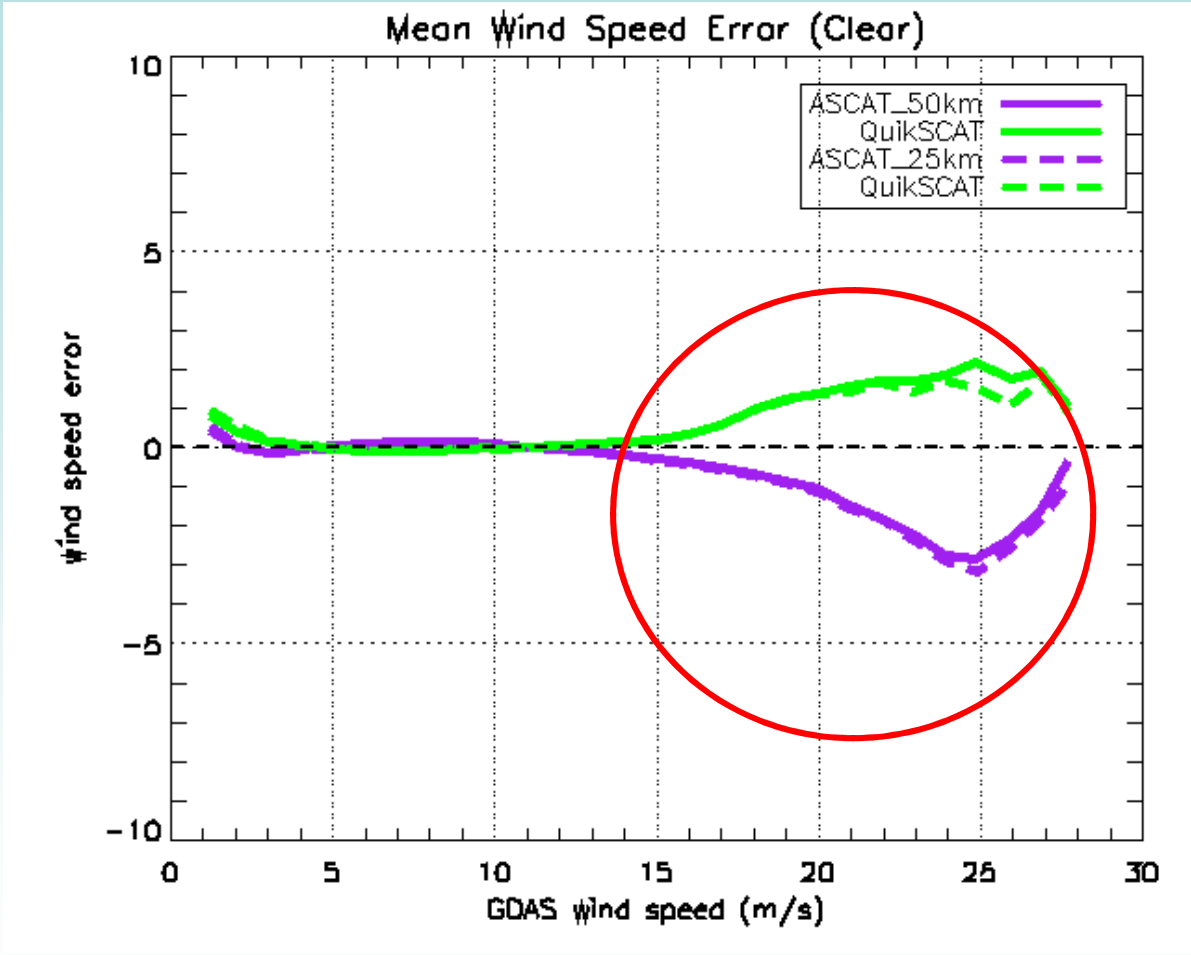
# 12.5 KM QuikSCAT vs 25 (12.5) KM ASCAT Retrievals




QuikSCAT Higher by ONE warning category in 8 out of 9 events

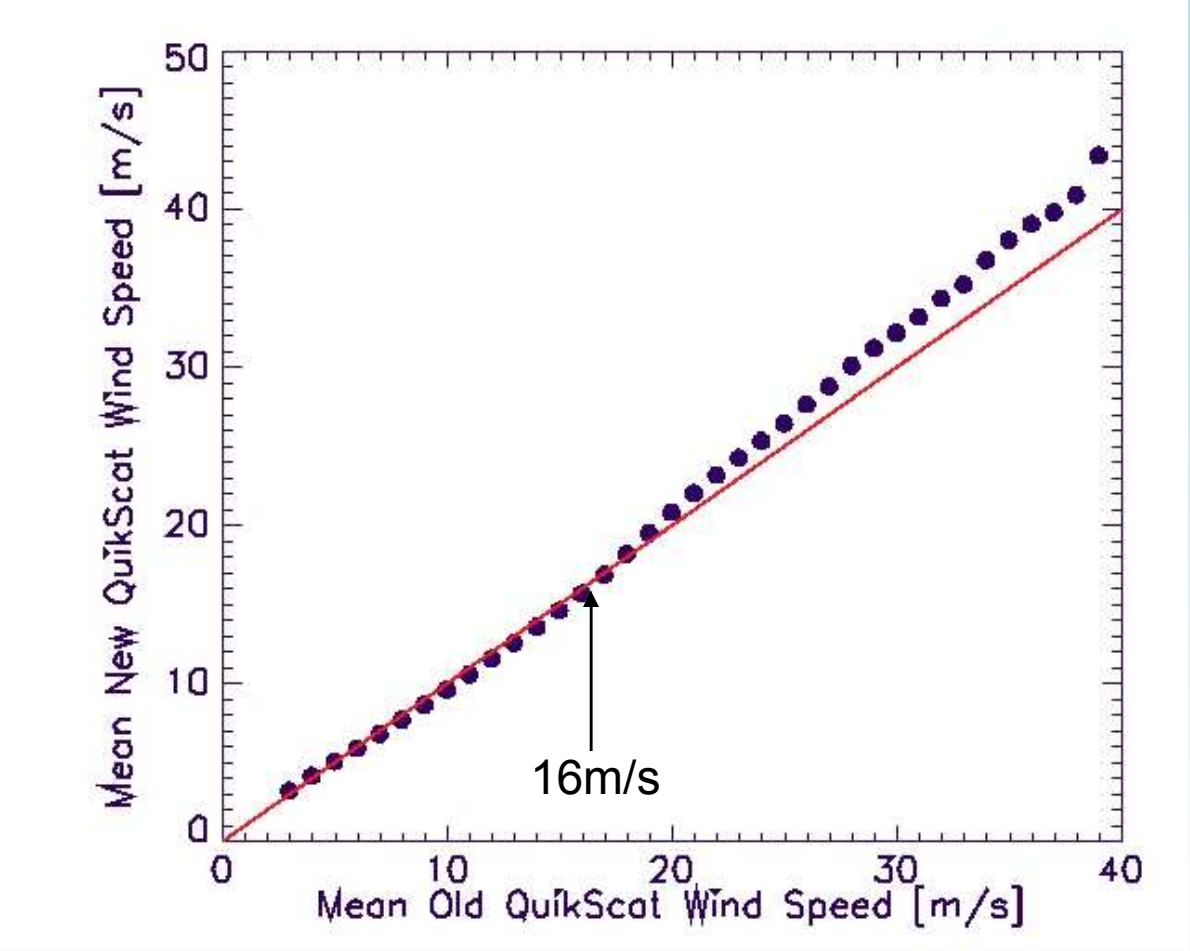
Hugh Cobb NHC/TAFB

# QuikSCAT-ASCAT-GDAS Wind Speeds



# Turning Model Function Knob

# Old vs New QuikSCAT NRT Wind Speeds



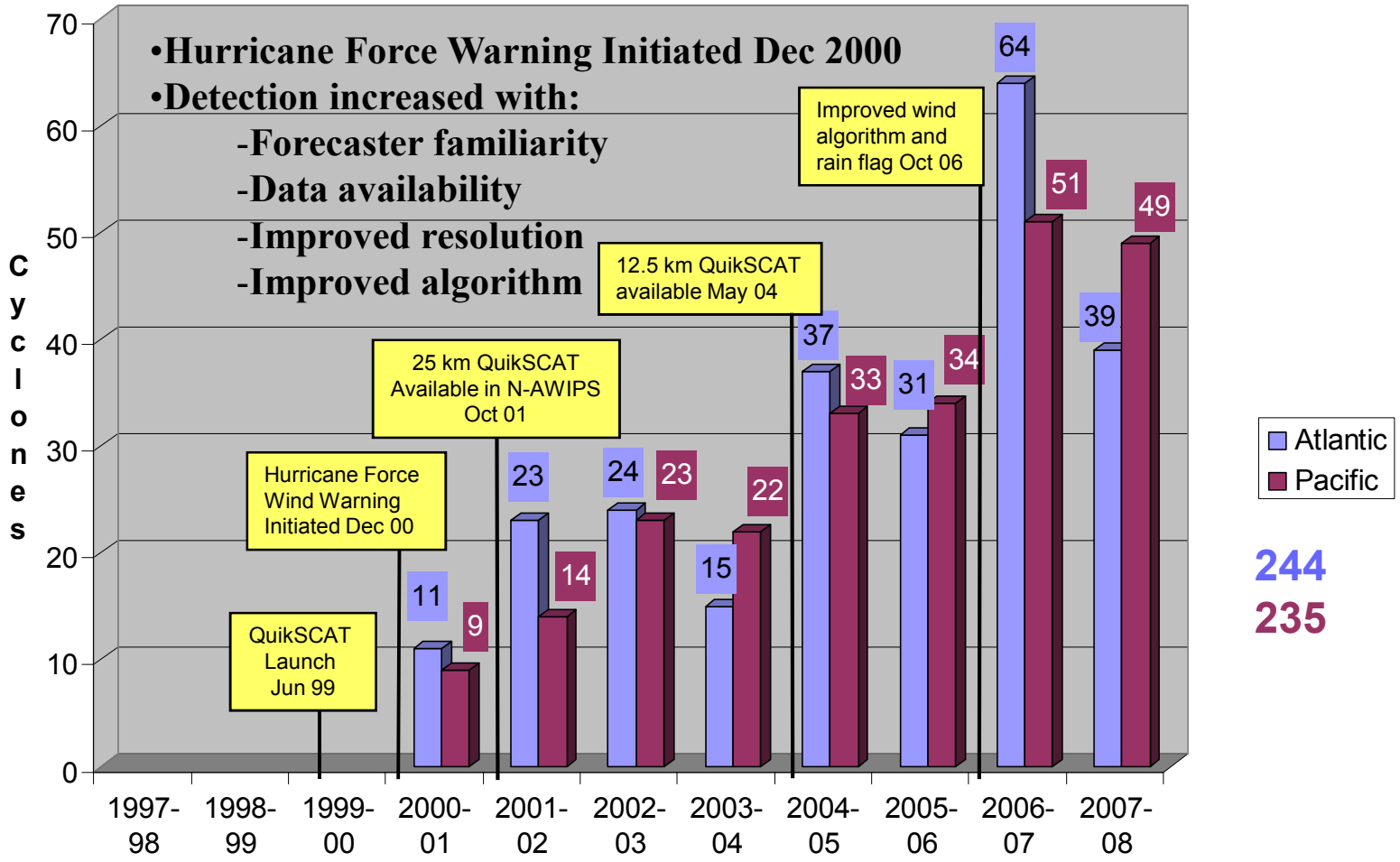

QSCAT-1MOD model function implemented in QuikSCAT NRT processing in May 2006

# Hurricane Force Extratropical Cyclones - Detection and Warning Trend using QuikSCAT

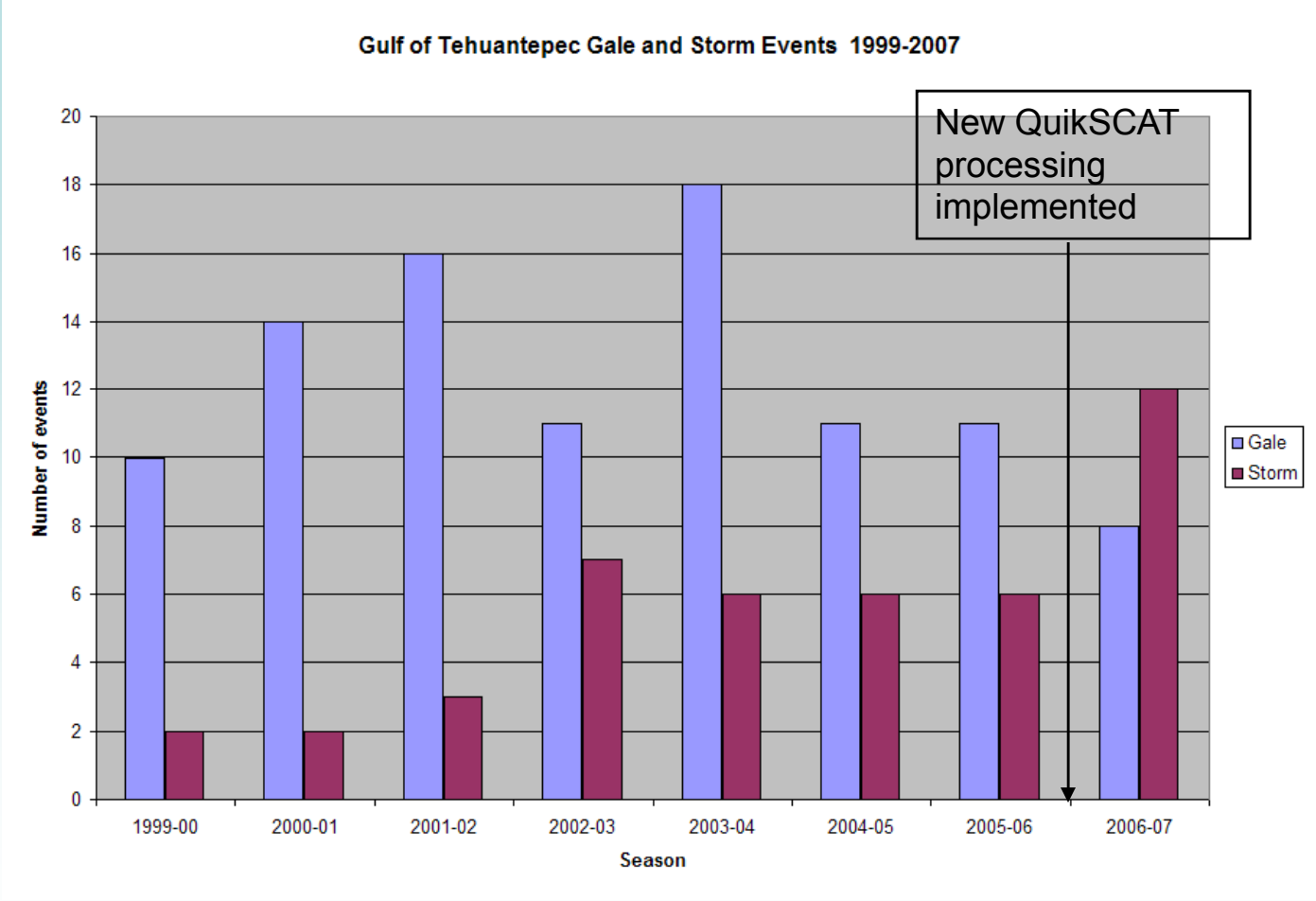
**WARNING CATEGORIES**

**Pre- QSCAT**
1. GALE 34-47 kt
2. STORM ≥48

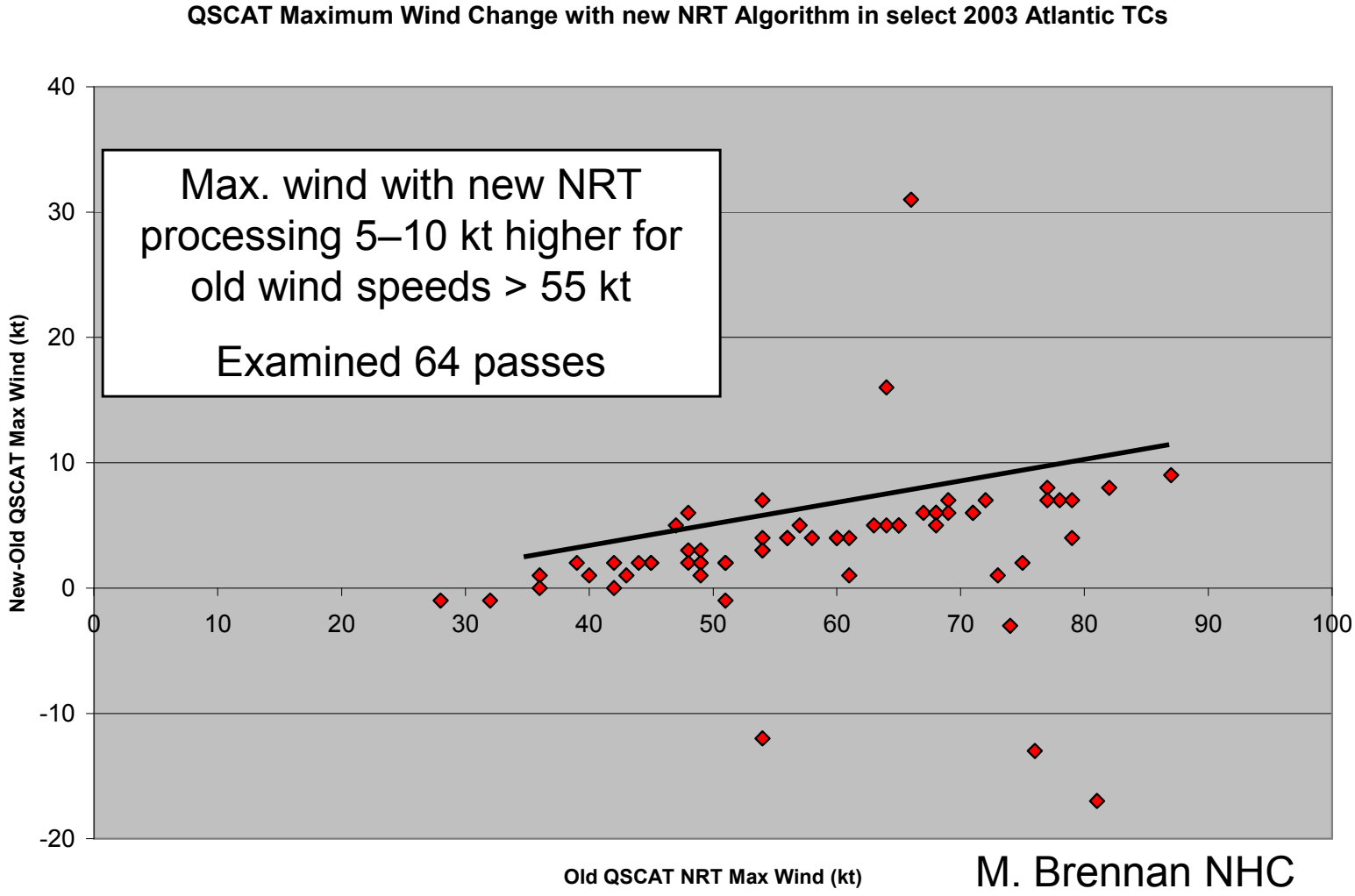
**QSCAT ERA**
1. GALE 34-47 kt
2. STORM 48 -63 kt
3. HURCN FORCE ≥ 64 kt



# Storm and Gale Wind Events – Gulf of Tehuantepec from 1999-2007



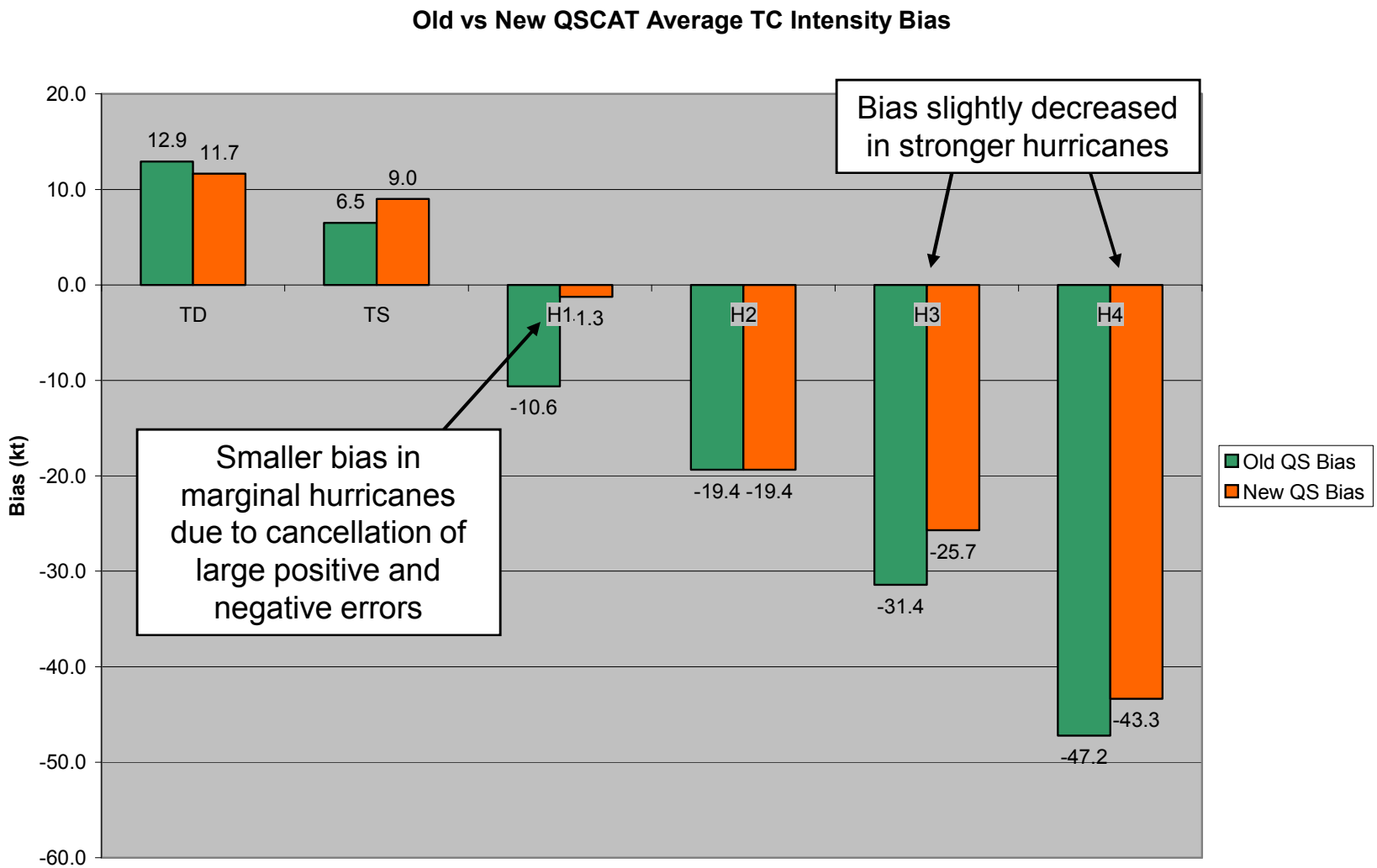
# Old vs New QuikSCAT NRT Wind Speeds

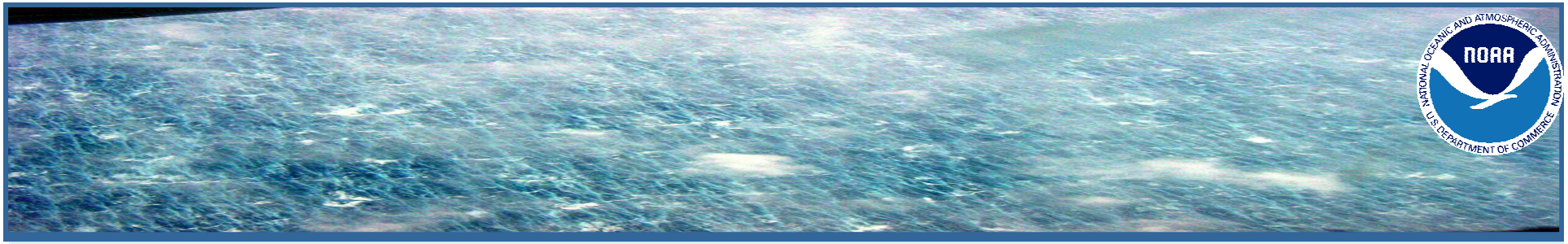



M. Brennan NHC

# Average Old and New QuikSCAT Wind Bias Binned by NHC Best Track

## 2003 Sample

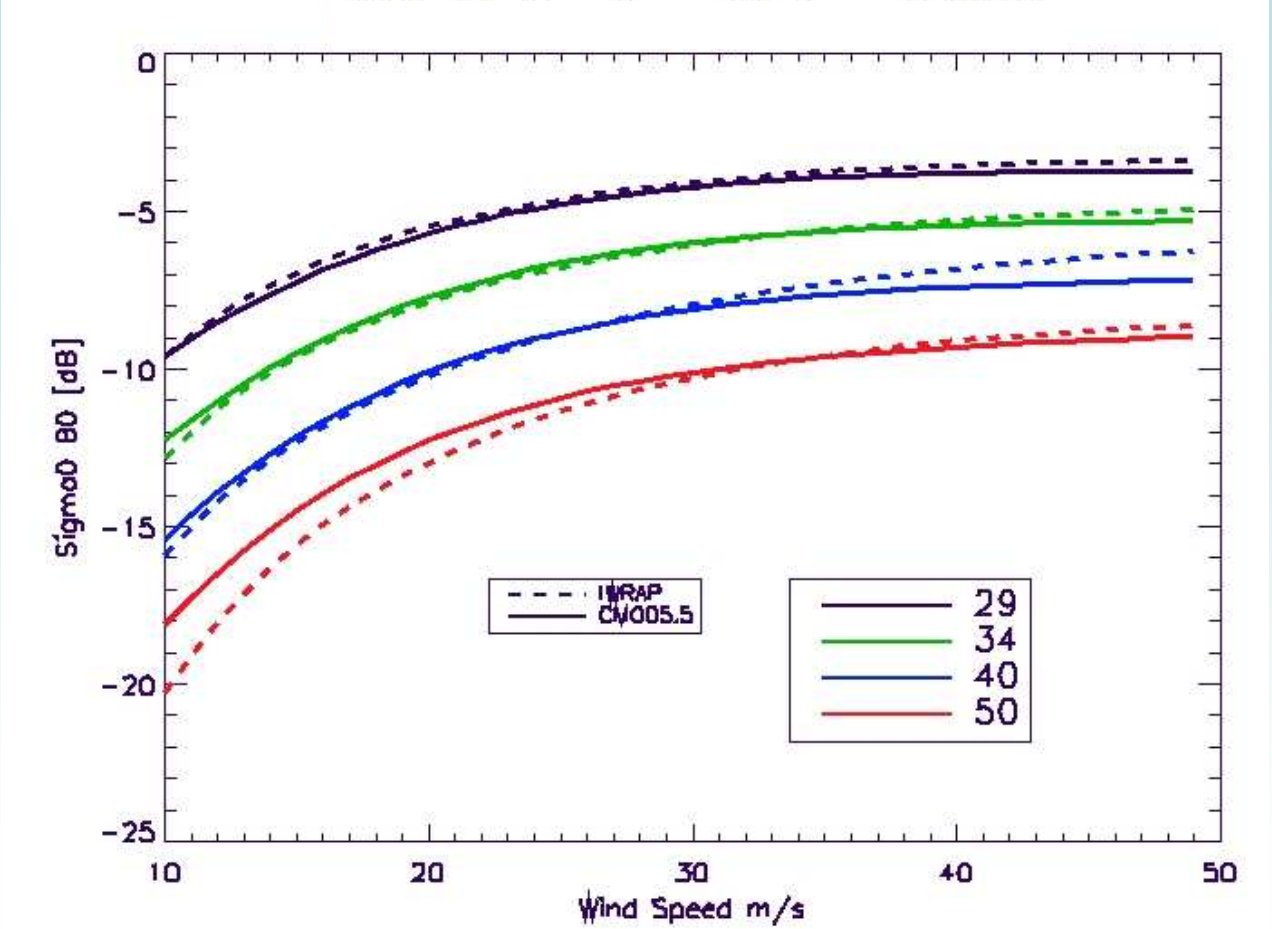




# High Wind Hurricane Aircraft Data and Scatterometer Model Functions

# CMOD5 vs IWRAP C-Band V-Pol Model

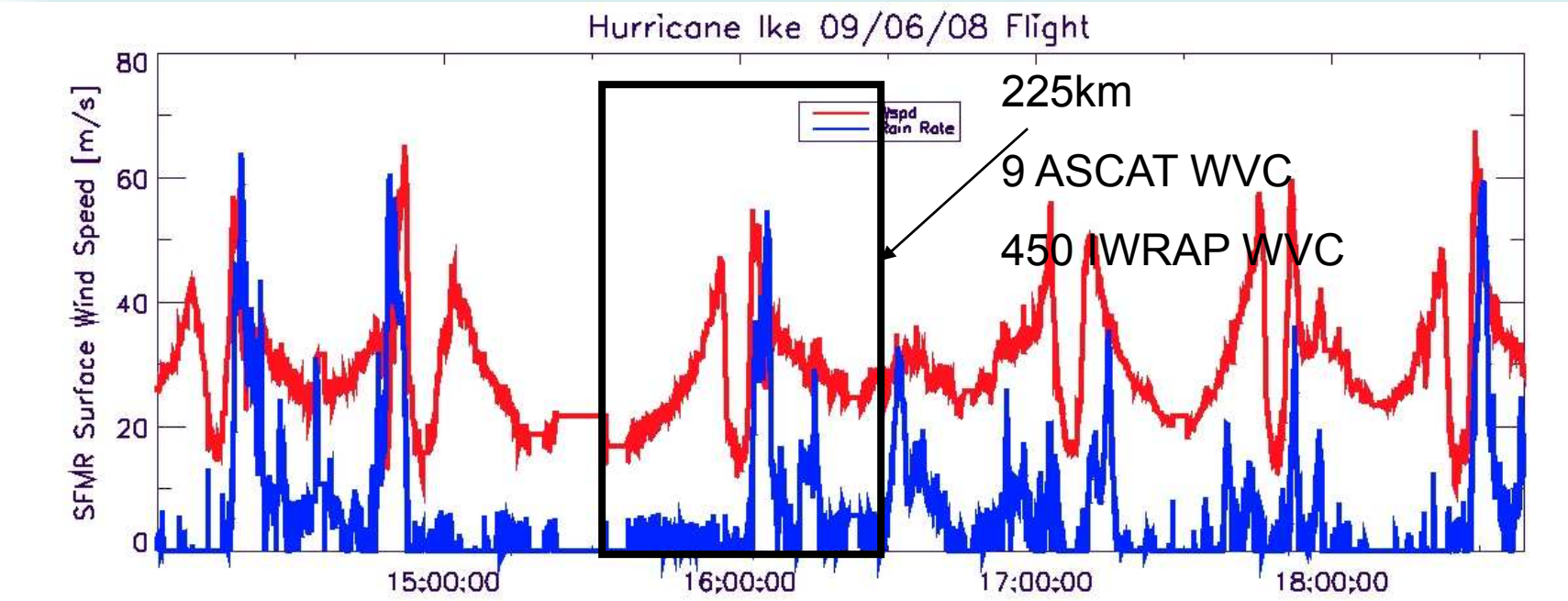
$$\sigma_0 = B_0[1+B_1\cos(\varphi)+B_2\cos(2\varphi)]^{1.6}$$



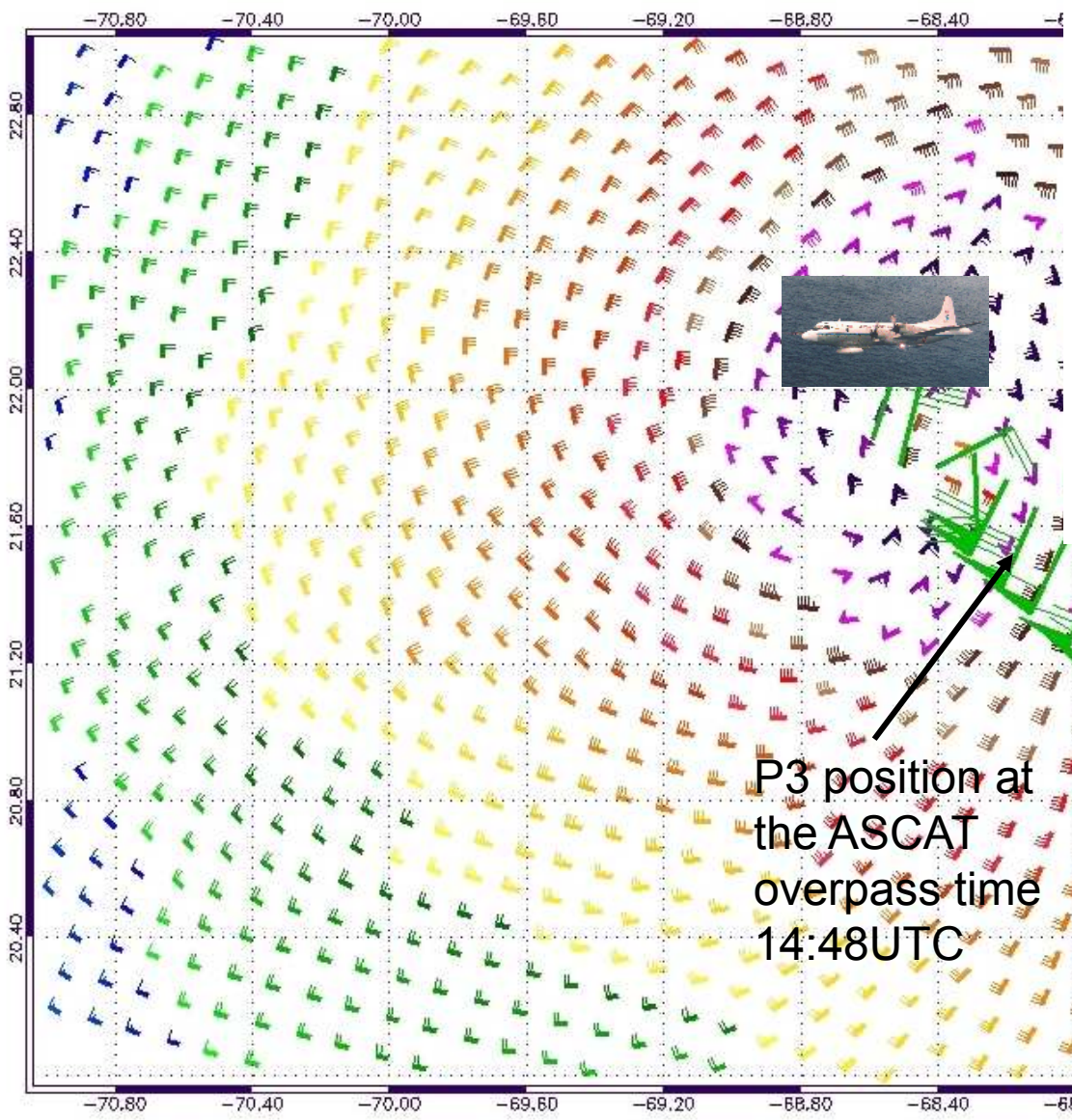

Aircraft Model Function = Satellite Model Function

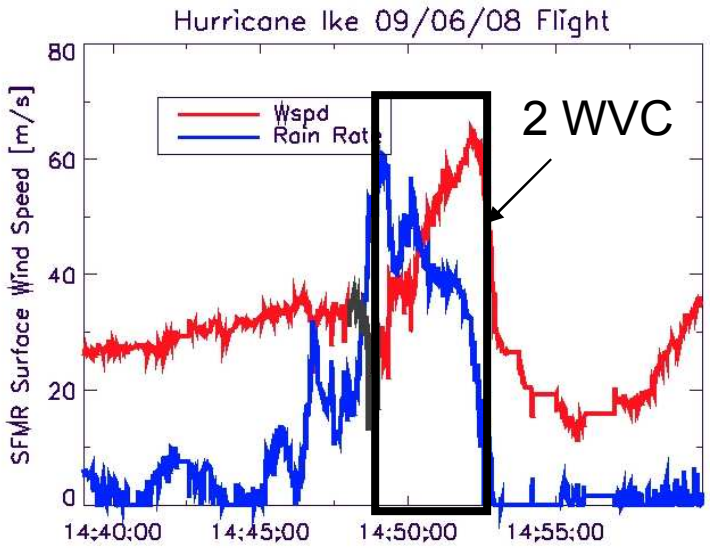
# 2008 Hurricane Season - NOAA P3 Flights

- 3 missions in hurricane Gustav, 1 mission in hurricane Hanna, 6 missions in hurricane Ike and 4 missions in TC Kyle flown during season, sampling wind speeds in the range of 5 to 70 m/s
- The dataset includes GPS dropsondes and collocated radiometer (SFMR) brightness temperatures measurements providing surface wind speed and precipitation estimates.



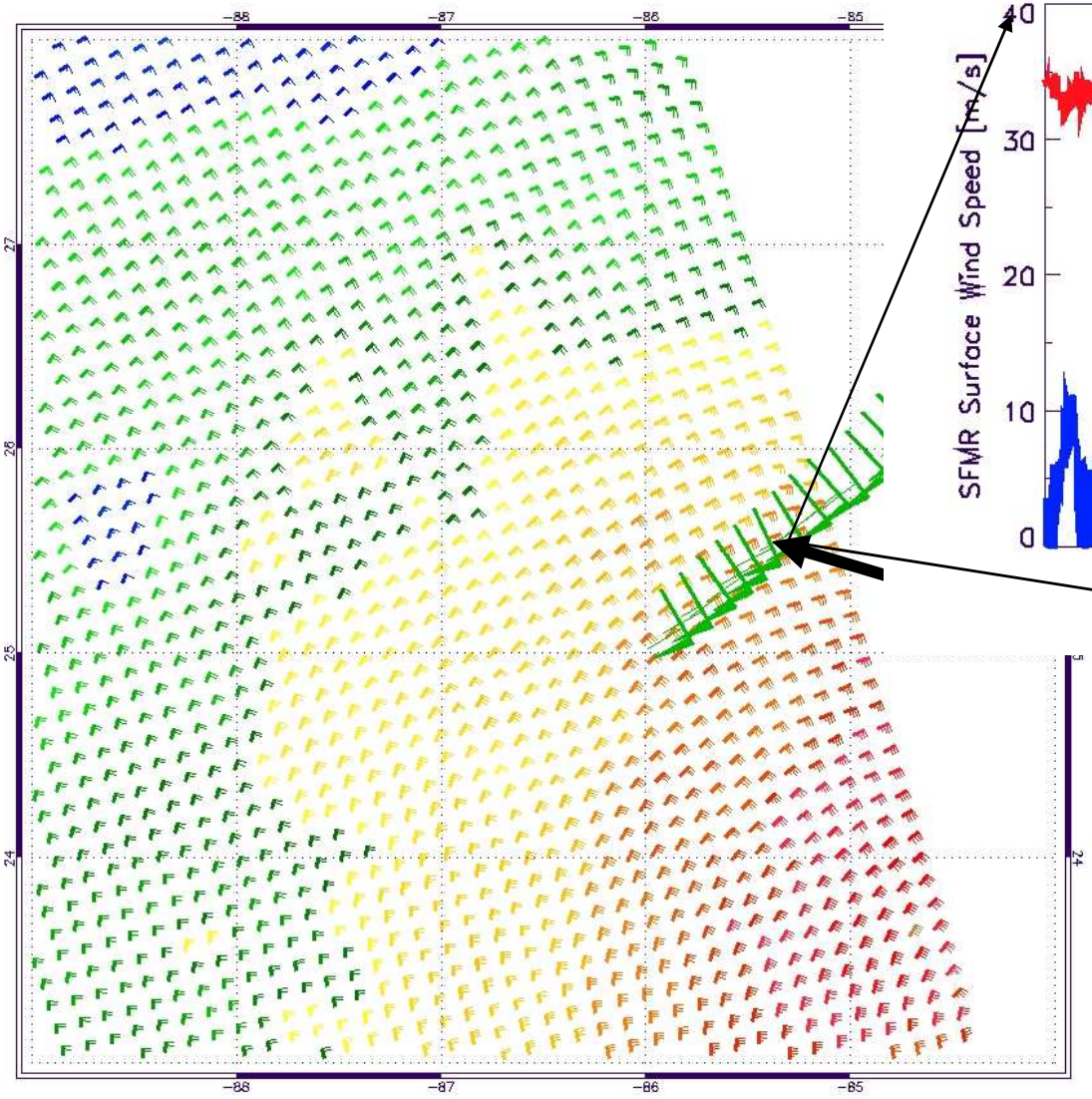
# Coordinated P3 ASCAT Underflight Hurricane Ike 09/06/08

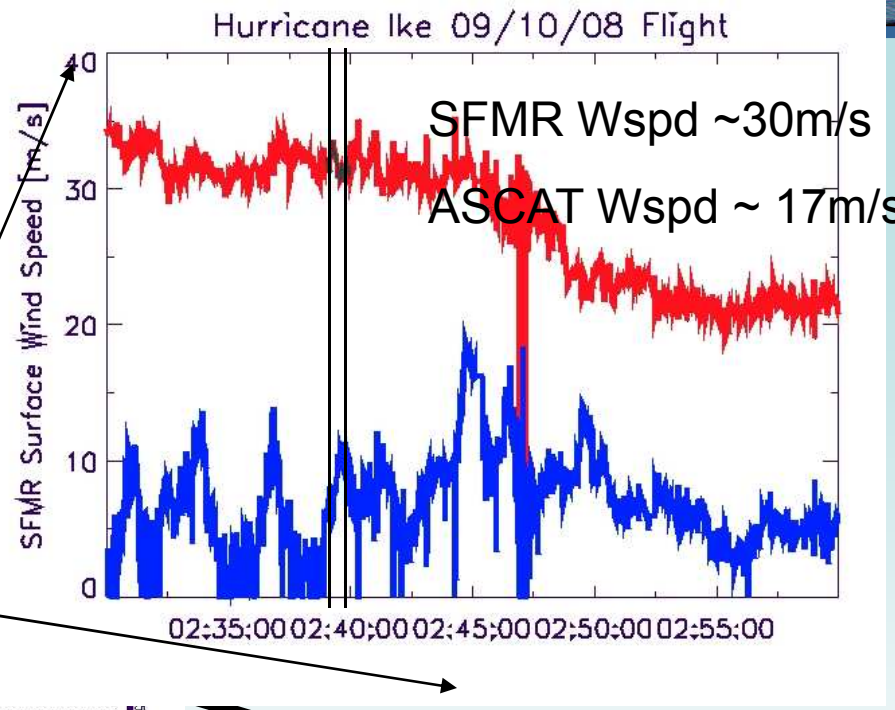



- Max surface wind measured by sfmr 67.5 m/s
- Max dropsonde wind at 50m 73 m/s
- Max ASCAT wind 35.93 m/s

# Hurricane Ike 09/10/08

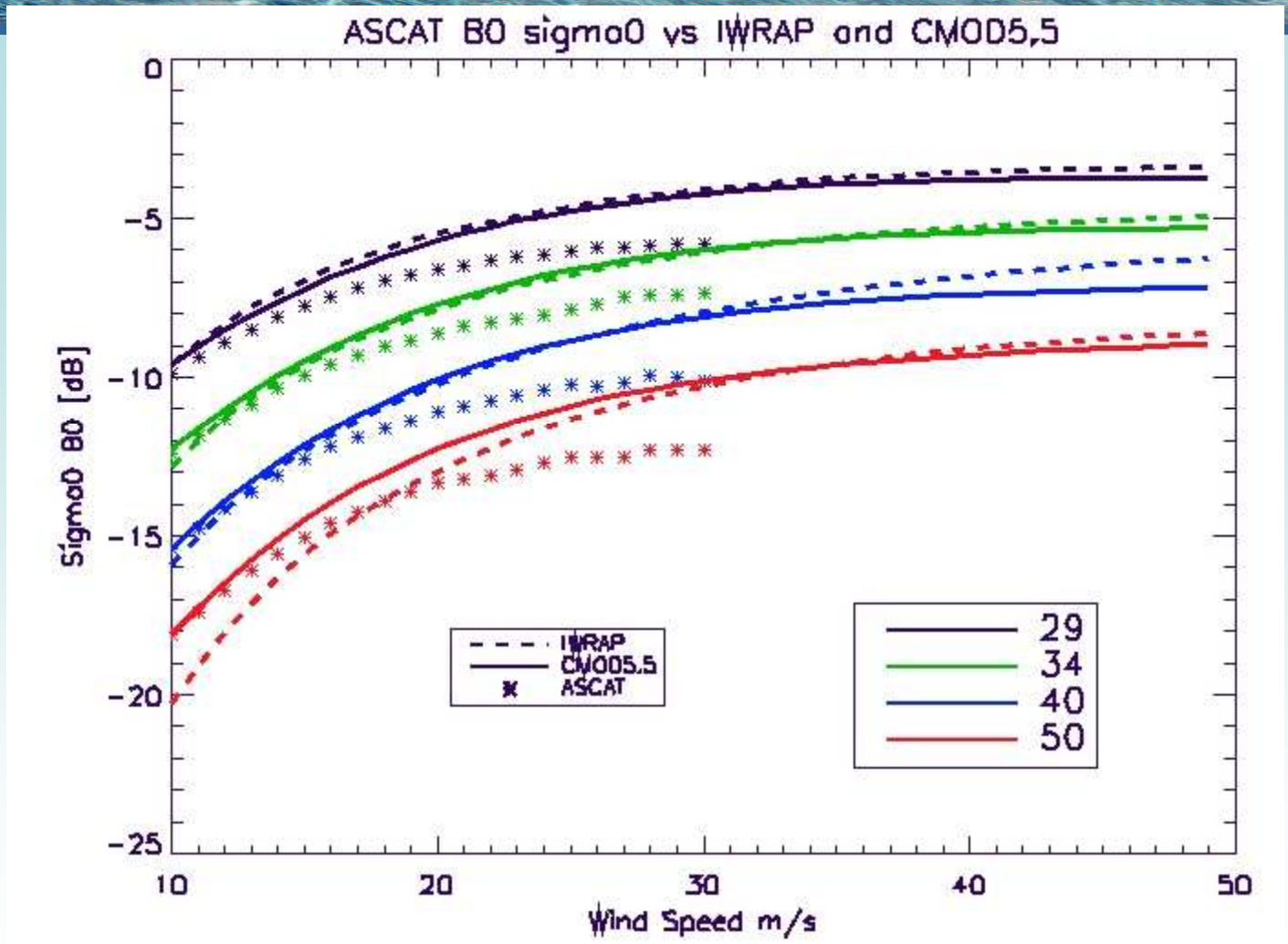



P3 position at the ASCAT overpass time 2:39UTC

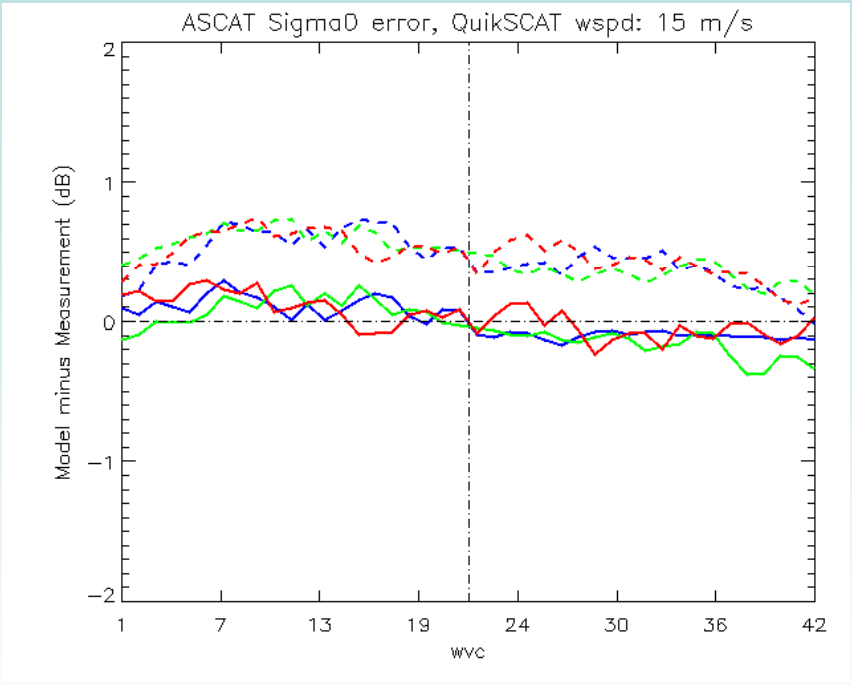
# ASCAT vs IWRAP Model Function

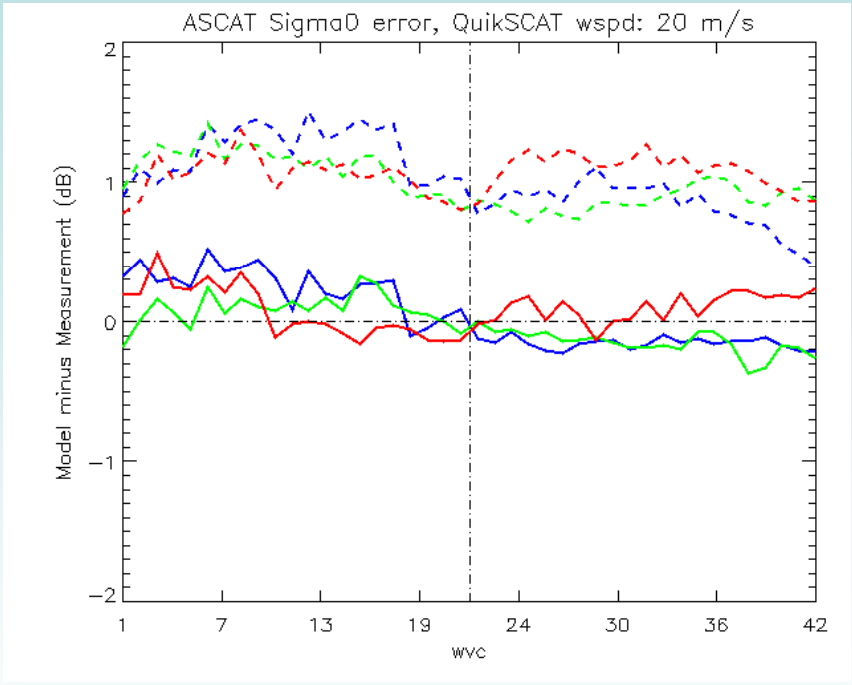
# ASCAT vs CMOD5 and IWRAP Model




$$\sigma_0 = B_0[1+B_1\cos(\varphi)+B_2\cos(2\varphi)]^{1.6}$$

# $\sigma_0^{meas} - \sigma_0^{mod}$ Differences



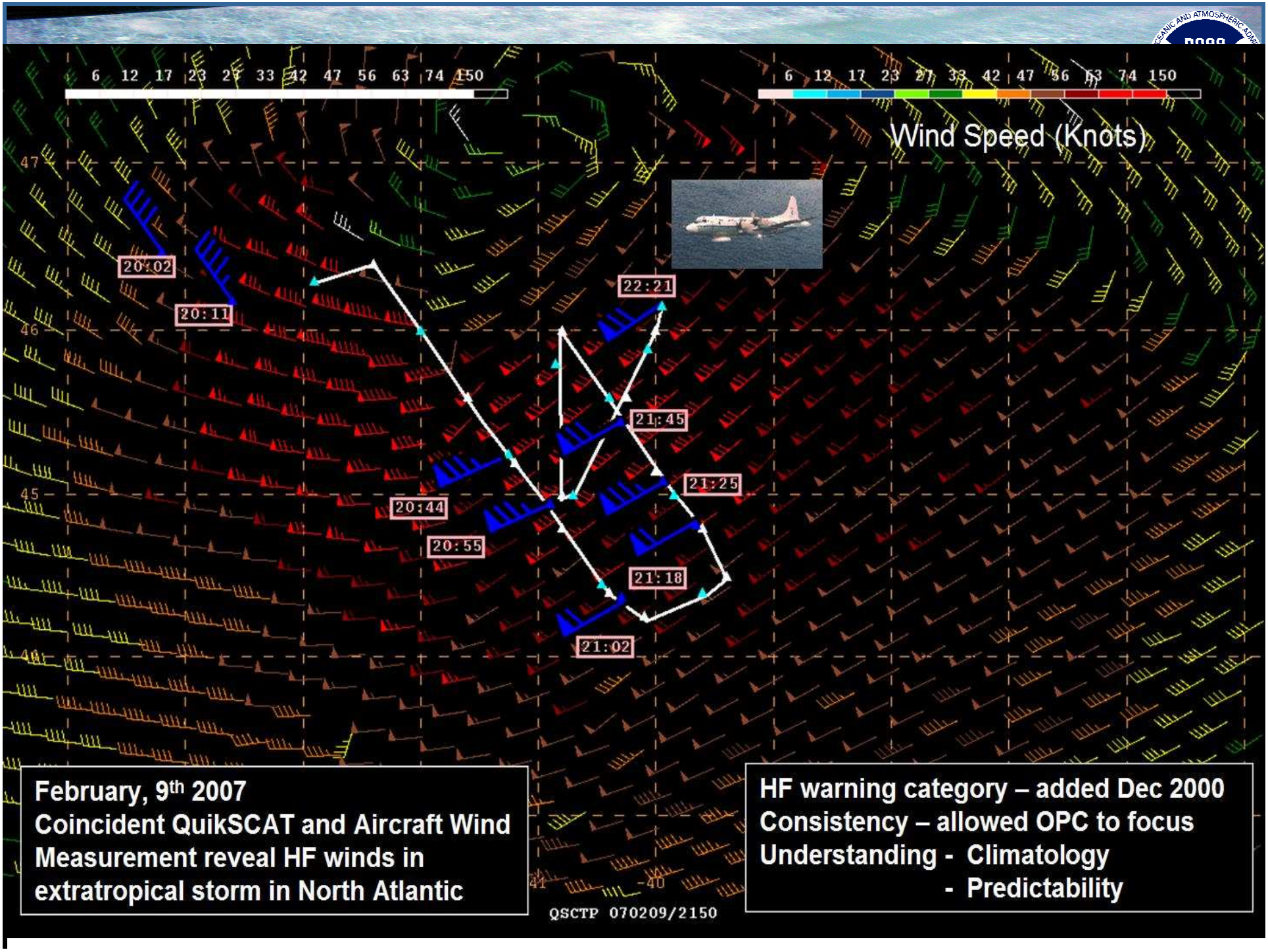




Aircraft Model Function ≠ Satellite Model Function

# What can be done and Should something be done and Can we reach an agreement on how to do it?

- What wind products do we want to produce?
  - Peak winds? If QuikSCAT/ASCAT/WindSat/AMSR can really measure them do we need XOVWM?
- What changes in processing of measurements might lead to higher wind retrievals?
  - Model function, data averaging, implemented retrieval scheme or measurement technique limitations?
- Calibrating high wind model function
  - Calibration should be consistent with resolution of phenomena being measured
  - Data sets used for model function development should be of comparable resolution with measurement resolution
  - Wind products with comparable resolution should produce comparable winds

# Extratropical Storms and Possible Hi Wind data sets

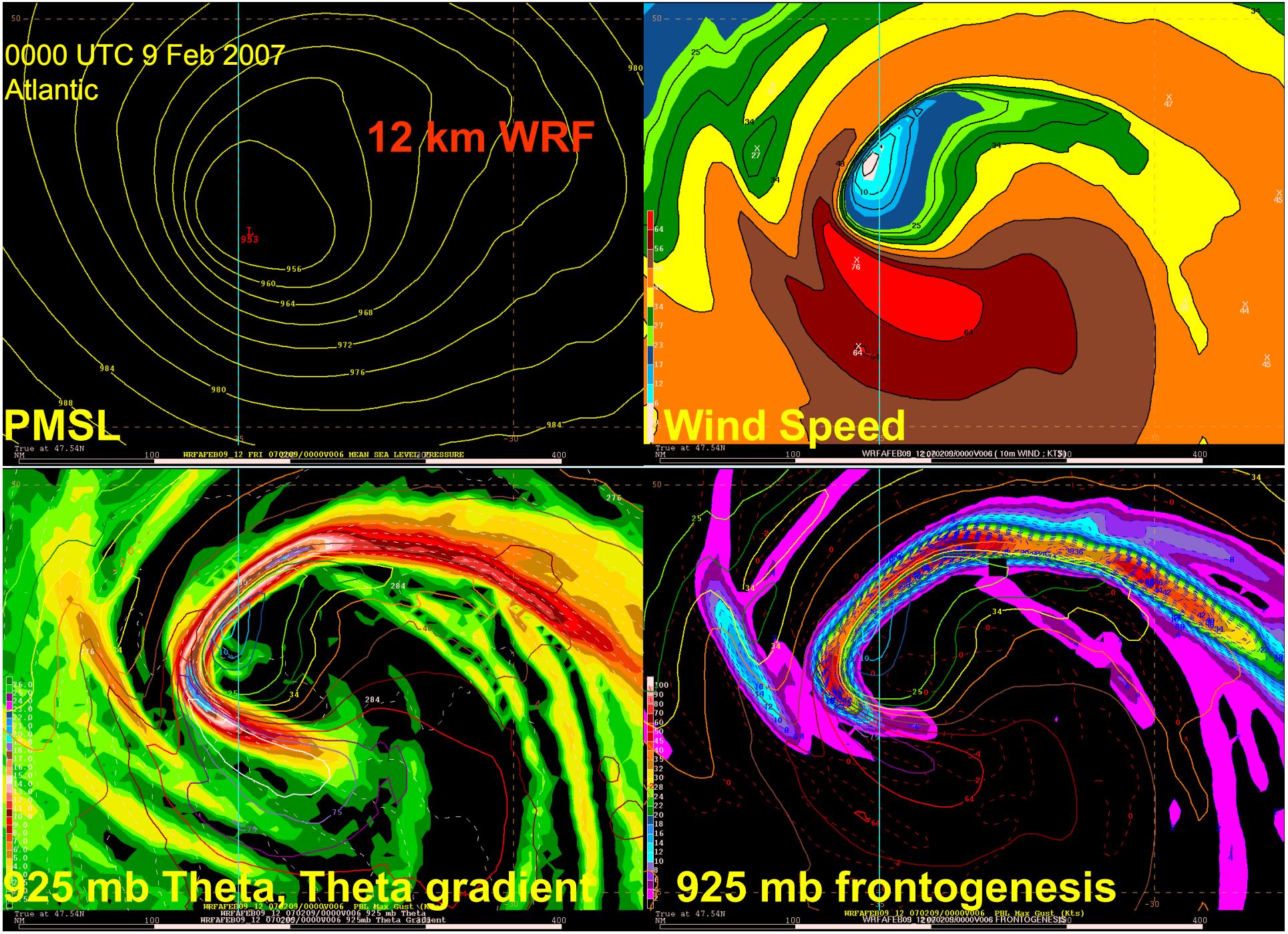



**February, 9th 2007**
**Coincident QuikSCAT and Aircraft Wind Measurement reveal HF winds in extratropical storm in North Atlantic**

**HF warning category – added Dec 2000**
**Consistency – allowed OPC to focus**
**Understanding - Climatology**
**- Predictability**

# Winter 2007 NOAA-P3 Field Campaign

•Seven missions flown sampling wind speeds in the range of 5 to 50 m/s (virtually rain-free
conditions).
• The dataset includes GPS dropsondes and collocated radiometer (SFMR) brightness
temperatures measurements providing surface wind speed and precipitation estimates.


0000 UTC 9 Feb 2007
Atlantic
12 km WRF
PMSL
Wind Speed
925 mb Theta, Theta gradient
925 mb frontogenesis