Impact of the loss of QuikSCAT on National Hurricane Center operations: Current mitigation efforts and future plans

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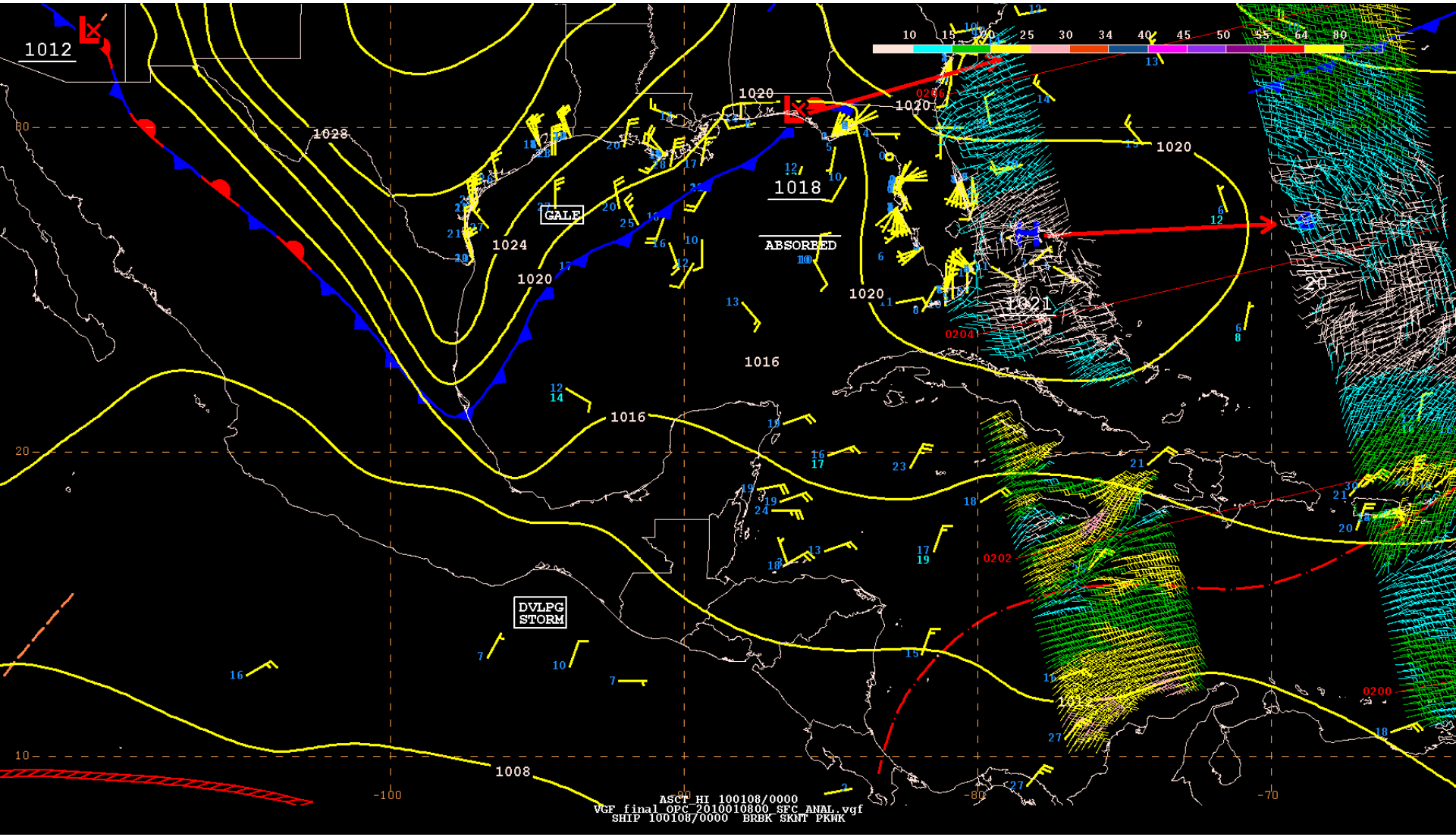
- Post-QuikSCAT impact on wind warnings in the Gulf of Tehuantepec
- Recent Gulf of Tehuantepec scatterometer coverage – looking for the “best” winds
- Examples of hurricane forecast impacts

Gulf of Mexico gale / Tehuantepec storm
8-14 January 2010



surface analysis ship/buoy obs ASCAT every 6 h

NHC high seas forecast (east Pacific)

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000
FZPN03 KNHC 120915
HSFEP2

HIGH SEAS FORECAST
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
1030 UTC SUN FEB 12 2006
SUPERSEDED BY NEXT ISSUANCE IN 6 HOURS

SECURITE

E PACIFIC FROM THE EQUATOR TO 30N E OF 140W.

SYNOPSIS VALID 0600 UTC SUN FEB 12
24 HOUR FORECAST VALID 0600 UTC MON FEB 13
48 HOUR FORECAST VALID 0600 UTC TUE FEB 14

.WARNINGS.
...STORM WARNING...
.N OF 14N BETWEEN 94W AND 96W...INCLUDING THE GULF OF
TEHUANTEPEC...N TO NE WINDS 40 TO 50 KT SEAS 10 TO 16 FT.
ELSEWHERE WITHIN 75 NM OF LINE 16N95W 13N96W N TO NE WINDS
30 TO 40 KT SEAS BUILDING 9 TO 14 FT.
.24 HOUR FORECAST N OF 13.5N BETWEEN 94W AND 96.5W...INCLUDING
THE GULF OF TEHUANTEPEC...N TO NE WINDS 40 TO 50 KT SEAS 14 TO
20 FT. ELSEWHERE WITHIN 90 NM OF LINE 16N95W 13N96W 12N98W N TO
NE WINDS 30 TO 40 KT SEAS 12 TO 18 FT IN NE SWELL.
.48 HOUR FORECAST N OF 13N BETWEEN 94W AND 96.5W...INCLUDING
THE GULF OF TEHUANTEPEC...N TO NE WINDS 30 TO 40 KT SEAS 10 TO
16 FT.

...GALE WARNING...
.30 HOUR FORECAST FROM 9N TO 12N E OF 89W...INCLUDING THE
GULF OF PAPAGAYO...NE WINDS 30 TO 35 KT SEAS 8 TO 11 FT.
.48 HOUR FORECAST FROM 8N TO 12N E OF 89W...INCLUDING THE
GULF OF PAPAGAYO...NE WINDS 30 TO 35 KT SEAS 8 TO 12 FT.

.SYNOPSIS AND FORECAST
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issued at 9:15 UTC

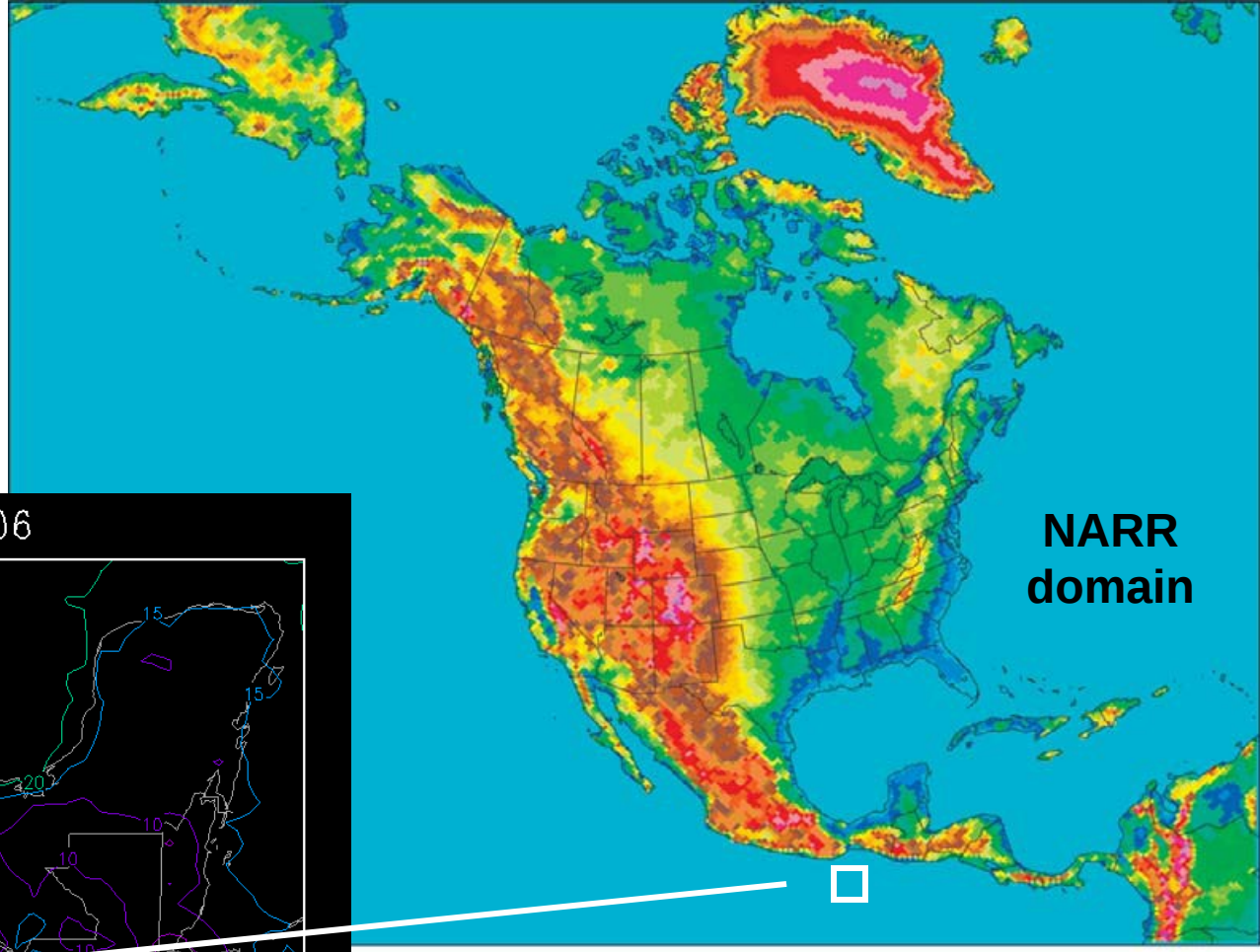
valid at 6:00 UTC

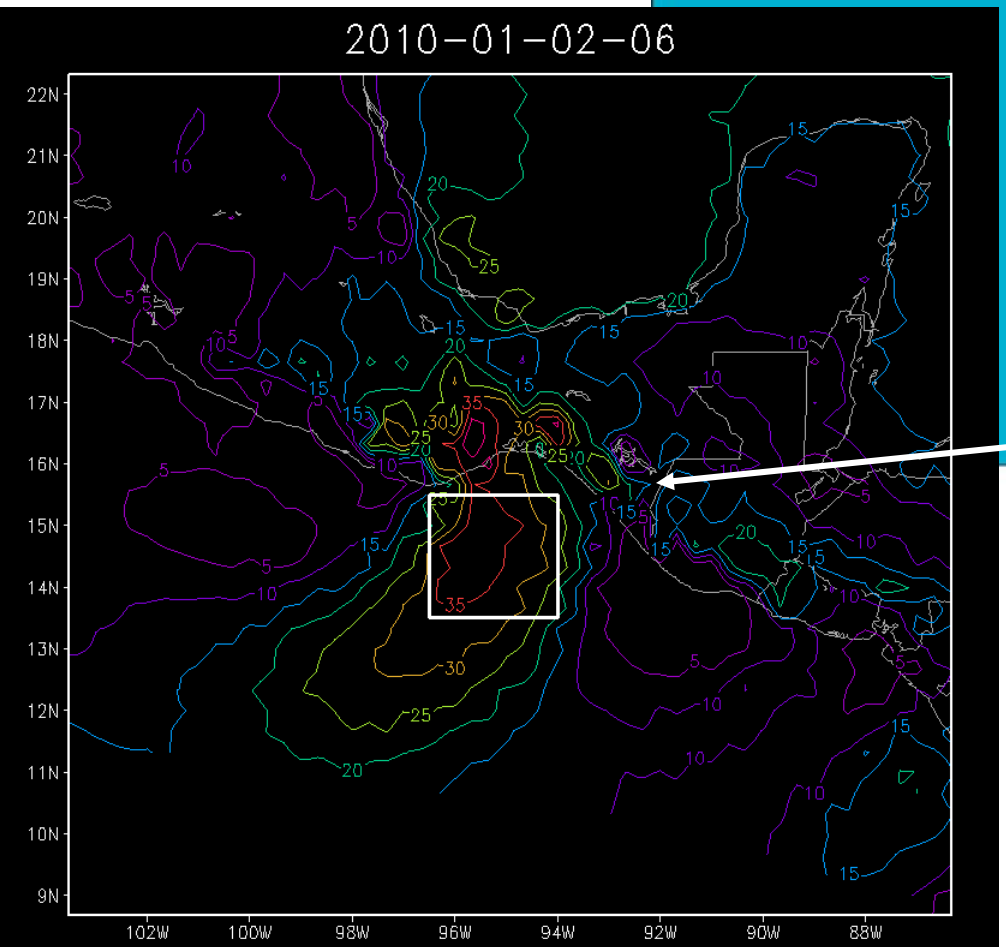
wind range maximum (50 kt)

2003 – 2011
October – March
Tehuantepec
gale/storm
warning
peaks

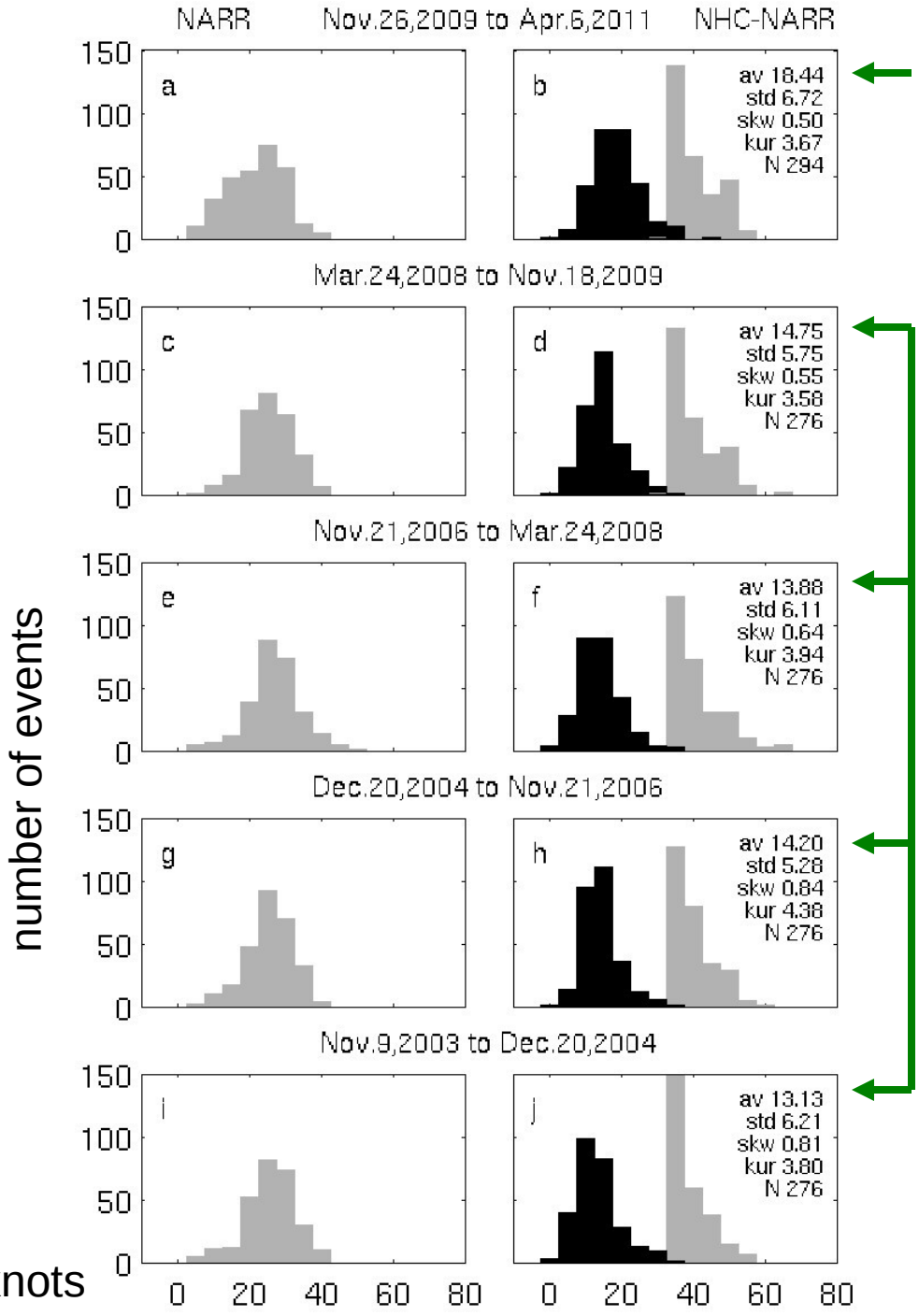
A reference timeseries

- 32-km NCEP Regional Reanalysis (NARR)





- areal average of the core 30-m wind speed
- note no QuikSCAT assimilation in NARR (but perhaps in the global driving model?)

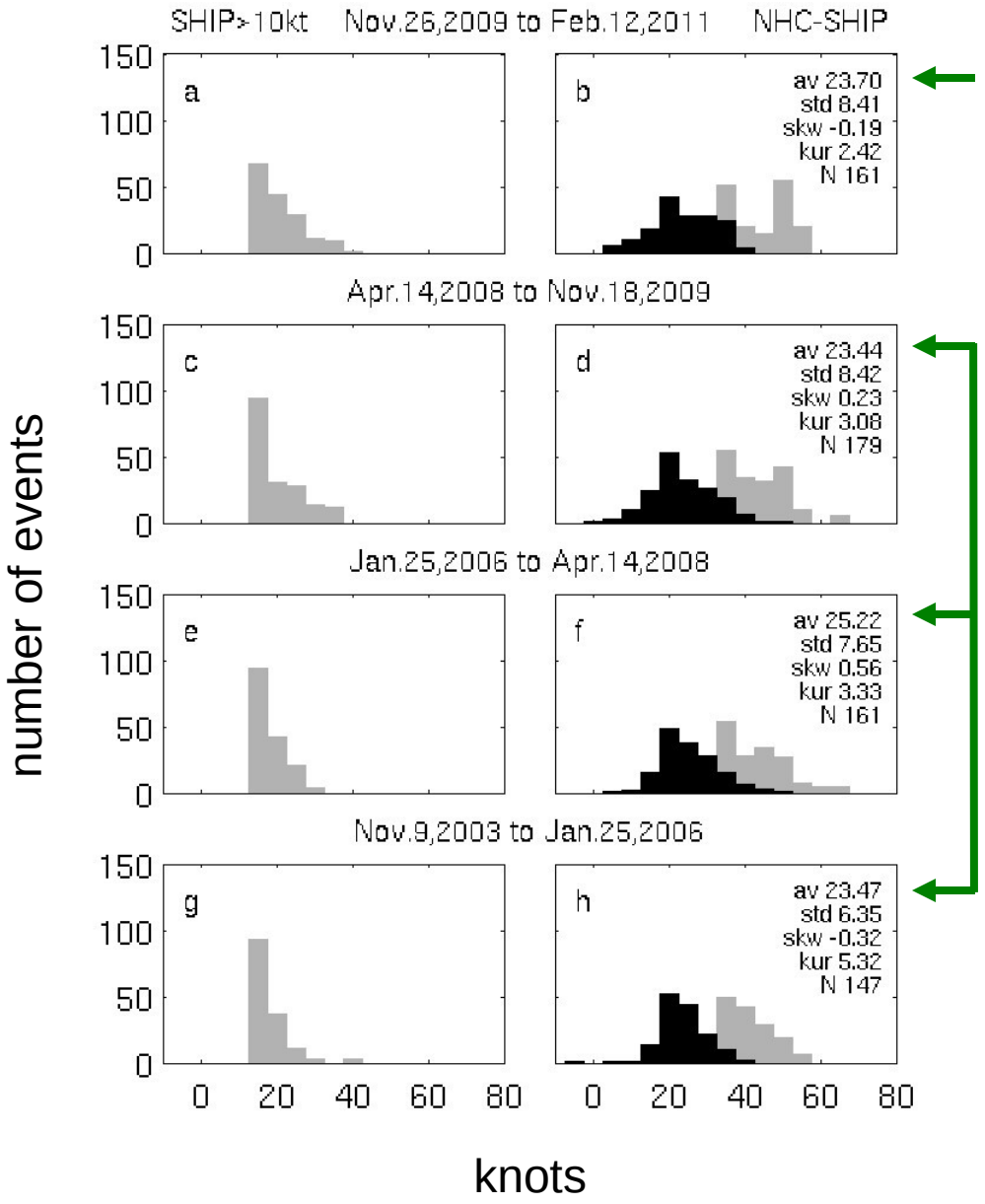


after QuikSCAT

during QuikSCAT

Analysis differences (~280 / group)

All warnings
(35kt +)



after QuikSCAT

during QuikSCAT

Analysis-Obs differences (~160 / group)

Only ship obs > 10kt

Ancillary ship data (WMO Pub. 47)

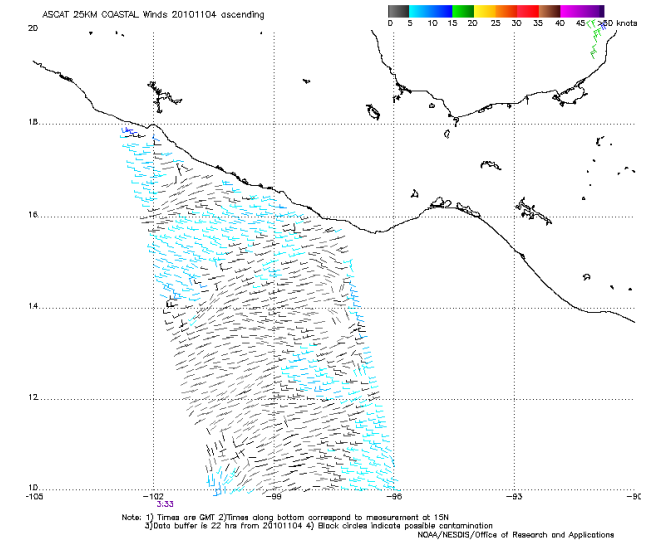
Recruiting country	United Kingdom
Metadata format version	3
Date of report preparation	Apr.6 2011
NMS reference number	0
Ship name	CORAL PRINCESS
Country of registration	Bermuda
Call sign or WMO Number	ZCDF4
IMO Number assigned by Lloyds Register to hull	9229659
Vessel type	Passenger ship or cruise liner
Length overall of ship, ignoring bulbous bow	(965 ft) 294 m
Moulded breadth - greatest breadth amidships	(105 ft) 32 m
Freeboard - average height of upper deck above maximum summer load line	(2 ft) 0.507 m
Draught - average depth of keel below maximum summer load line	(27 ft) 8.30 m
Distance to bridge from bow	(131 ft) 40 m
Route	R46
Route	R43
Route	R41
Recruitment date of current VOS participation	Sep.19 2002
Last VOSClim recruitment date if within current period of VOS participation	Sep.22 2010
Type of meteorological reporting ship	Selected
General observing practice	Fully manual (no automation)
Satellite system for transmitting reports	Inmarsat-C (SAC41)
Name and version of electronic logbook software	TurboWin V4.0 professional
Visual wind/wave observing height	(95 ft) 29 m
General wind observing practice	Visual estimates (sea state)
Baseline check of automatic weather station	No automation
Barometer type	Digital aneroid barometer (aka Precision Aneroid Barometer)
Make and model of barometer	NEGRETTI AND ZAMBRA
Height of barometer above maximum summer load line	(92 ft) 28 m
Location of barometer	Chart room (NOTE: this description is no longer supported)
Pressure units of barometer	hPa
Most recent calibration date of barometer	Feb.25 2002
Dry bulb thermometer type	Dry bulb mercury thermometer
Make and model of dry bulb thermometer	ZEAL ORD2C
Exposure of dry bulb thermometer	Screen (non ventilated, i.e. natural ventilation)
Location of dry bulb thermometer and hgyrometer	Bridge wing both sides
Height of dry bulb thermometer and hygrometer above maximum summer load line	(92 ft) 28 m
General reporting practice for dry bulb thermometer and hygrometer	Centigrade to tenths
Hygrometer type	Psychrometer
Exposure of hygrometer	Screen (non ventilated, i.e. natural ventilation)
Method of obtaining sea surface temperature	Engine cooling system inlet (motor ship) or condensor intake (steam sh
Depth of sea surface temperature observation below maximum summer load line	(20 ft) 6.0 m
Barograph type, or method of determining pressure tendency	Open Scale barograph with 7 day clock
Last date of change to any metadata value	Sep.23 2010

Note: WMO Voluntary Observing Ship (VOS) metadata is downloaded to NHC once a week from
ftp://esurfmar.meteo.fr/pub/Pub47/PUB_47_export_esurfmar_database_active_vos_v3a.csv

“Best” high winds for Tehuantepec warnings of 2010/2011

- For each day of a wind warning, plot ascending then descending satellite winds
- Boxed in green is the strongest retrieved wind (or satellite with best coverage when two satellites are similar)

ASCAT COASTAL



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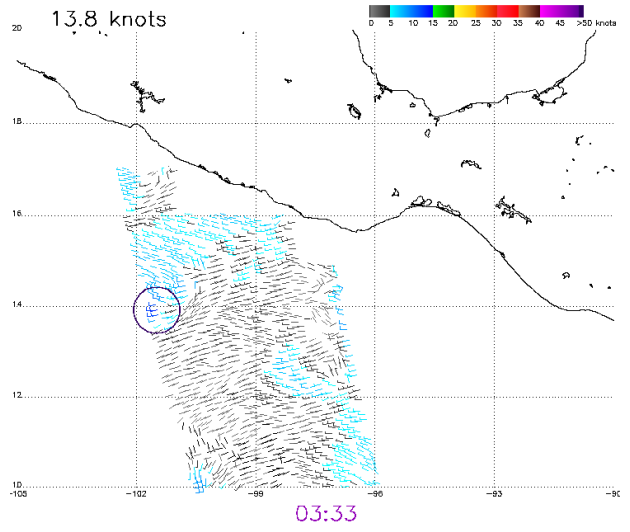

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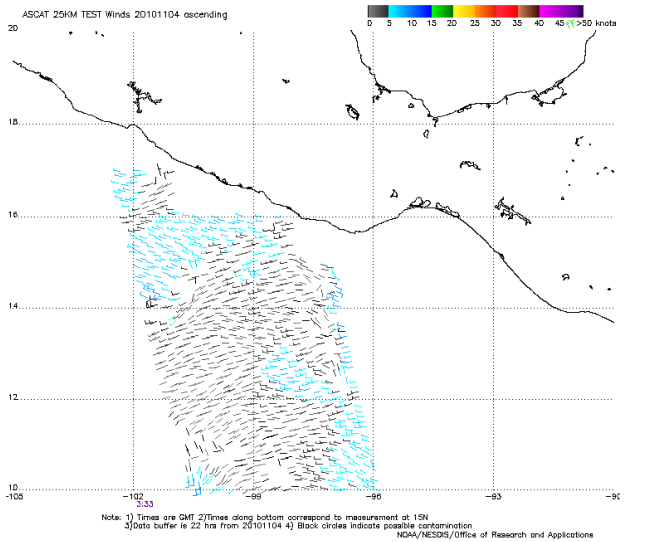

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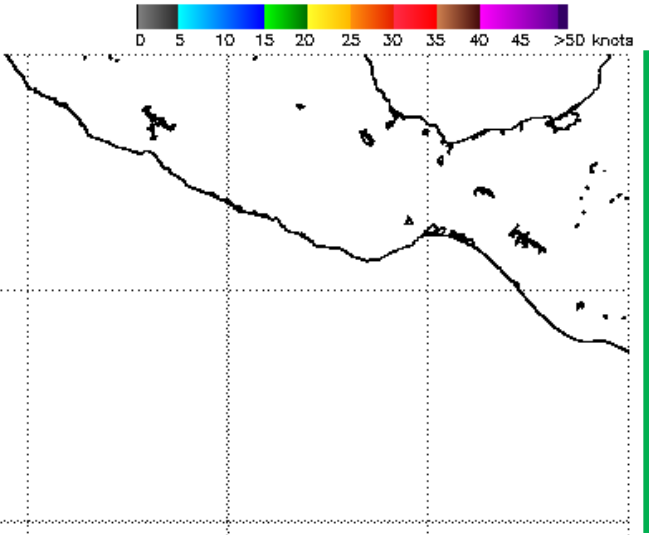

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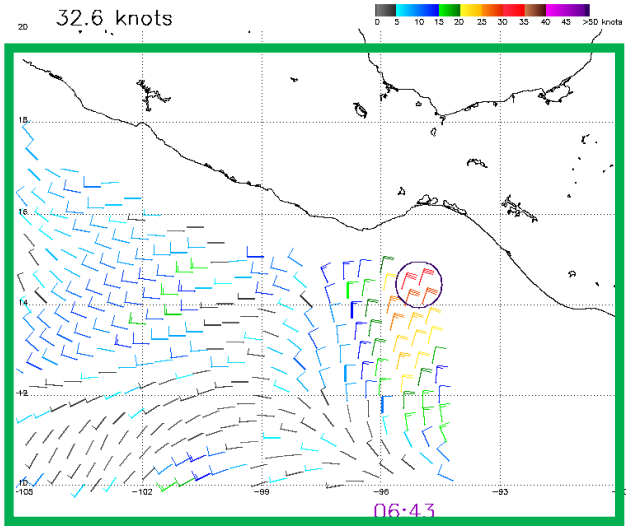

2010-11-04

hour (UTC)	TAFB (kt)
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12	35
18	40

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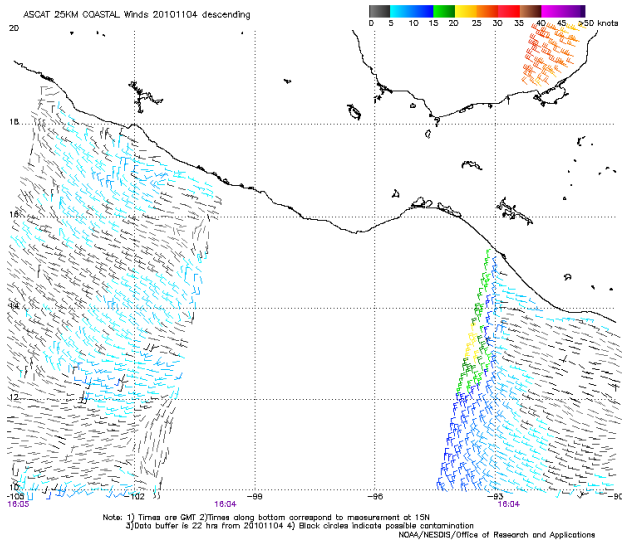

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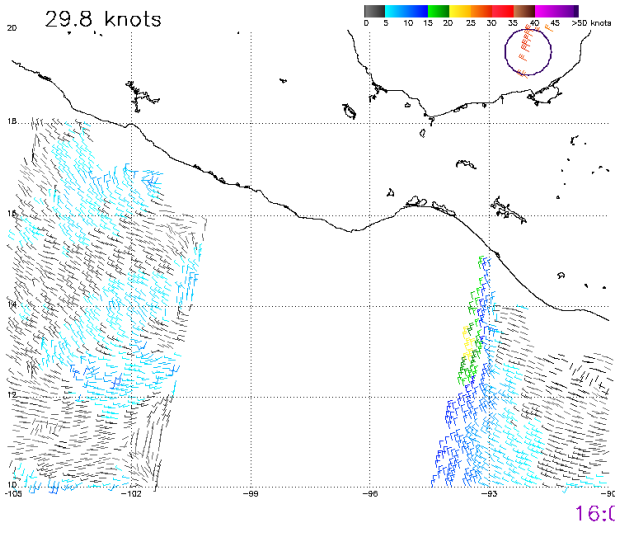

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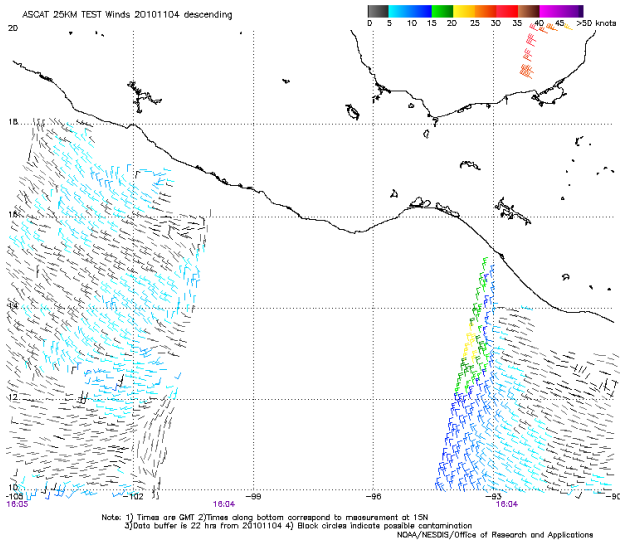

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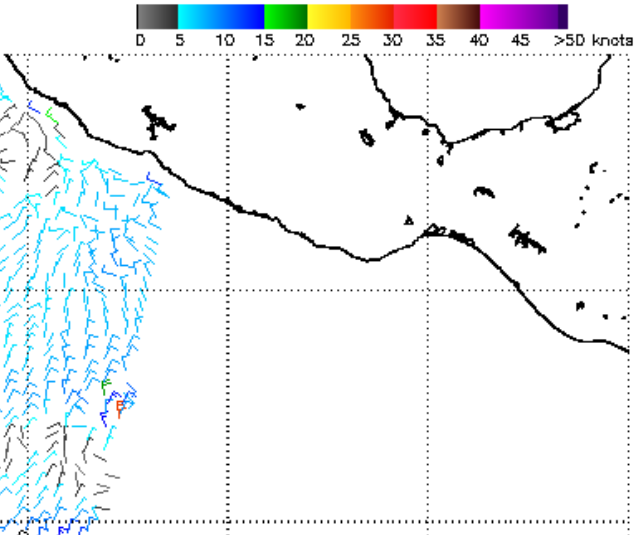

11:30-12:50

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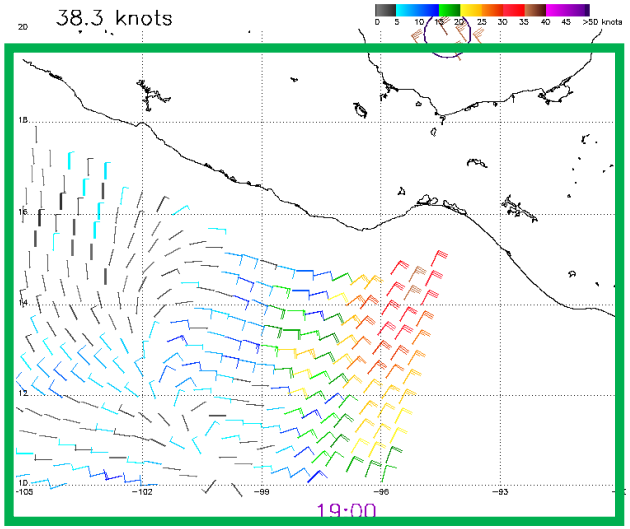

2010-11-04

hour (UTC)	TAFB (kt)
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12	35
18	40

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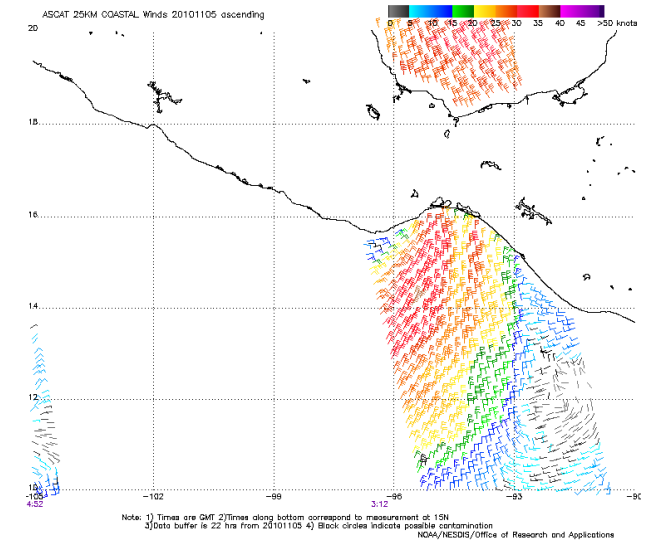

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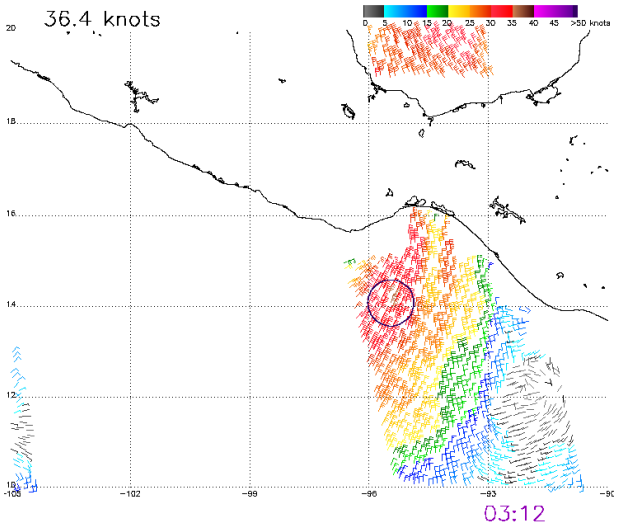
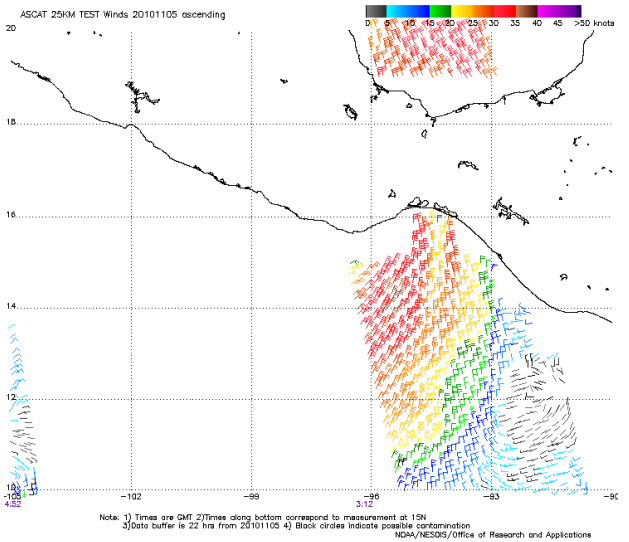


ASCAT High Wind



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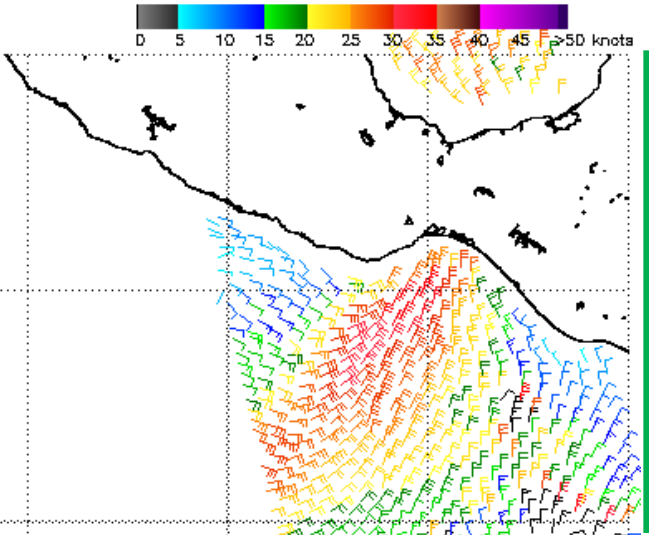

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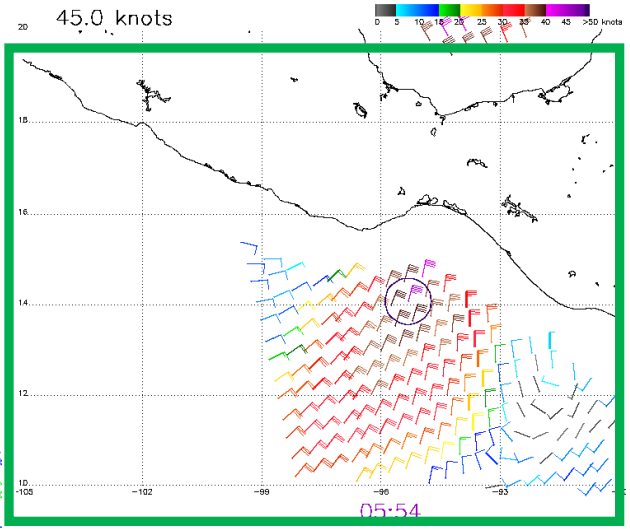

2010-11-05

hour (UTC)	TAFB (kt)
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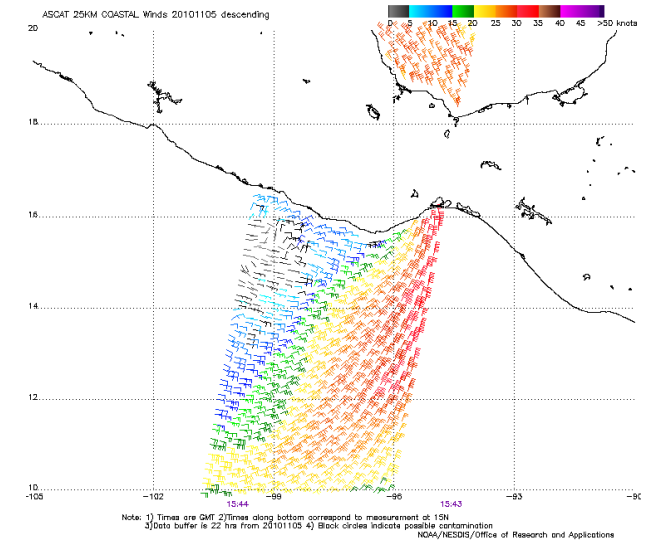

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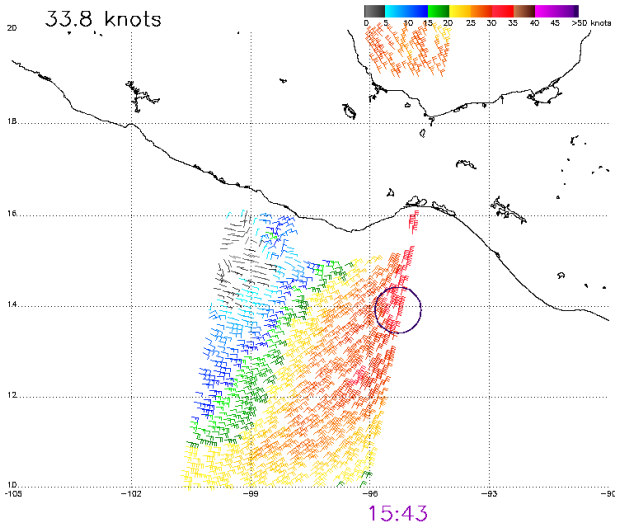

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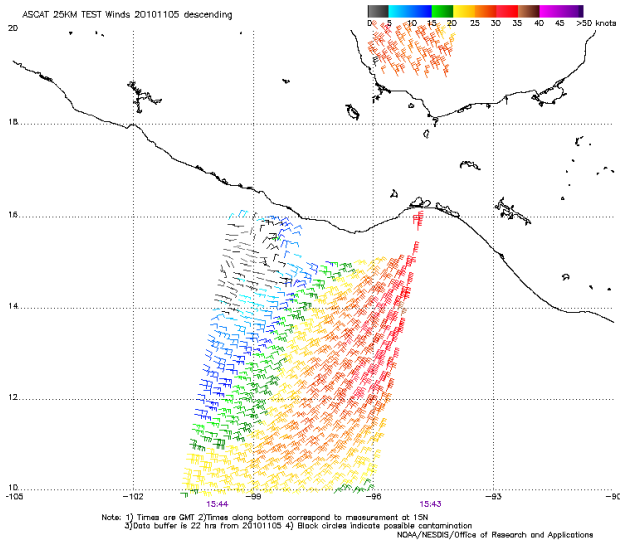

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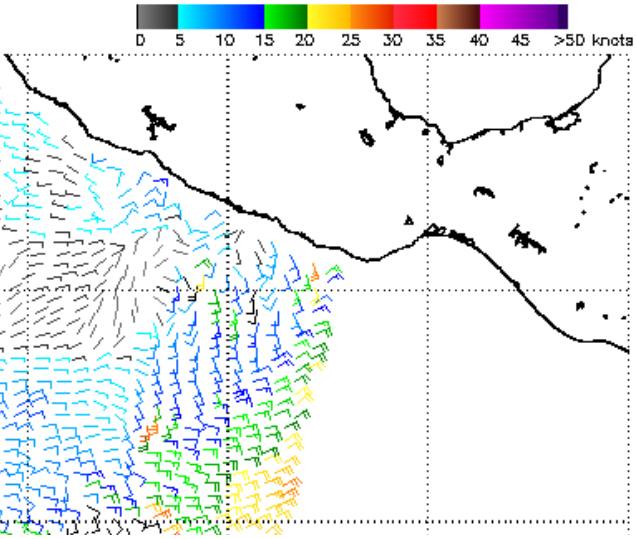

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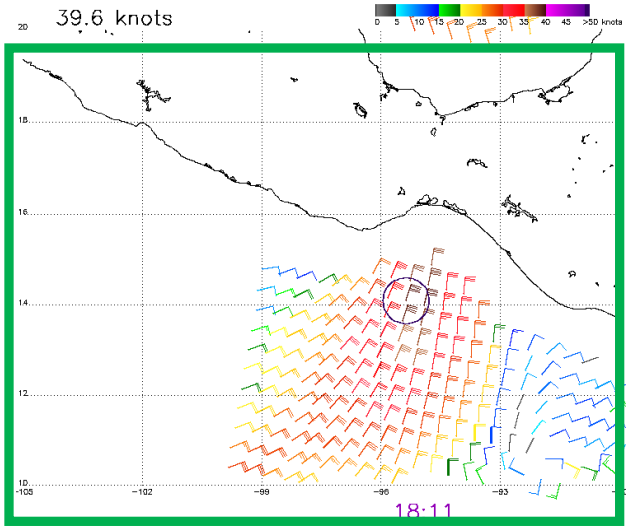

2010-11-05

hour (UTC)	TAFB (kt)
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12	50
18	50

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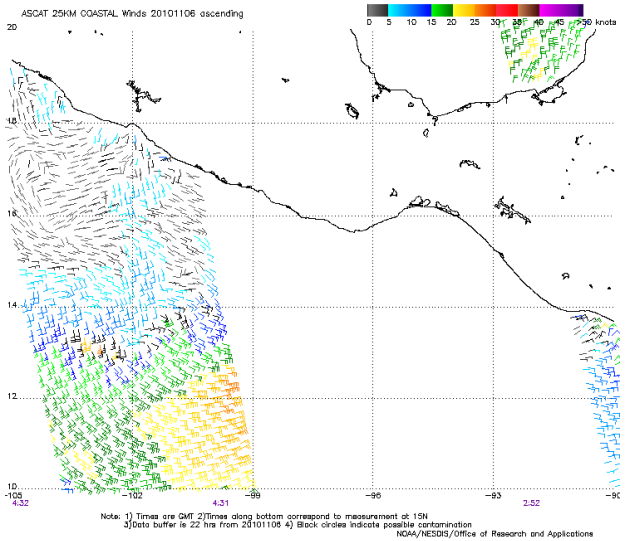

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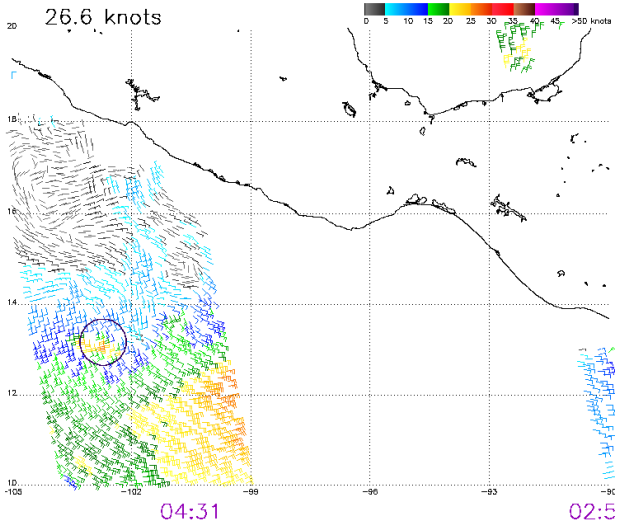

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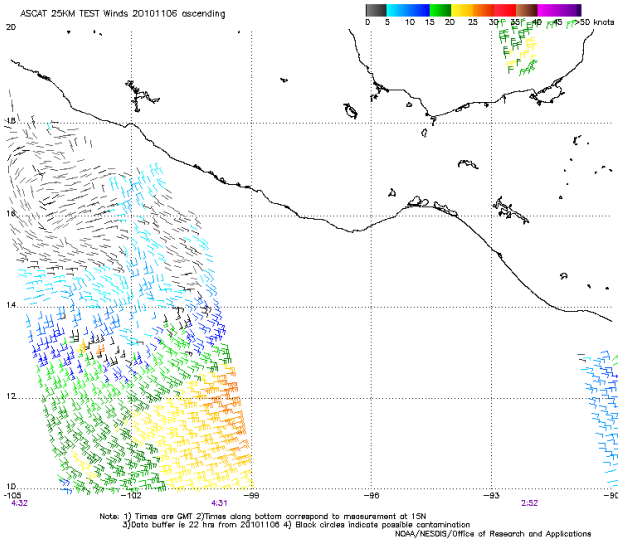

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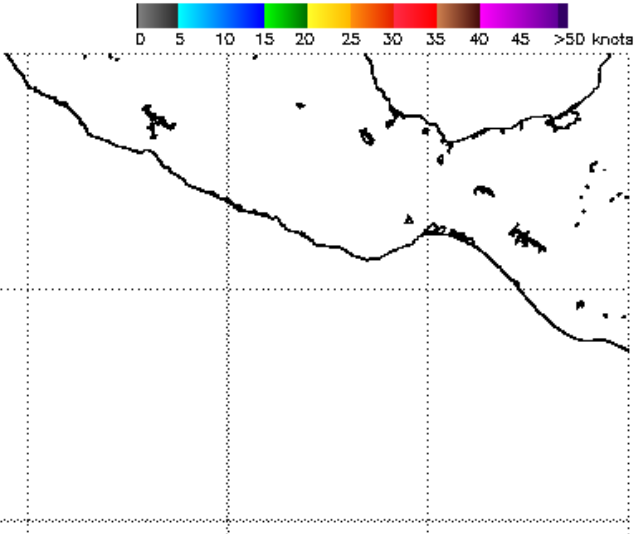

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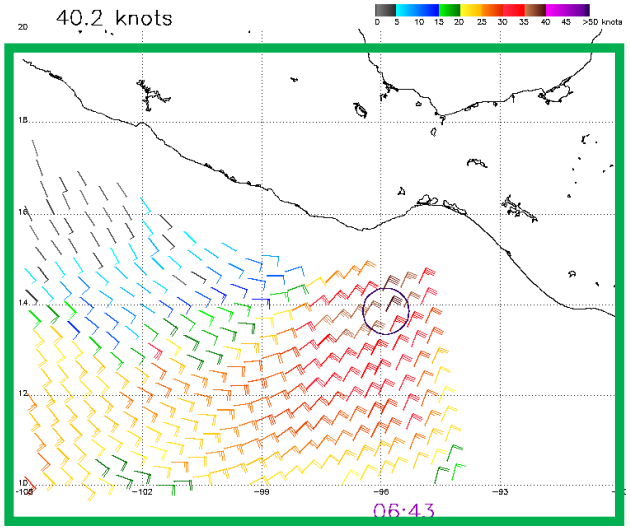

2010-11-06

hour (UTC)	TAFB (kt)
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06	45
12	45
18	45

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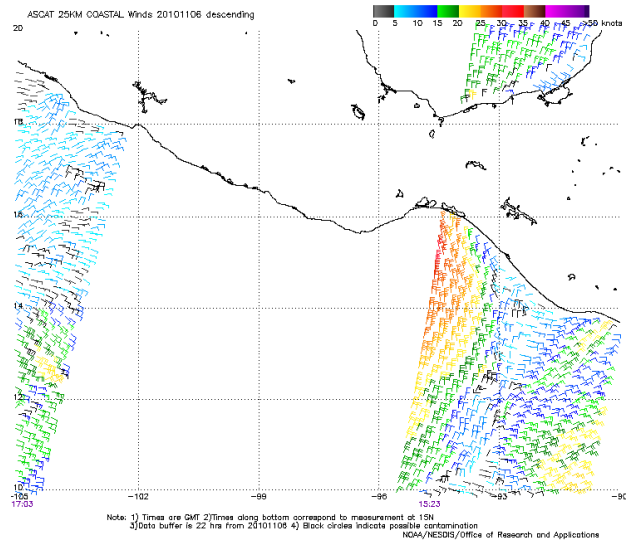

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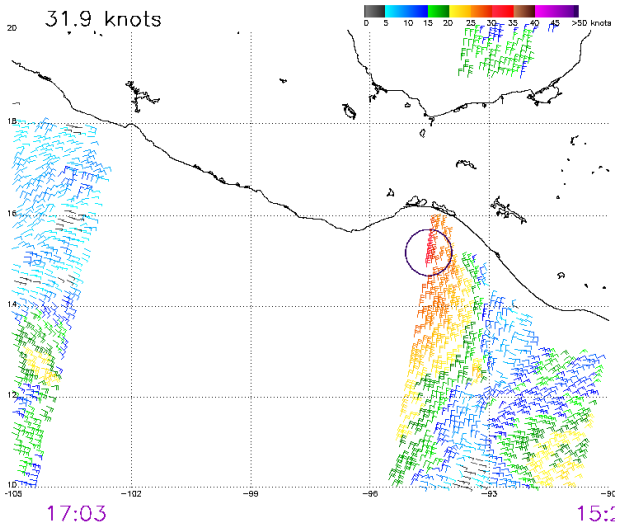

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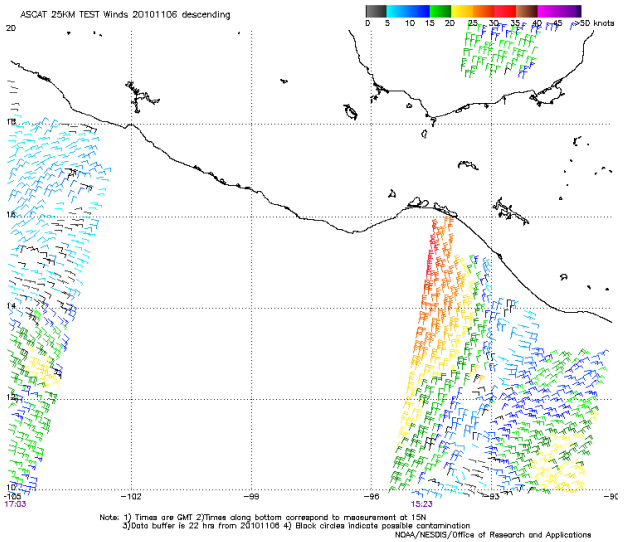
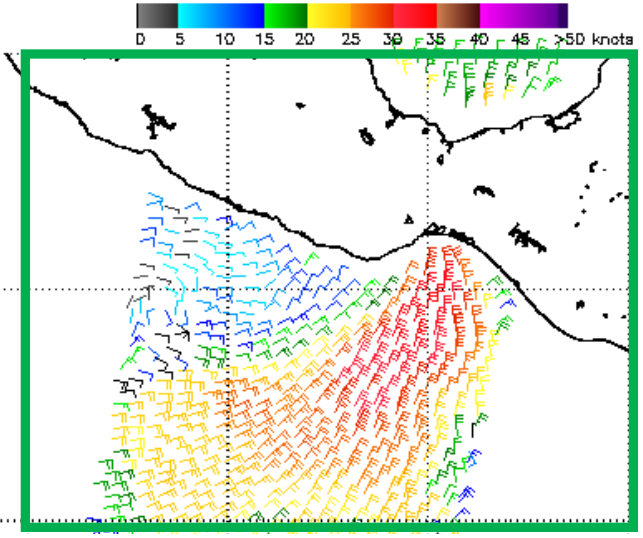


WINDSAT



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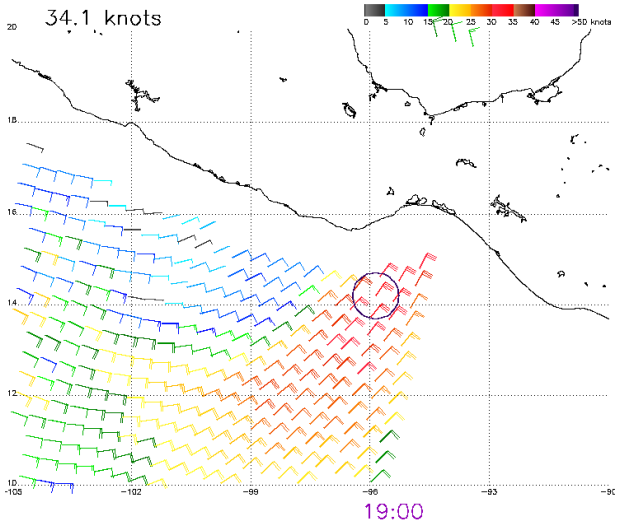

2010-11-06

hour (UTC)	TAFB (kt)
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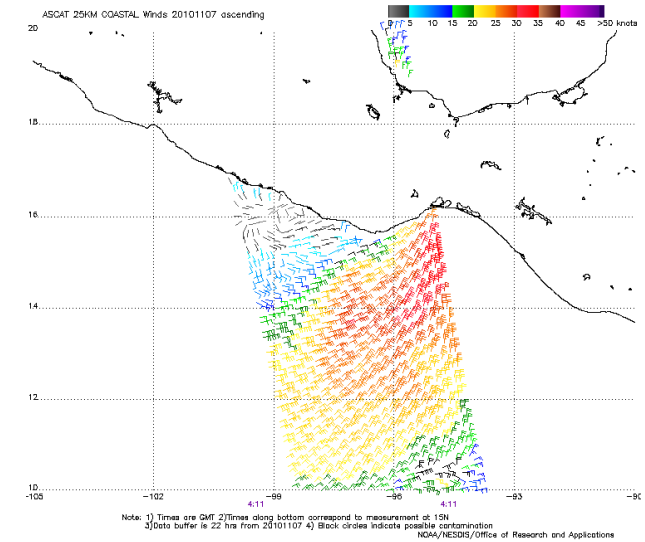
06	45
12	45
18	45

ASCAT COASTAL



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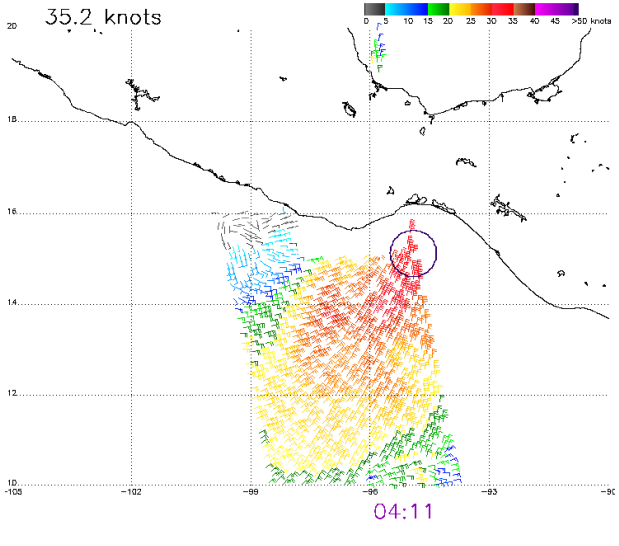

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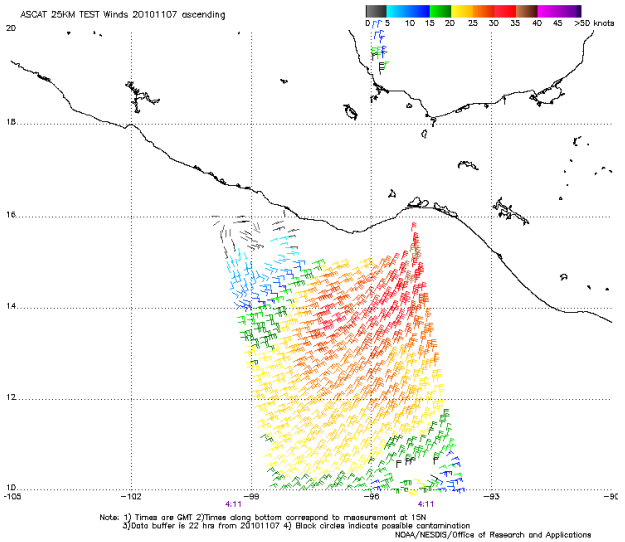

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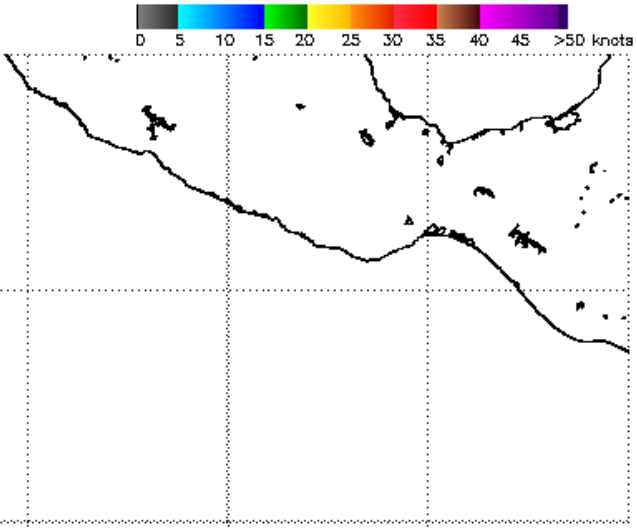

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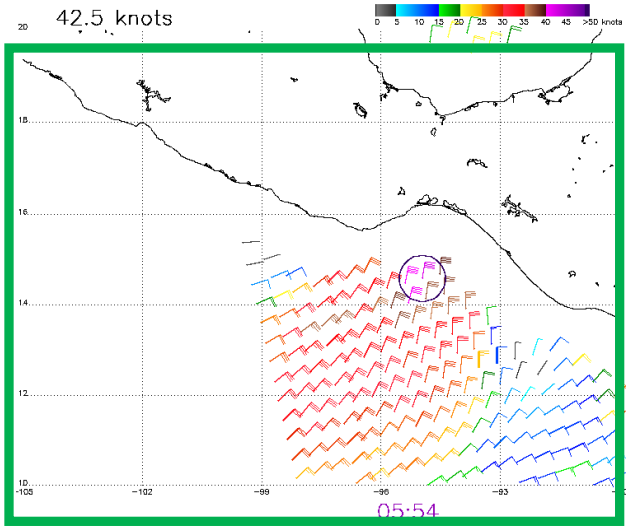

2010-11-07

hour (UTC)	TAFB (kt)
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06	45
12	40
18	40

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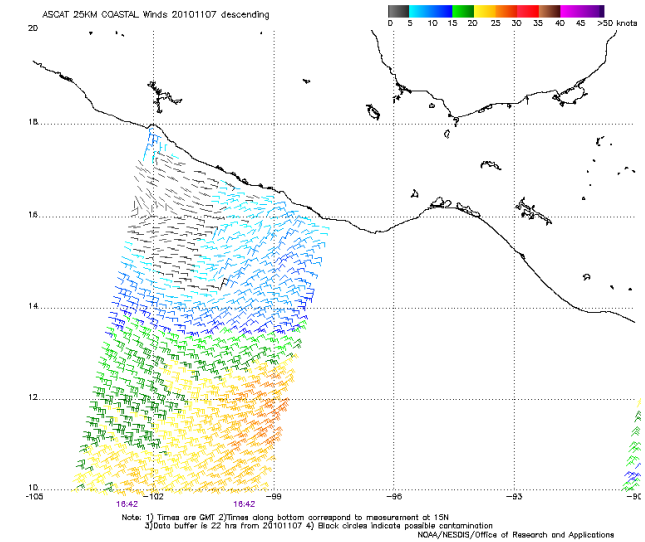

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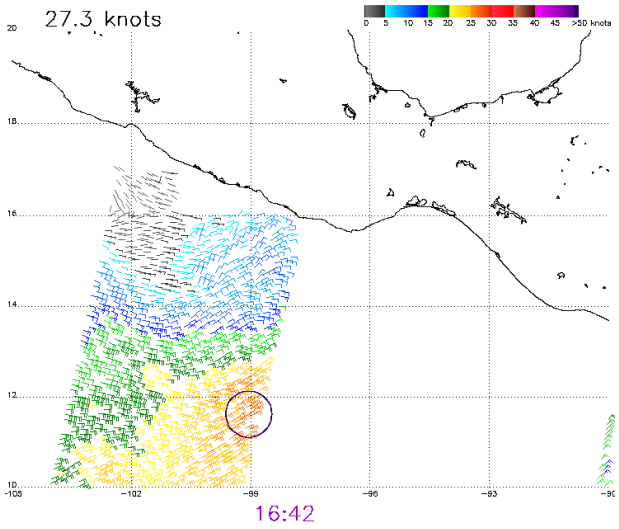

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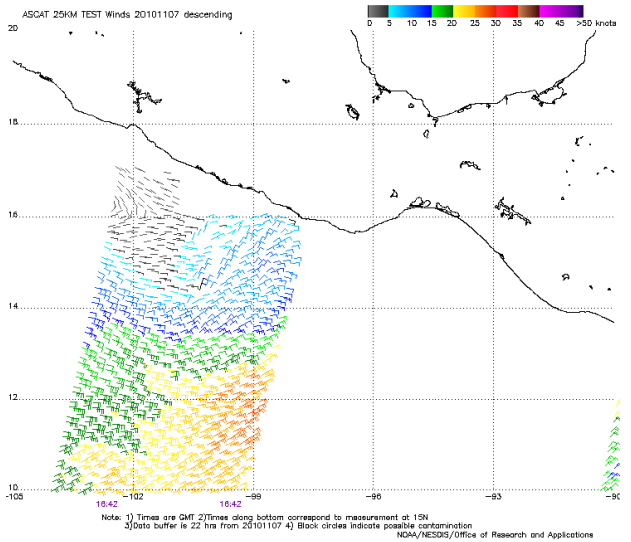
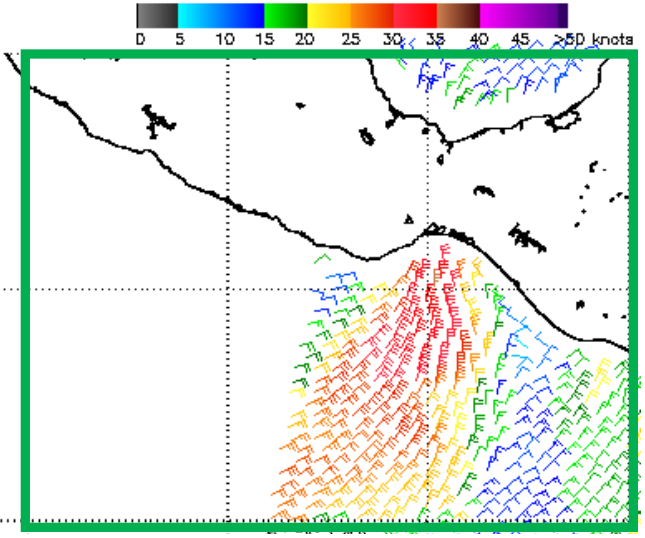
ASCAT High Wind



WINDSAT



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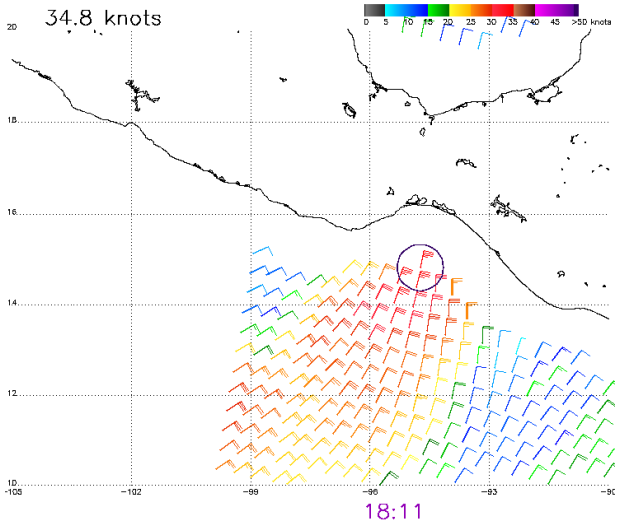

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2010-11-07

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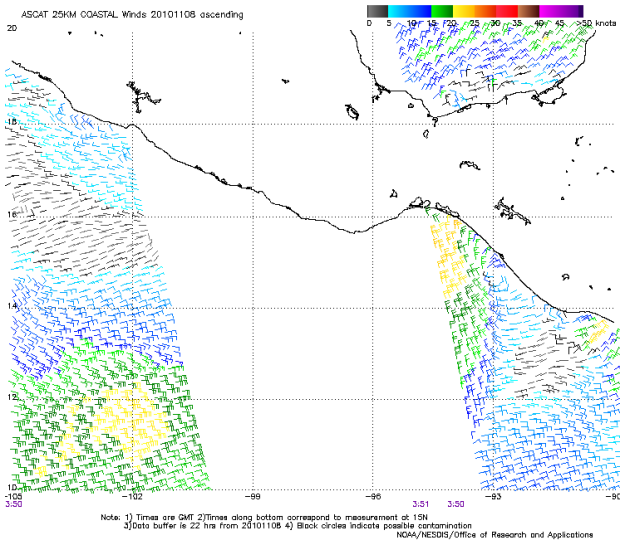
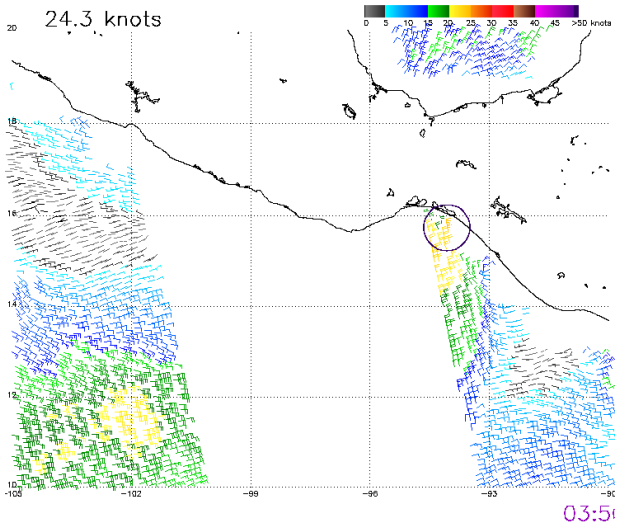
18	40

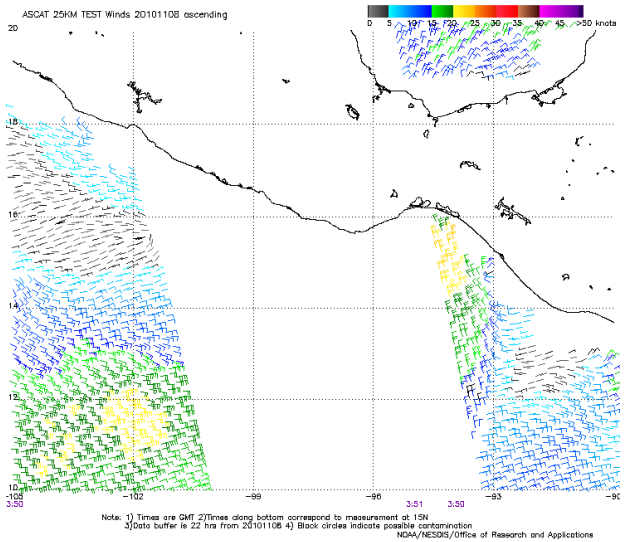
ASCAT COASTAL



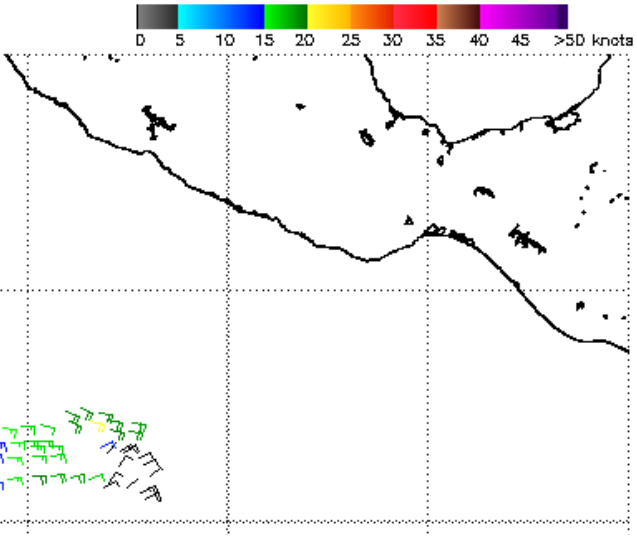
ASCAT



ASCAT High Wind

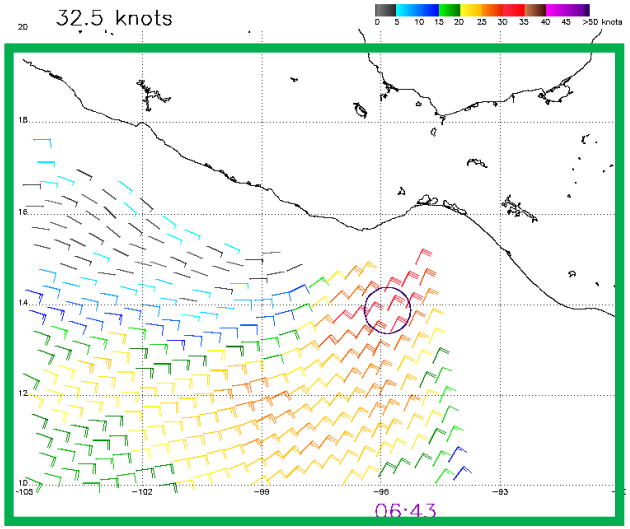


WINDSAT



23:40-0:40

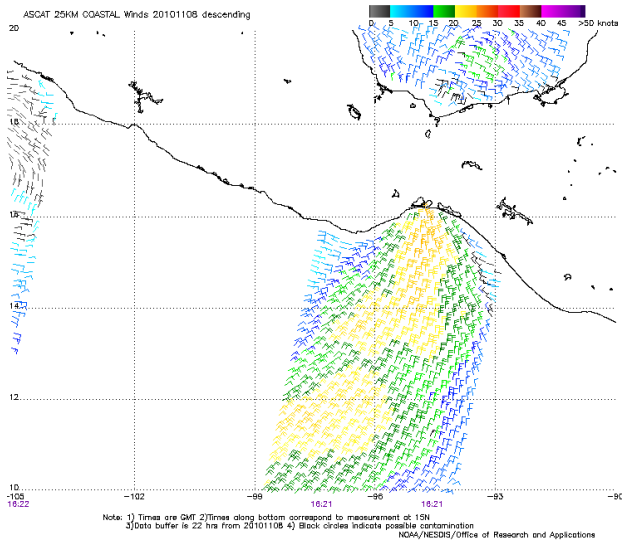
OSCAT



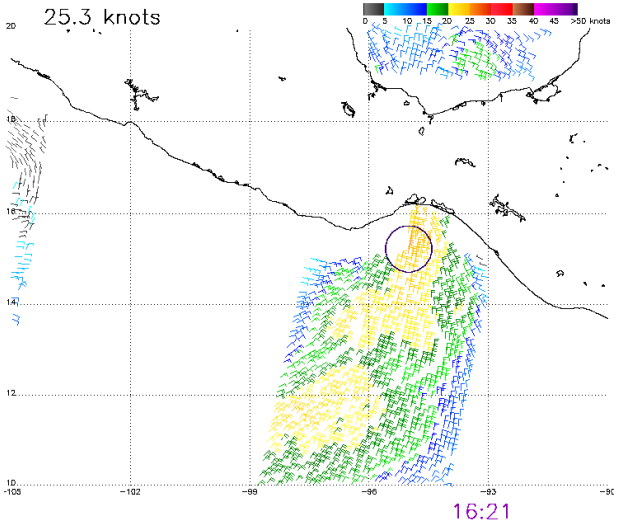
2010-11-08

hour (UTC)	TAFB (kt)
00	35
06	35
12	35

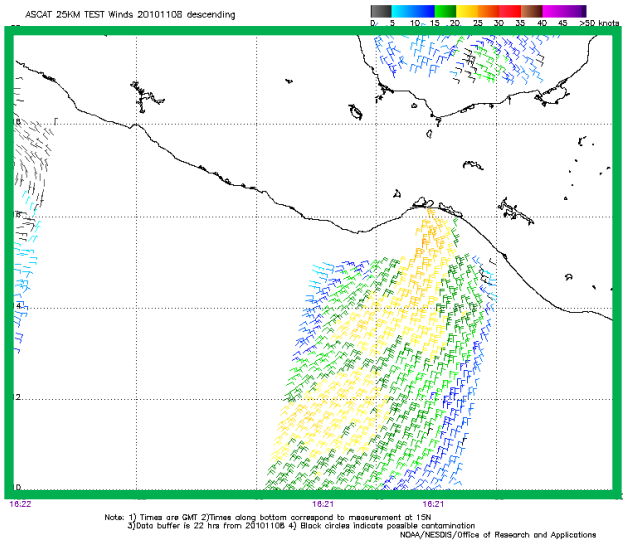
ASCAT COASTAL



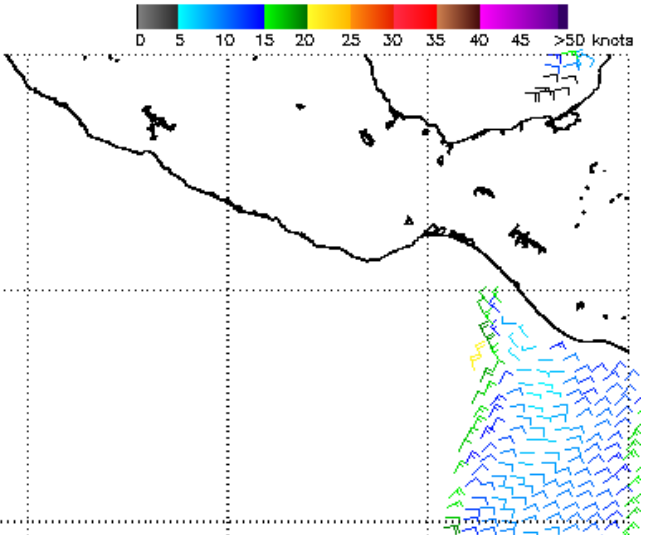
ASCAT



ASCAT High Wind

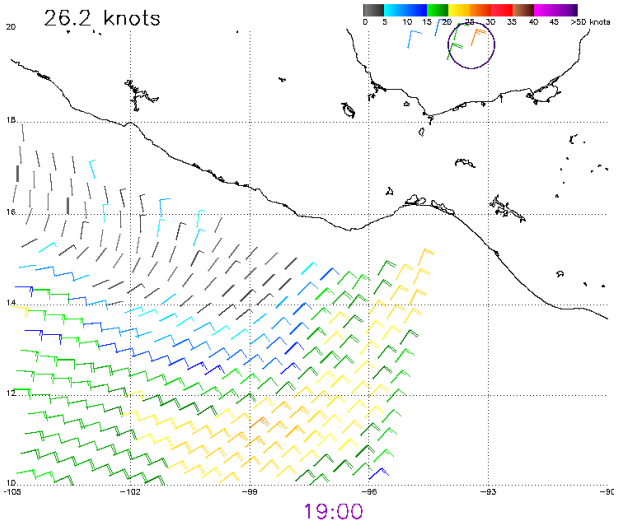


WINDSAT



11:30-12:50

OSCAT



2010-11-08

hour (UTC)	TAFB (kt)
00	35
06	35
12	35

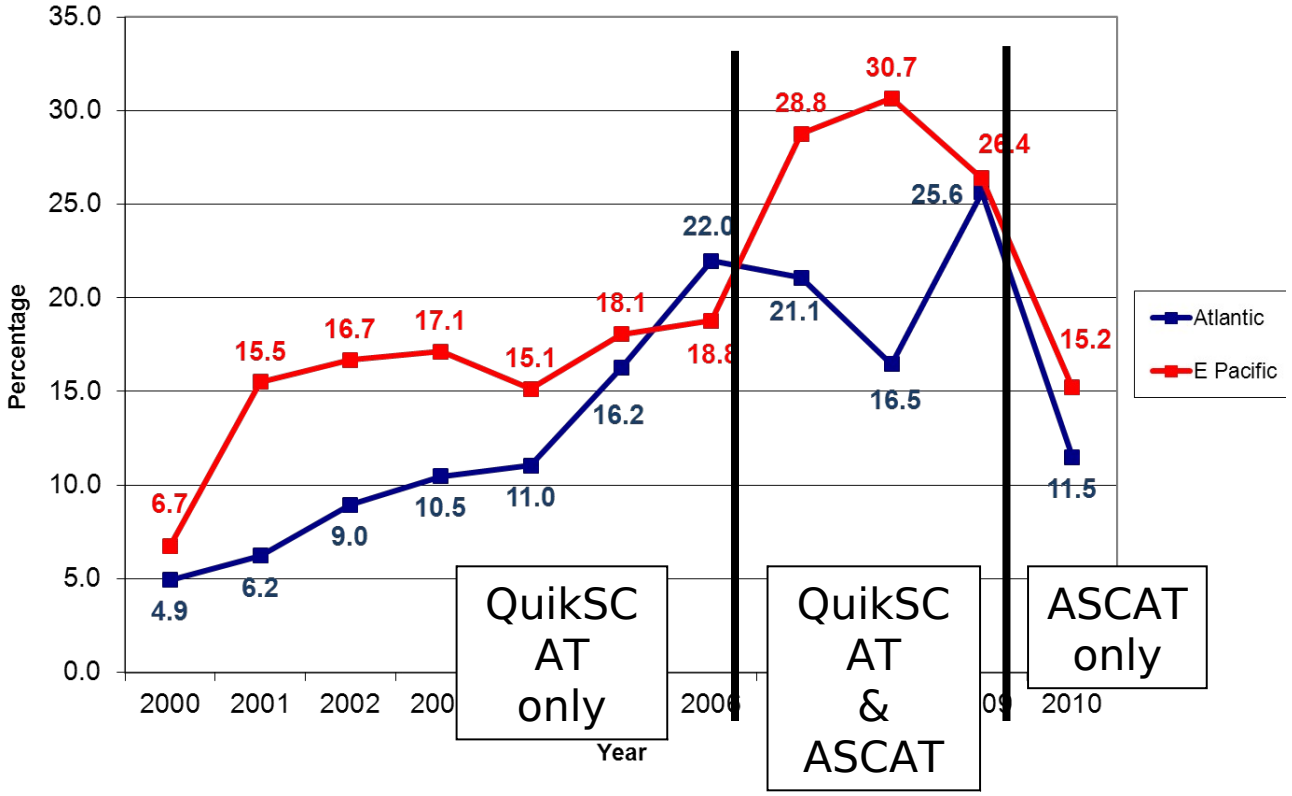
“Best” high winds for Tehuantepec warnings of 2010/2011

- For each day of a wind warning, plot ascending then descending satellite winds
- Boxed in green is the strongest retrieved wind (or satellite with best coverage when two satellites are similar)

ASCAT-coastal (26) ASCAT-high wind (8)

WindSAT (15) **OSCAT (39)**

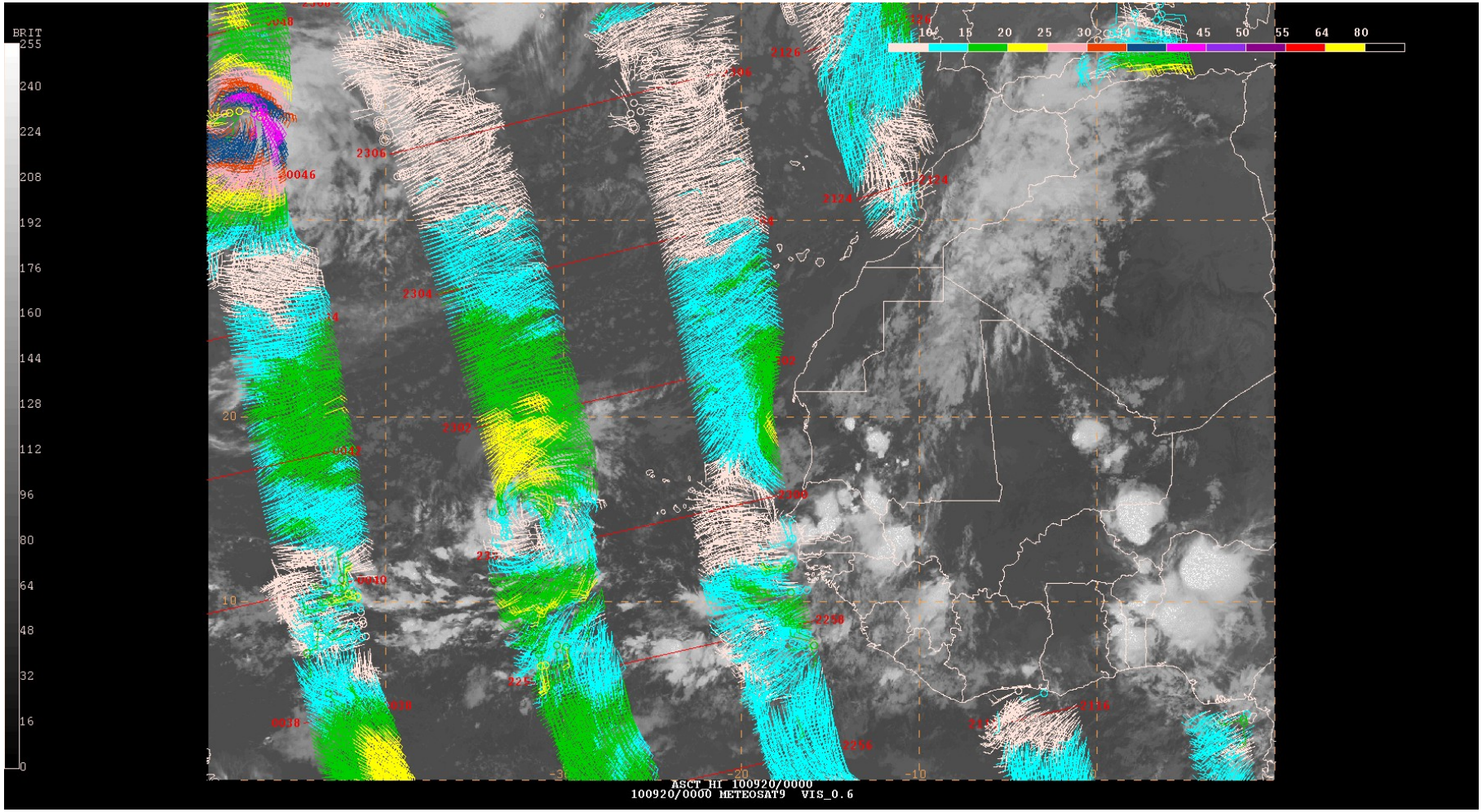
Scatterometer Mentions (%) in NHC Tropical Cyclone Discussions



- Sharp reduction in percentage of TCDs mentioning scatterometer data in 2010 after the loss of QuikSCAT – a decrease of almost half compared to the previous 3-year average
- Lack of mention mostly due to decrease in coverage with ASCAT leading to fewer passes over TCs and a lack of sampling of the entire TC circulation

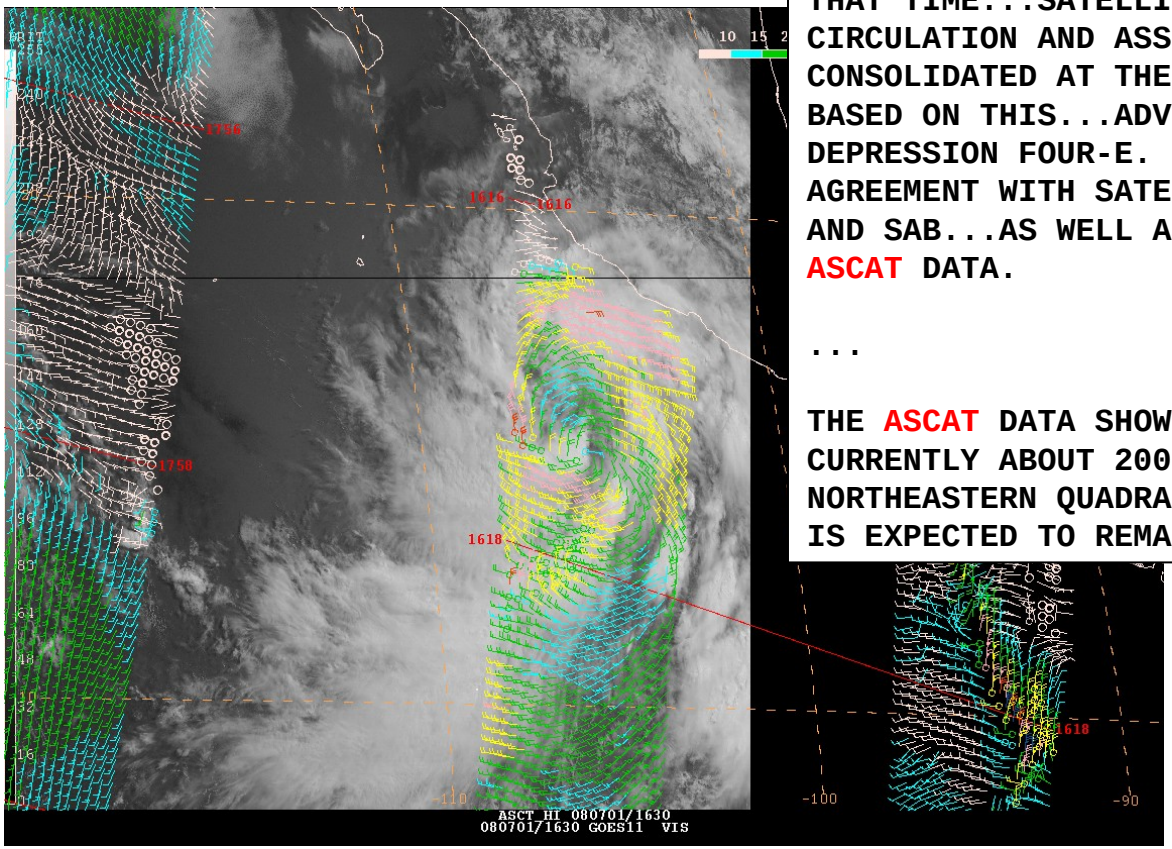
Hurricane Lisa

20-26 September 2010



Example of ASCAT Use

- Used as justification to initiate advisories on TD Four-E (later TS Douglas) and set initial intensity



TROPICAL DEPRESSION FOUR-E DISCUSSION NUMBER 1
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL EP042008
800 PM PDT TUE JUL 01 2008

ASCAT DATA AT AROUND 16Z SHOWED THAT THE LOW PRESSURE AREA SOUTHWEST OF MANZANILLO MEXICO HAD A BROAD CENTER ELONGATED NORTH-NORTHWEST TO SOUTH-SOUTHEAST. SINCE THAT TIME...SATELLITE IMAGERY INDICATES THAT THE CIRCULATION AND ASSOCIATED SHOWER ACTIVITY HAS SOMEWHAT CONSOLIDATED AT THE SOUTHERN END OF THE ELONGATION. BASED ON THIS...ADVISORIES ARE INITIATED ON TROPICAL DEPRESSION FOUR-E. THE INITIAL INTENSITY IS 30 KT IN AGREEMENT WITH SATELLITE INTENSITY ESTIMATES FROM TAFB AND SAB...AS WELL AS THE OBSERVED WINDS IN THE EARLIER ASCAT DATA.

...

THE ASCAT DATA SHOWED 25-30 KT WINDS IN A BAND THAT IS CURRENTLY ABOUT 200 N MI FROM THE CENTER IN THE NORTHEASTERN QUADRANT. WHILE THE CENTER OF THE CYCLONE IS EXPECTED TO REMAIN WELL OFFSHORE...

Summary of Lost Capability Due to Loss of QuikSCAT

- Was the loss of QuikSCAT expected to impact forecasts?
- Can such an impact be quantified? (Is there a bias trend in numerical *wave* forecasts, for example?)
- Oceansat-2 coverage would be great, but operational decisions can't be based on it (yet)

Summary of Lost Capability Due to Loss of QuikSCAT

- Ability to detect storm-force winds with satellite ocean vector wind data
- Ability to fully detect area impacted by gale-force winds in strongest events
- Ability to compare the model wind field with observations over a large spatial area
- Decreased forecaster confidence for severity, coverage, and timing of most extreme events